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HIV-Related Knowledge, Attitudes, and Behaviors in Two Low Resource Settings

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HIV-Related Knowledge, Attitudes, and Behaviors in Two Low Resource Settings

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by

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ABSTRACT

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Two Human Immunodeficiency Virus (HIV) outbreaks occurred almost simultaneously in the United States (US) (2014-2015) and in Cambodia (2015). Information is lacking on HIV-related knowledge, stigmatizing attitudes, and high-risk behaviors (KAB) among the general population, which may affect the transmission of HIV and lead to outbreaks. The current study aimed to: 1) assess KAB among the general population in a high-risk county in the US, 2) analyze KAB among the general population of Cambodia, and 3) compare KAB across samples from a high-risk county in Northeast Tennessee and a province in Cambodia. Tennessee data were collected in 2017 and Cambodian Demographic and Health Survey data were from 2014. Descriptive, Kruskal-Wallis, Wilcoxon, Bonferroni, and Spearman's correlation as well as simple and multiple logistic regression analyses were conducted on individual questions and KAB variables. Among Northeast Tennessee participants, 92.6% had heard of HIV, 43.5% knew that HIV could not be transmitted by mosquitos, and 67.8% of participants had never tested for HIV. Cambodian females aged 20-29, 30-39, and ≥40 were more likely to have a high level of HIV knowledge than those aged 15-19 (Odds Ratio (OR): 1.4, 1.6, and 1.6, respectively). Cambodian males who completed secondary and higher education had significantly higher odds of having a high level of HIV knowledge (OR: 2.3 and 2.9, respectively) and lower odds of engaging in some high-risk behaviors (OR: 0.3 and 0.2, respectively) than those who had completed no level of education. Battambang participants were more likely to have a high level of HIV knowledge (OR: 4.44;

95% CI: 2.14-9.24) and less likely to have at least one stigmatizing attitude (OR: 0.47; 95% CI: 0.24-0.94) and one high-risk behavior (OR: 0.16; 95% CI: 0.08-0.33) compared to Northeast Tennessee participants. Future studies are needed to determine associations between results and policies/laws, frequency of personal contact, and other differences between the two locations. KAB can greatly impact the outcome of HIV prevalence within a community. Having a greater understanding of KAB and creating interventions based on that understanding can have a positive influence on HIV infection and related outcomes.

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CHAPTER 1

INTRODUCTION

Statement of the Problem

Globally, there were 36.9 million people living with Human Immunodeficiency Virus (HIV) and 1.2 million deaths from AIDS-related diseases in 2014.[1] These numbers could have been significantly worse if not for the international efforts of those trying to achieve the HIV targets of the Millennium Development Goals (MDGs). MDG 6 states, in part, that HIV should have been halted and countries should have begun to reverse the spread of HIV/Aqcuired Immunodeficiency Syndrome (AIDS) by 2015 and that universal access to HIV/AIDS treatment should have been available to all those who needed it by 2010.[2] Fifteen years after declaring the MDGs, HIV infections decreased by 35% and AIDS-related deaths decreased by 24%.[3]

More recently, efforts have begun to reach the Joint United Nations Programme on HIV/AIDS (UNAIDS) 90-90-90 target. That is, 90% of people living with HIV know their status, 90% of people living with HIV who know their status are on treatment, and 90% of people on treatment are virally suppressed.[4] This has led to scaling up HIV testing and antiretroviral therapy (ART) globally.[4]

However, even with these significant improvements, health disparities still occur in racial minorities, age groups, and at-risk populations, such as men who have sex with men (MSM) and injection drug users.[5] For example, among adolescents, AIDS is the second leading cause of death and almost one third of new infections are among those aged 15-25 years.[6] Also, in the United States (US), there are currently more than 1.2 million people living with HIV[7] with most new infections occurring in at-risk groups. The MSM population, alone, has a 19-fold higher

prevalence rate than that of the general population.[8] Also, the Centers for Disease Control and Prevention (CDC) found that 1 in 5 MSM were HIV positive in 21 major cities.[9]

The estimated number of people diagnosed in the US in 2013 by transmission category were as follows: 30,689 male-to-male sexual contact, 3,887 heterosexual contact, 1,942 injection drug use, 1,270 male-to-male sexual contact and injection drug use, and 99 other (such as blood transfusion, perinatal exposure, and those who did not report).[10] The percentage of new infections arising from the MSM population has increased from 58.3% in 2009 to 64.8% in 2013 while heterosexual and injection drug use transmission have decreased from 28.6% to 25.2% and 8.9% to 6.5%, respectively.[5]

Even with this decrease in infection among injection drug users, a large HIV outbreak occurred in Scott County, Indiana due to sharing of injection equipment.[11] Between 2014 and 2015, 181 new infections were diagnosed in Scott County, Indiana, where only five cases were newly diagnosed in the previous ten years combined.[11] While it is not possible to obtain certain data prior to the outbreak, the CDC has identified 219 other counties under similar conditions.[12] Included in this list are several counties located in Northeast Tennessee. Located in the Appalachian region, this high-risk region has multiple barriers for HIV prevention and treatment that are worth exploring to better understand potential risk factors for a HIV outbreak.

At the same time as the Indiana outbreak, another major outbreak was occurring in Southeast Asia. In the Battambang Province in Cambodia, 242 new infections were diagnosed within a three-month period.[11] While this outbreak was also due to injection equipment, the outbreak occurred because of the reuse of needles by an unlicensed medical care provider.[11] Although the sources (an injection drug user and an unlicensed medical provider) of the outbreaks were different, there is no evidence to show that either location was aware of what

HIV was or that unclean injection equipment could spread HIV. This leads to the belief that lack of awareness and knowledge about HIV contributed to the rapid outbreaks because if more people were aware then they would have taken necessary precautions to prevent getting infected.

It is not uncommon that these outbreaks spread so quickly within their communities as studies have shown that neighborhood characteristics and HIV risk behaviors are associated.[13] Certain "toxic" neighborhoods (high levels of violence, poor housing, abandoned buildings, and low levels of employment) correlate with injection drug use, making sharing injection equipment more convenient, therefore more likely to occur.[13] Levels of enforcement, such as number of officers patrolling an area or how strict the punishment is, may also be higher in these areas making it difficult for people to carry protective equipment, such as extra needles or condoms.

One of the earliest reports on HIV labeled *Pneumocystis* pneumonia, a potential coinfection for HIV patients, as being associated with "homosexual lifestyle".[14] After this, HIV was labelled as "gay cancer" or gay-related immune deficiency (GRID), establishing stigma and discrimination towards HIV and those living with HIV during early cases.[15] Since then, a three-pronged approach to intervening on HIV infections has been identified: 1) information or education about HIV transmission and prevention, 2) health and social services that provide care for those living with HIV and testing for HIV, and 3) social support environment of those who think they are at risk or who are infected with HIV.[15]

To establish a base for the three-pronged intervention, it is imperative to study the knowledge, attitudes, and behaviors (KAB) that currently exist in the population. A 2009 KAB study on college students at a Midwestern university showed that 14.2% thought that HIV can be transmitted by mosquitos and 19.9% did not know one way or the other, only 29.4% had ever been tested before, and 53% reported using condoms during their last intercourse.[16] A study

conducted in 2013 on international students at a US university found that 41% believed that HIV can be spread by mosquitos and 20% thought sharing cigarettes, swimming pools, and toilet seats were transmission routes.[17] These results show that misconceptions are high and may differ across samples given the large differences in prevalence of HIV knowledge questions. Therefore, KAB study should be assessed prior to implementation of an intervention in a community to study HIV knowledge, stigmatizing attitudes, and high-risk behaviors.

To prevent future outbreaks from occurring, evaluating KAB can highlight alterable factors that may have contributed to the outbreaks. A KAB assessment (specifically HIV knowledge about transmission and prevention, stigmatizing attitudes, and high-risk behaviors) will also establish certain groups, such as age, race, or wealth index, and educational materials that organizations should concentrate their prevention efforts. Although this information may work better as a prevention, in the aftermath of an outbreak, KAB information allows public health professionals to target populations to ensure they are tested and to educate the general population.

While it would be beneficial to evaluate all regions within both countries, there is currently no available data for the US on HIV-related KAB. However, to complete this project relevant data were obtained from a county in Northeast Tennessee that was identified by the CDC as a county at high-risk for an outbreak similar to that of Scott County, Indiana. Comparing a province in Cambodia that had a recent HIV outbreak and a high-risk county in Northeast Tennessee provides the opportunity to analyze the similarities and differences of HIV-related KAB across two different cultures where recent outbreaks have occurred or may occur.

Research Aims

The current study aimed to: 1) assess the HIV knowledge about transmission and prevention, stigmatizing attitudes, and high-risk behaviors (KAB) among the general population in a high-risk county in the United States, 2) analyze the KAB among the general population of Cambodia, and 3) compare KAB across samples from a high-risk county in Tennessee and Battambang province in Cambodia.

Theoretical Framework

As shown in Figure 1.1, while fewer high-risk behaviors may be directly linked to a decrease in HIV transmission, many other factors impact the transmission of HIV. This study focused on the associations between KAB and the factors that influence KAB (as shown in the red box). In the HIV KAB theoretical framework, an increase in knowledge leads to a decrease in stigmatizing attitudes towards HIV and fewer high-risk behaviors taken. HIV knowledge questions assessed include ones on transmission by sex, blood and blood products, mother-to-child transmission and prevention, and other forms of transmission (such as through a mosquito bite).

For this theoretical framework, based on previous theories, stigmatizing attitude is used to predict, in part, high-risk behaviors.[18] Among others, this study focused on desire for social distance and anticipated stigma. Desire for social distance refers to individuals who do not wish to be around someone with HIV. For example, if someone agrees to the statement "I could not be friends with someone who has HIV" this would indicate that the individual desires social distance. Anticipated stigma refers to the stigma an individual believes they would encounter if they had HIV. If someone agrees to the statement "people talk badly about people living with

HIV" then that individual believes they would be stigmatized by other community members if they were a person living with HIV.

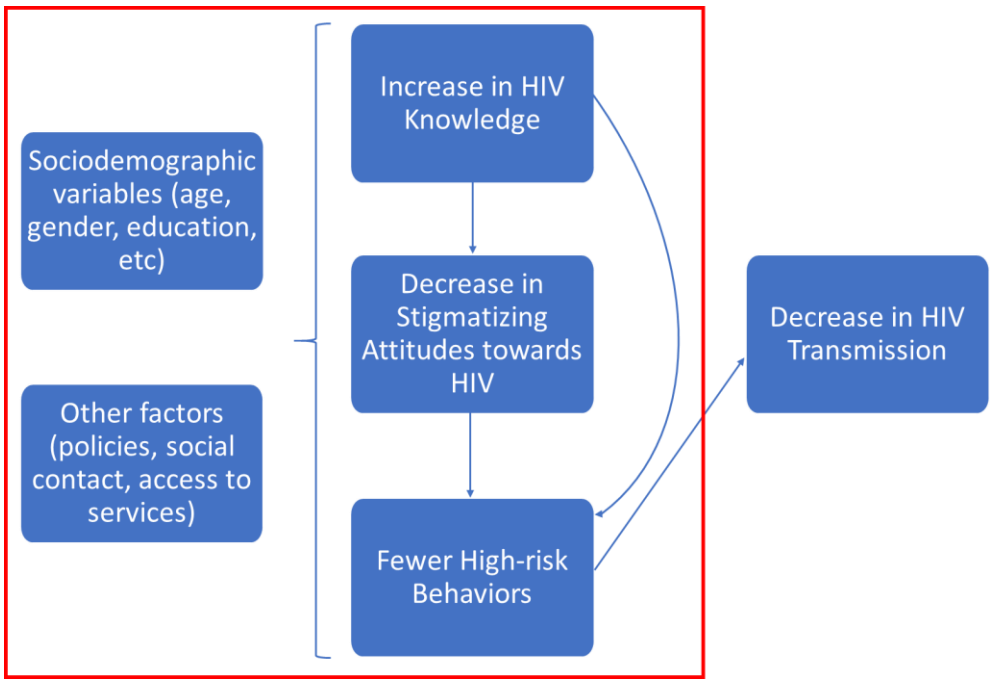

Figure 1.1: HIV KAB theoretical framework

Theoretically, higher levels of correct HIV knowledge should lead to decreased stigma about HIV and to fewer high-risk behaviors taken.[19] Fewer stigmatizing attitudes towards HIV and those living with HIV may lead to an increase or decrease in high-risk behaviors related to HIV. For example, if someone has a generally positive attitude about HIV and outcomes associated with HIV then they may persist with high-risk behaviors, not caring about the outcomes. However, fewer stigmatizing attitudes may also lead to the individual getting tested for HIV. While increased HIV knowledge leads to fewer high-risk behaviors, the relationship between the two will be lower than the relationship between increased HIV knowledge and fewer stigmatizing attitudes and fewer stigmatizing attitudes and high-risk behaviors, as the

relationship between HIV knowledge and high-risk behaviors is mediated through stigmatizing attitudes.

Sociodemographic variables and other factors can affect HIV knowledge, stigmatizing attitudes and high-risk behaviors. Sociodemographic variables include where you live, the type of education you receive, among others. Other social indicators include social contact with someone who has HIV, policies, and access to services. Having social contact with someone who has HIV should lead to an increase in HIV knowledge, decrease in stigmatizing attitudes, and decrease in high-risk behaviors.[20] Policies about abstinence only sexual education in schools and criminalization of needle and condom possession also have an effect. The presence of these policies can lead to decreased knowledge, increased stigmatizing attitudes, and increased high-risk behaviors. Similarly, decreased access to services can also lead to a decrease in knowledge, increased stigma, and increased high-risk behaviors taken.

Tennessee and HIV

In 2014, the prevalence of HIV in Tennessee was 295 per 100,000.[21] The next year brought 712 newly diagnosed cases, making Tennessee ranked number 16 out of the 50 states for new cases in 2015.[22] Overall, 49% of HIV diagnoses were located in the Southern US, while it only accounts for 37% of the population.[23] These states include Alabama, Georgia, Florida, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Texas. Researchers point to cultural conservatism and policies prohibiting needle exchanges as reasons why the south is disproportionately affected.[23]

In the CDC report identifying 220 counties where a potential HIV outbreak could occur, 56% are located in the Appalachian region of Kentucky, West Virginia, and Tennessee.[12,24]

Appalachian areas experience multiple barriers that impede prevention efforts including distance to healthcare facilities, limited HIV care providers, limited peer support, and social stigma.[25-26] These areas also tend to experience high levels of poverty, poor mental health, and high rates of drug abuse. All of which are associated with increased HIV infection risk.

Cambodia and HIV

Cambodia is a lower-middle income country located in Southeast Asia. In 2015 an estimated 7,000 people were living with HIV with the rate of HIV at 3326 per 100,000 people.[27] Since 1991, various agencies have been fighting to prevent and eliminate the HIV and AIDS epidemic in Cambodia.[28] Their combined efforts successfully decreased the prevalence rates from 2.4% in 1998 to 0.6% in 2013.[28] In fact, Cambodia is one of few countries to have achieved the MDG of halting and reversing the spread of HIV.[29-30] However, there are still high prevalence rates among certain high-risk populations. Unlike the US, most new infections occur among couples engaging in casual sex.[30]

Knowledge and HIV

Correct knowledge about transmission and prevention of HIV is necessary for an individual to take precautions to keep from becoming infected. When analyzing how knowledge affected people getting tested for HIV, a systematic review presented 14 studies that found a significant positive association between the two.[31] One of these studies showed that the associations differ among genders, while another discovered that associations did not differ across income levels.[31]

A study conducted in Trinidad found that HIV knowledge was associated with concern about personal risk, communicating with partners, and possession of condoms, as well as that

those with lower education levels had lower HIV knowledge.[32] While knowledge is essential to prevent HIV, it is not solely indicative of individual behaviors.

Attitudes Towards HIV and People Living with HIV

The attitudes this study focused on are the stigma towards HIV and those living with HIV. Stigma is defined as "a powerful discrediting and tainting social label that radically changes the way individuals view themselves and are viewed as persons'".[33] Stigma contributes to the continued transmission of HIV because of its effects on adherence to antiretroviral therapy (ART), drugs abuse, and getting tested for HIV.[5, 34-36]

High-risk groups are burdened by stereotypes and potential for violence within their community. Having some form of social support, whether a friend or family member, influences the positive behaviors one takes.[9] Therefore, living in an unsupportive environment increases the likelihood of engaging in high-risk behaviors. One study showed that participants delayed testing because of negative comments made by their support networks.[9] A meta-synthesis on 32 countries showed that HIV-related stigma interfered with patients' adherence to ART.[34]

Studies have found that stigma leads to higher rates of mental health issues, such as stress, anxiety, and depression.[35] Depression may lead to lack of self-care, anxiety may reduce assertiveness of health-protective behavior, and stress could cause a person to avoid effective coping mechanisms.[35] All of which could lead to risk-taking behaviors potentially leading to HIV infection. Anxiety can also be associated with locations at which HIV testing occurs. Some locations offer little privacy and are transparent in their purpose.[9] Not only does this cause anxiety, but it can also lead to the lack of follow-up or return of individuals seeking HIV testing.

Violence and discrimination can also cause higher rates of substance abuse.[36] MSM are more likely to drink alcohol and use drugs, start drug use at an earlier age, and have a more rapid increase of consumption over time.[35] Substance abuse causes a lack of self-control and increased impulsive decisions which, in turn, lead to risk-taking behaviors potentially leading to HIV infection.[35]

Behaviors Associated with HIV

High-risk behaviors associated with contracting HIV include: unprotected anal intercourse, injection drug use, lack of condom use, multiple sexual partners, and commercial sex work. Unprotected anal intercourse is typically associated with the MSM community. Within the MSM community, those who are HIV negative discriminate against those who are HIV positive by excluding HIV positive individuals from events and only dating someone of the same status instead of taking precautions to prevent HIV transmission.[37] This discrimination and fear of loss of social support can prevent MSM from disclosing their HIV status to their partner, exacerbating the risk of infection.[6] While injecting drugs alone is not a high-risk behavior, sharing equipment is. A study found that more than 60% of people who inject drugs report sharing injection equipment.[38]

HIV-related KAB in Cambodia and Northeast Tennessee

As shown, KAB can greatly impact the outcome of HIV prevalence within a community. If residents in Battambang or Scott County had greater knowledge about the risks of injection equipment, then they may have taken necessary precautions to ensure they were injected with clean or new equipment. Because Northeast Tennessee and Cambodia are high-risk and have low resources distributed to HIV prevention, assessing KAB may allow for a more effective

allocation of resources. Having a greater understanding of each of these and analyzing the relationship between HIV knowledge, stigmatizing attitudes, and high-risk behaviors to create interventions based on the results can assist with developing effective interventions to prevent the further spread of HIV and reduce the stigma surrounding HIV and those living with HIV.

Methods

Surveys.

Due to the 2014-2015 HIV outbreaks in Cambodia and the US, it is imperative to study factors that contributed to the outbreaks in those areas to avoid future outbreaks in these regions, regions similar to these regions that have been identified as high-risk areas, and different regions in both countries. Demographic and Health Survey (DHS) data on HIV-related KAB were collected in Cambodia in 2014, one year prior to the outbreak. Therefore, these data were used to analyze factors associated with individual KAB questions for the general population of Cambodia and for the specific province associated with the outbreak, Battambang.

However, data were not available for KAB prior to the outbreak in Scott County, Indiana. It would not be beneficial in preventing an outbreak to collect data now, as the outbreak and interventions to control and stop the outbreak would have altered KAB. Given this, using a county that was identified with similar healthcare services and population statistics, but has not yet had an outbreak, was needed for KAB data collection. Therefore, primary data were collected from a high-risk county in Northeast Tennessee. To collect these data, a multi-pronged approach was warranted. Participants in the sample were 18 years or older as well as current residents of the high-risk county. Using a confidence level of 95%, a margin of error of 5% and an expected frequency of 50%, a sample size of 383 individuals was needed. However, only 348 individuals agreed to participate with 26 of those being ineligible resulting in a final sample size of 322.

The high-risk county is subdivided into 23 census tracts, 22 of which have household units. Within the 22 census tracts, two census blocks were randomly selected to conduct a door to door survey at all households on those blocks. According to data from the census website, there are 66,434 household units across 4,412 blocks.[39] This averaged into roughly 15 household units per block, equaling a total of 660 households. However, 900 households were actually in the sample area. Of the 900, 134 (15.0%) were excluded due to no trespassing signs, fences, or because the residents were not fluent in English.

Each individual over 18 in the household was asked to complete the paper survey. The participants could complete the survey in the location of their choosing to help with privacy. If a participant refused to take survey at that moment, they were asked if a better time was available or given a letter describing the survey and the link to the online survey. Of the 766 household that were knocked on, 476 (62.1%) did not answer, 152 (19.8) took the link to the online survey, 47 (6.1%) refused to participate, and 91 (11.9%) filled out the survey.

Flyers were also strategically posted around the high-risk county in an attempt to attract the more at-risk populations such as men who have sex with men and injection drug users. The survey was also available for students at a local university on Sona. The Sona system allowed for the Department of Psychology to offer students in the Introductory to Psychology course, as well as other courses, participation in research credit. The survey was available from the beginning of October to the end of the Fall semester of 2017. Of the final sample, 70.0% completed the survey on Sona, 25.0% completed a paper version, and 5.0% completed the online version.

The survey used for data collection in Northeast Tennessee was developed based on the DHS survey as well as other published surveys.[40-41] Along with HIV knowledge, stigmatizing attitudes, and high-risk behavior variables, sociodemographic variables, such as age, gender,

race, educational attainment, etc., were also gathered. The complete survey can be found in Appendix A.

KAB Variables. Principal component analyses (PCA), exploratory factor analyses (EFA), and Cronbach's alpha were conducted to confirm validity and reliability of KAB variables. Principal component analysis and exploratory factor analysis using promax (oblique) rotation was used to extract factors. Kaiser-Guttman criteria (minimum eigenvalue of 1.00) and scree plots were used to assess meaningful factors. A question was considered to load onto a factor if the factor loading was 0.40 or greater. If a question loaded onto more than one factor or no factors, it was excluded from analyses.

Originally, knowledge was assessed using 24 true and false questions. Of these, 15 remained after PCA and EFA. Six questions loaded onto the first factor which was labeled "transmission through sex, blood, and blood products (SBBP)". Four questions and five questions were loaded onto "mother to child transmission (MTCT)" and "other knowledge questions", respectively. SBBP, MTCT, and other had a combined total variance of 43.5% from PCA and 94.0% from EFA. Cronbach's α for the overall model was 0.822 with individual factors ranging from 0.683-0.765. To calculate overall score, one point was awarded for each correct answer. If an answer was left blank, it was considered incorrect and no point was awarded.

A 4-point Likert scale was used to analyze stigmatizing attitudes towards HIV and those living with HIV. Each of the 23 stigmatizing attitude statements were answered with "strongly agree", "agree", "disagree", and "strongly disagree". The points awarded were based on the individual statement with more points indicating a greater stigmatizing attitude. For example, for the statement "I would buy fresh fruits and vegetables from a shopkeeper who was infected with HIV", four points were awarded for answering "strongly disagree" while 1 point was awarded

for answering “strongly agree”. For the statement “people with HIV should be ashamed of themselves”, one point was awarded for “strongly disagree” while four points were awarded for “strongly agree”.

After conducting PCA and EFA, 18 questions remained that were evenly distributed across three factors labeled “responsibility and blame (R&B)”, “social contact (SC)”, and “anticipated stigma (AS)”. R&B, SC, and AS had a combined total variance of 50.2% from PCA and 89.1% from EFA. Cronbach’s α for the overall model was 0.889 with individual factors ranging from 0.767-0.863. The total score for stigmatizing attitudes could be 72 points. However, if someone skipped a question, their total points would drop 4 points for each question skipped. The percentage of total points awarded over total potential points was used for analyses.

Six yes or no questions or open-ended questions were used to evaluate behaviors. High-risk behaviors analyzed included: not ever being tested for HIV, having sexual relationships with more than one person in the last 12 months, paying someone in exchange for sex, not using a condom with someone other than a spouse or live-in partner, and injecting drugs in the last 12 months. One point was given for each behavior for a range of 0-5. Having five points was considered as being a high-risk participant while zero points was considered as being a low-risk participant. However, if a participant skipped a question their total score was reduced by one. Percentages for high-risk behaviors were used for analyses.

Summary

Assessing KAB in a community can assist in creating targeted interventions for HIV prevention. Therefore, the overarching goal of this study was to determine the KAB among the general population of a high-risk county in the US, examine the KAB among the general

population in Cambodia, and analyze the similarities and differences in KAB across the two cultures.

CHAPTER 2

HIV-RELATED KNOWLEDGE, ATTITUDES, AND BEHAVIORS AMONG THE GENERAL POPULATION IN A HIGH-RISK COUNTY

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ABSTRACT

Information is lacking on what the population knows about HIV and what their attitudes are towards the disease and those living with HIV, which may affect HIV transmission. A cross-sectional survey was administered to assess the HIV-related knowledge, attitudes, and behaviors (KAB) of a high-risk county in Northeast Tennessee. Descriptive, Kruskal-Wallis, Wilcoxon, Bonferroni, Spearman's correlation, and multiple logistic regression analyses were conducted on individual questions and KAB variables. Of the 322 participants, 92.6% had heard of HIV, 43.5% knew that HIV could not be transmitted by mosquitos, 82.9% felt that people talked badly about people living with HIV, and 67.8% of participants had never tested for HIV. Participants with an Associate's degree or higher were less likely to have high stigmatizing attitudes than those with high school or below (OR: 0.25; 95% CI: 0.11-0.57). Interventions are needed to increase levels of knowledge and decrease stigma in this high-risk county.

Keywords: HIV, KAB, stigma, Tennessee

INTRODUCTION

Since its arrival in the United States (US) in the 1980's, Human Immunodeficiency Virus (HIV) has been the highest or among the highest causes of infectious disease mortality and morbidity each year. Currently, more than 1.2 million people are living with HIV in the US (1). Even though overall HIV infections are decreasing in the US, infections among certain groups are on the rise. This, in part, can be contributed to the stigma towards HIV and those living with HIV.

Stigma from the general population can be assessed by analyzing their attitudes towards HIV and those living with HIV (2). As some theoretical frameworks state, attitudes can be influenced by ones' knowledge on the subject matter (3). Attitudes can then affect the behaviors of an individual. In the case of HIV, high-risk behaviors, such as multiple sexual partners, unprotected sexual intercourse, and sharing needles, can lead to contracting HIV.

The most recent research on knowledge, attitudes, and behaviors (KAB) in the US has focused on specific groups such as college students or immigrants (4-5). Therefore, information is lacking on what the general population knows about HIV and what their attitudes are towards the disease and those living with HIV. A comprehensive understanding of KAB is necessary prior to designing and implementing interventions for an area.

In 2016, the CDC identified 220 counties in the US with similar conditions to Scott County Indiana, where an HIV outbreak occurred in 2015 (6). Over half of those counties (56%) are located in the Appalachian region of Kentucky, West Virginia, and Tennessee (6-7). Included are 7 of the 8 counties located in Northeast Tennessee (6,8).

The county where this study was conducted has the highest HIV prevalence in Northeast Tennessee at 172 per 100,000 people (9). Further, 64.8% of people living with HIV in this county had HIV transmitted to them by male-to-male sexual contact or male-to-male sexual contact and injection drug use (10).

The purpose of this study was to assess the HIV-related KAB among the general population of a high-risk county in Northeast Tennessee by determining the level of comprehensive HIV knowledge, specific stigmatizing attitudes towards HIV and people living with HIV, and high-risk behaviors taken as well as evaluating the relationship between KAB.

METHODS

Sample and Recruitment

Participants in the sample were 18 years or older as well as current residents of the high-risk county in Northeast Tennessee. Using a confidence level of 95%, a margin of error of 5% and an expected frequency of 50%, a sample size of roughly 383 individuals was estimated. A total of 348 participants responded to the survey. However, 26 of these participants were excluded due to being under the age of 18 or not a resident of the high-risk county making the final sample size 322.

A cross sectional survey, adapted from previously published questionnaires, was collected in a high-risk county in Northeast Tennessee (11-12). To recruit participants, researchers conducted door to door surveys and posted flyers at community and health centers. The door to door survey was conducted in two randomly selected census blocks within 22 of the 23 census tracts in the high-risk county. The 23rd census tract had no residential households.

Participants responding to flyers could choose to take the survey online or contact the principal investigator to complete the survey on paper. The survey was also made available on a local university's Department of Psychology testing system, so that students could receive credit for participating in the survey. Having the survey available on this system ensured access to those aged 18-25, an age group with high rates of HIV in Northeast Tennessee (10). Informed consent was obtained from all individual participants included in the study.

Measures

Knowledge. Knowledge was assessed using 15 true or false questions. These were divided into three subscales on transmission by sex, blood, and blood products (SBBP), mother to child transmission (MTCT) and other forms of transmission. One point was given for each correct response for a final overall score ranging between 0-15. Scores were reported in percent of total questions correct.

Stigmatizing Attitudes. Stigmatizing attitudes were examined with 18 questions using a 4-point Likert scale. The questions were designed to see how participants would respond in hypothetical situations as well as to assess their attitudes about how other people may respond to HIV. Each question could be answered with "strongly disagree", "disagree", "agree", or "strongly agree" and was given 1-4 points, with 4 points being awarded to the more negative response. The overall model had a Cronbach's α of 0.889.

Stigmatizing attitudes were divided into three subscales on responsibility and blame (R&B) (α: 0.863), social contact (SC) (α: 0.778), and anticipated stigma (AS) (α: 0.767). Variables for social contact were reverse coded. Scores were reported in percentages ranging from 25-100%.

Behaviors. Behaviors were evaluated with yes or no questions and open ended questions. High-risk behaviors were considered: not ever being tested for HIV, having sexual relationships with more than one person in the last 12 months, paying someone in exchange for sex, not using a condom with someone other than a spouse or live-in partner, and injecting drugs in the last 12 months. One point was given for each behavior for a range of 0-5. Having five points was considered as being a high-risk participant while zero points was considered as being a low-risk participant.

Covariates. Demographic variables were also collected to determine factors associated with KAB. These included: gender, age, education level, household income, employment, race, marital status, personal contact with someone who has HIV, and attended an educational program on HIV or sexually transmitted diseases (STDs). These variables were also considered as covariates for the multivariate regression analyses.

Statistical Analyses

Frequencies and percentages were reported to describe demographic variables as well as individual KAB questions. Kruskal-Wallis (more than two groups per variable) and Wilcoxon rank sum tests (two group variables) were used to find significant differences between mean KAB scores among covariates because of the non-parametric distribution of the data. Bonferroni post hoc adjustment was then conducted to determine where the intergroup differences occurred for covariates that were compared using Kruskal-Wallis tests. Spearman's correlation analysis was conducted to determine association between KAB scores.

Finally, to control for covariates and assess the association of KAB with sociodemographic variables, logistic regression was conducted with dichotomized KAB

variables. The median score was used as the cutoff point for all KAB variables because of the non-parametric distribution of data. The outcome variables for logistic regression analyses included high level of knowledge (≥73.3%), high stigmatizing attitude (≥51.7%), and engaged in at least one high-risk behavior (≥20%). The predictor variables were gender, age, education level, household income, employment, race, marital status, personal contact with someone who has HIV, and attended an educational program. All predictor variables were also considered as covariates. SAS version 9.4 (SAS Institute, Cary, NC, USA) was used to conduct data management and statistical analyses.

RESULTS

Participant Characteristics

Participants were mostly female (65.2%), white (78.9%), 18-24 years old (68.9%), had some college education (48.1%), single (68.3%), and had no personal contact with someone who has HIV (85.7%) (Table 2.1). Roughly half (50.3%) of participants had not had an educational program on HIV or STDs. The highest percentage of participants were employed (45.0%) followed by students (33.9%). The most frequent income categories for participants were <$20,000 (31.1%) and ≥$100,000 (19.9%).

Table 2.1 Characteristics of the study sample (n=322)

Variable	N (%)
Gender	
Male	112 (34.8)
Female	210 (65.2)
Race	
White	254 (78.9)
Black/ African American	32 (9.9)
Other	36 (11.2)
Age	
18-24	222 (68.9)
25-34	26 (8.1)
35-44	17 (5.3)
45-54	14 (4.3)
≥55	43 (13.4)
Education	
High school or below	84 (26.1)
Some college	155 (48.1)
Associates degree or higher	83 (25.8)
Marital Status	
Married/ Domestic Partnership	75 (23.3)
Widowed/Separated/ Divorced	27 (8.4)
Single	220 (68.3)
Employment Status	
Unemployed	41 (12.7)
Employed	145 (45.0)
Retired	27 (8.4)
Student	109 (33.9)
Income	
<$20,000	100 (31.1)
$20,000-39,999	50 (15.5)
$40,000-59,999	49 (15.2)
$60,000-79,999	36 (11.2)
$80,000-99,999	23 (7.1)
≥$100,000	64 (19.9)
Personal Contact	
Yes	43 (13.4)
No	276 (85.7)
Unknown	3 (0.9)
Educational Program	
Yes	143 (44.4)
No	162 (50.3)
Unknown	17 (5.3)

Assessment of Individual KAB Questions

Of the 322 participants, 298 (92.6%) had heard of HIV (Table 2.2). The overall percentages of individuals to correctly answer SBBP questions was relatively high. Almost all participants (95.6%) knew that people who were not gay could contract HIV. The question with the fewest correct answers within the SBBP subscale assessed whether having one uninfected

faithful partner would reduce their chances of getting HIV (79.5%). Regarding MTCT, 61.7% knew that HIV could be transmitted from mother to child during pregnancy. However, only 41.6% knew that breastfeeding can transmit HIV. Overall knowledge about other methods of transmission showed the highest percentage of participants correctly knew that sharing food with someone who has HIV could not transmit HIV (70.1%). The fewest correct responses occurred for knowing the mosquitos could not transmit HIV (45.3%) and that HIV was not found in saliva, tears, and urine (45.3%).

Regarding stigmatizing attitudes towards HIV and those living with HIV, 25.9% either agreed or strongly agreed that the spread of HIV is linked to the decline of moral values and 22.8% agreed or strongly agreed that reinforcement of traditional sexual values will help control HIV. The majority of participants (85.6%) either agreed or strongly agreed that someone infected with HIV can have a safe and loving relationship. However, 38.9% disagreed or strongly disagreed that they would buy fresh fruits or vegetables from a shopkeeper who was infected with HIV. When asked about other people's actions, 86.6% and 82.9% agreed or strongly agreed that people were hesitant to test for HIV due to fear of other people's reactions and that people talked badly about people living with HIV, respectively.

There were few participants to admit to paying for sex (0.6%) and injecting drugs (1.0%) in the past 12 months. The most common high-risk behavior was never testing for HIV (67.8%) followed by high risk lack of condom use (27.3%) and having more than one sexual partner in the last 12 months (22.2%).

Table 2.2 Frequencies of individual HIV knowledge, stigmatizing attitudes, and high-risk behaviors questions

Variable	Yes N (%)
Heard of HIV	298 (92.6)
HIV Knowledge	
	Correct N (%)
Sex, blood, and blood products (SBBP)	
People can reduce their chances of getting HIV by having just one uninfected sexual partner who has no other sexual partners.	237 (79.5)
People can reduce their chances of getting HIV by using a condom every time they have sex.	267 (89.6)
Only gay people can get HIV.	285 (95.6)
HIV can be transmitted by blood and blood products.	280 (94.0)
HIV can only be spread by sex.	238 (79.9)
Rinsing out injection equipment (needles/ syringes) with cold water kills HIV.	249 (83.6)
Mother to child transmission (MTCT)	
HIV can be transmitted from an HIV positive mother to her child during pregnancy.	184 (61.7)
HIV can be transmitted from an HIV positive mother to her child during delivery.	182 (61.1)
HIV can be transmitted from an HIV positive mother to her child while breastfeeding.	124 (41.6)
Risk of transmission from mother to child can be reduced if the mother is taking medication to treat HIV during pregnancy.	130 (43.6)
Other methods	
HIV can be transmitted by mosquito bites.	135 (45.3)
People can get HIV by sharing food with a person living with HIV.	209 (70.1)
HIV is found in high concentrations in saliva, tears, and urine.	135 (45.3)
Coughing and sneezing spread HIV.	204 (68.5)
A person can get HIV from a toilet seat.	201 (67.5)

Stigmatizing Attitudes	Strongly Disagree N (%)	Disagree N (%)	Agree N (%)	Strongly Agree N (%)
Responsibility and blame (R&B)				
People with HIV should be ashamed of themselves.	170 (57.1)	109 (36.6)	13 (4.4)	3 (1.0)
I would be ashamed if someone in my family had HIV.	130 (43.6)	134 (45.0)	26 (8.7)	4 (1.3)
People who inject drugs deserve to have HIV.	142 (47.7)	131 (44.0)	18 (6.0)	4 (1.3)
I am disgusted by persons who were infected through homosexual relations.	149 (50.0)	106 (35.6)	28 (9.4)	8 (2.7)
Reinforcement of traditional sexual values (sex only between a man and a woman) will help control HIV.	96 (32.2)	124 (41.6)	56 (18.8)	12 (4.0)
The spread of HIV is linked to the decline of moral values.	101 (33.9)	110 (36.9)	61 (20.5)	16 (5.4)
Social contact (SC)				
I would buy fresh fruits and vegetables from a shopkeeper who was infected with HIV. *	37 (12.4)	79 (26.5)	125 (42.0)	50 (16.8)
If a family member became sick with HIV, I would be willing to care for him/her in my own household. *	11 (3.7)	45 (15.1)	165 (55.4)	70 (23.5)

Table 2.2 (continued)

If a spouse knows that his/her partner has a disease that can be transmitted during sex, he/she is justified in asking that a condom be used when having sex with that partner*	8 (2.7)	12 (4.0)	86 (28.9)	186 (62.4)
I feel compassion for people infected with HIV. *	3 (1.0)	38 (12.8)	166 (55.7)	79 (26.5)
I feel sympathetic towards people who are infected with HIV. *	1 (0.3)	38 (12.8)	166 (55.7)	79 (26.5)
It is possible to have a safe and loving relationship with a person infected with HIV. *	2 (0.7)	30 (10.1)	157 (52.7)	98 (32.9)
Anticipated stigma (AS)				
If a family member became sick with HIV, I would want this to remain a secret.	37 (12.4)	136 (45.6)	104 (34.9)	17 (5.7)
People are hesitant to take an HIV test due to fear of other people's reaction if the test result is positive.	8 (2.7)	29 (9.7)	191 (64.1)	67 (22.5)
People talk badly about people living with HIV.	7 (2.4)	38 (12.8)	191 (64.1)	56 (18.8)
Transmitting HIV should be punishable by law.	81 (27.2)	119 (39.9)	67 (22.5)	17 (5.7)
Needle exchange programs increase drug use.	49 (16.4)	89 (29.9)	100 (33.6)	26 (8.7)
I do not want a needle exchange program in my community	57 (19.1)	85 (28.5)	91 (30.5)	32 (10.7)

High-Risk Behaviors	
	N (%)
Never tested for HIV	215 (67.8)
More than one sexual partner in past 12 months	61 (22.2)
Paid for sex in the past 12 months	2 (0.6)
Injected drugs in the past 12 months	3 (1.0)
High risk lack of condom use	88 (27.3)

Note: * indicates reverse coded question; The total sum of participants for attitude may not add to 100% due to missing data.

Assessment of Mean KAB Scores

Total mean score for HIV knowledge, SBBP, MTCT, and other were 68.5, 87.0, 52.0, and 59.3, respectively (Table 2.3). When comparing overall knowledge and knowledge factors across demographic characteristics, the main differences occurred between age, education, income, and educational program categories. For overall knowledge and other knowledge, participants aged 18-24 had a significantly lower mean score than participants aged 25-34 (62.7 vs 80.0 and 54.7 vs 76.2, respectively). Participants aged 25-34 also had a higher level of MTCT than those aged 18-24, 45-54 and ≥55 (96.1 vs 85.2, 88.1, and 86.2, respectively). Across all knowledge factors, participants with at least an Associate's degree had a higher mean score than those with some college and high school or below. Participants who had completed an educational program on HIV or STDs had a significantly higher mean score than those who had

not completed an educational program for overall knowledge, SBBP, and MTCT (73.3 vs 65.9, 92.0 vs 85.1, and 57.6 vs 48.0, respectively). Table 2.4 shows the results of the Bonferroni Post Hoc tests of where the within group differences occurred for knowledge and knowledge factors.

Table 2.3 Mean scores of knowledge and knowledge factors by demographic characteristics

Variable	Knowledge Mean (SD)	SBBP Mean (SD)	MTCT Mean (SD)	Other Mean (SD)
Gender*				
Male	69.7 (20.8)	88.9 (17.8)	52.7 (36.5)	60.4 (34.6)
Female	67.8 (21.4)	86.1 (20.6)	51.7 (33.8)	58.7 (33.3)
Race**				
White	69.4 (20.6)	**88.5 (19.0)**	52.6 (34.4)	59.9 (33.7)
Black/ African American	68.3 (22.1)	**83.3 (23.1)**	59.8 (32.9)	57.1 (35.2)
Other	61.1 (23.6)	**78.9 (2.5)**	40.0 (36.9)	56.7 (34.1)
Age**				
18-24	**62.7 (21.9)**	**85.2 (22.0)**	50.2 (34.3)	**54.7 (33.6)**
25-34	**80.0 (15.8)**	**96.1 (7.2)**	60.6 (34.0)	**76.2 (30.5)**
35-44	**78.0 (18.2)**	**96.1 (7.3)**	54.4 (38.8)	**75.3 (30.4)**
45-54	**72.4 (15.2)**	**88.1 (13.7)**	51.8 (36.0)	**70.0 (34.9)**
≥55	**69.3 (19.8)**	**86.2 (16.0)**	54.4 (35.8)	**61.0 (32.6)**
Education**				
High school or below	**62.1 (22.1)**	**81.5 (20.9)**	50.3 (38.0)	**48.1 (30.0)**
Some college	**67.5 (21.8)**	**86.5 (22.1)**	51.4 (34.6)	**57.5 (35.0)**
Associates degree or higher	**75.9 (16.6)**	**92.9 (10.8)**	54.6 (31.9)	**72.7 (30.6)**
Marital Status**				
Married/ Domestic Partnership	69.7 (22.1)	88.3 (19.5)	60.4 (41.0)	62.2 (35.3)
Widowed/Separated/ Divorced	67.9 (21.0)	86.1 (15.3)	51.3 (33.5)	56.7 (33.7)
Single	67.9 (21.0)	86.7 (20.3)	81.1 (36.0)	58.6 (33.3)
Employment Status**				
Unemployed	63.8 (21.5)	85.6 (21.6)	48.6 (31.7)	49.7 (34.8)
Employed	70.2 (21.2)	88.3 (19.5)	55.4 (33.9)	60.4 (33.2)
Retired	67.7 (17.8)	88.7 (12.5)	46.0 (38.0)	60.0 (32.7)
Student	67.9 (21.7)	85.4 (20.9)	50.0 (36.1)	61.2 (34.3)
Income**				
<$20,000	63.4 (21.4)	**83.3 (20.8)**	50.5 (35.2)	**49.9 (33.6)**
$20,000-39,999	70.1 (21.4)	**87.0 (19.8)**	57.2 (36.8)	**60.0 (33.6)**
$40,000-59,999	70.4 (19.3)	**88.4 (18.7)**	51.7 (34.7)	**63.7 (33.3)**
$60,000-79,999	68.1 (23.9)	**83.8 (25.3)**	50.0 (36.4)	**63.9 (32.7)**
$80,000-99,999	73.0 (18.5)	**95.5 (9.2)**	52.7 (29.8)	**62.7 (36.1)**
≥$100,000	71.9 (20.4)	**90.4 (16.5)**	51.6 (34.7)	**66.0 (32.3)**
Personal Contact*				
No	67.9 (21.0)	86.9 (19.7)	50.9 (34.9)	58.8 (33.1)
Yes	72.4 (18.8)	89.5 (15.0)	58.7 (32.2)	62.7 (36.4)
Educational Program*				
No	**65.9 (20.3)**	**85.1 (19.3)**	**48.0 (34.7)**	56.7 (33.7)
Yes	**73.3 (18.2)**	**92.0 (13.0)**	**57.6 (33.3)**	63.3 (32.5)
Total	68.5 (21.1)	87.0 (19.7)	52.0 (34.7)	59.3 (33.7)

Note: Bold indicates significance at 0.05; *Wilcoxon rank sum test was conducted; **Kruskal-Wallis test was conducted; SBBP- Sex, blood and blood products; MTCT- mother to child transmission; SD- standard deviation

Table 2.4 Within group differences for knowledge and knowledge factors

Variable	Knowledge	SBBP	Other
Race			
White		Other	
Black/ African American			
Other		White	
Age			
18-24	25-34	25-34; 35-44	25-34
25-34	18-24	18-24; 45-54; ≥55	18-24
35-44		18-24; ≥55	
45-54		25-34	
≥55		25-34;35-44	
Education			
High school or below	Associates degree or higher	Associates degree or higher	Associates degree or higher
Some college	Associates degree or higher		Associates degree or higher
Associates degree or higher	All	High school or below	All
Income			
<$20,000		$80,000-99,999; ≥$100,000	$40,000-59,999; $60,000-79,999; ≥$100,000
$20,000-39,999			
$40,000-59,999			<$20,000
$60,000-79,999		$80,000-99,999	<$20,000
$80,000-99,999		<$20,000; $60,000-79,999	
≥$100,000		<$20,000	<$20,000

Note: p-value of 0.05 was considered significant; SBBP- Sex, blood and blood products

Mean scores for stigmatizing attitudes, R&B, SC, and AS were 51.2, 43.1, 47.4, and 63.7, respectively (Table 2.5). Significant differences for overall stigmatizing attitudes and stigmatizing attitude factors were identified mainly among age and educational status. For overall attitudes, R&B, SC, and AS, participants with an Associate's degree or higher had lower mean scores than those with some college and high school or below. Participants aged 18-24 had the highest mean score for stigmatizing attitude (52.4), SC (48.6), and AS (66.1), indicating a higher stigmatizing attitude among that age group. However, for R&B, participants aged ≥55 had the highest mean score (46.8) with the score being significantly higher than those aged 25-34 (35.9). Descriptions of all within group difference can be found in Table 2.6.

Table 2.5 Mean scores of stigmatizing attitudes, stigmatizing attitude factors, and behaviors by demographic characteristics

Variable	Attitudes Mean (SD)	R&B Mean (SD)	SC Mean (SD)	AS Mean (SD)	Behaviors Mean (SD)
Gender*					
Male	49.9 (9.9)	42.9 (13.3)	**45.3 (13.1)**	62.1 (10.9)	16.6 (19.2)
Female	51.9 (10.1)	43.3 (15.2)	**48.4 (12.5)**	64.5 (12.6)	16.1 (18.5)
Race**					
White	51.2 (9.9)	43.0 (14.2)	47.1 (12.1)	63.9 (12.2)	16.3 (18.1)
Black/ African American	53.3 (10.1)	44.6 (16.9)	50.5 (17.3)	64.8 (12.5)	19.8 (19.4)
Other	49.9 (10.7)	42.4 (15.1)	46.9 (12.8)	60.6 (10.9)	13.3 (22.4)
Age**					
18-24	**52.4 (9.5)**	**43.2 (14.4)**	**48.6 (12.6)**	**66.1 (11.8)**	17.0 (20.0)
25-34	**44.7 (9.8)**	**35.9 (11.8)**	**39.9 (11.7)**	**58.9 (11.1)**	20.2 (17.9)
35-44	**48.1 (10.9)**	**41.9 (13.9)**	**44.4 (13.2)**	**58.1 (11.7)**	19.1 (13.3)
45-54	**49.6 (11.1)**	**46.7 (18.2)**	**46.1 (13.1)**	**56.1 (11.6)**	17.1 (17.3)
≥55	**51.5 (10.3)**	**46.8 (14.6)**	**48.0 (12.8)**	**59.6 (11.5)**	9.0 (12.7)
Education**					
High school or below	**54.7 (9.0)**	**46.7 (12.3)**	**50.7 (10.6)**	**67.1 (9.6)**	**13.0 (19.6)**
Some college	**52.1 (9.9)**	**43.8 (15.5)**	**47.8 (13.2)**	**65.1 (12.3)**	**18.2 (19.4)**
Associates degree or higher	**46.7 (9.5)**	**38.7 (11.8)**	**43.5 (13.0)**	**58.1 (12.1)**	**16.1 (15.9)**
Marital Status**					
Married/ Domestic Partnership	50.3 (10.3)	44.1 (13.8)	45.7 (11.5)	**61.7 (12.4)**	**11.3 (15.2)**
Widowed/Separated/ Divorced	50.0 (11.4)	46.17.7)	47.9 (14.1)	**56.1 (10.7)**	**16.3 (19.2)**
Single	51.7 (9.8)	42.5 (14.4)	47.9 (13.0)	**65.2 (11.8)**	**18.0 (19.5)**
Employment Status**					
Unemployed	52.2 (8.5)	41.5 (12.5)	49.5 (8.6)	65.8 (12.0)	**10.7 (17.9)**
Employed	50.6 (10.7)	43.2 (15.5)	46.6 (14.5)	62.4 (12.0)	**18.3 (17.9)**
Retired	51.7 (8.2)	46.3 (12.9)	47.6 (11.3)	61.5 (11.5)	**8.3 (11.7)**
Student	51.7 (10.0)	42.8 (12.4)	47.6 (11.8)	65.3 (12.4)	**17.7 (20.6)**
Income**					
<$20,000	53.6 (8.6)	45.2 (14.3)	49.3 (10.3)	**67.0 (11.7)**	18.0 (21.1)
$20,000-39,999	50.4 (10.0)	41.7 (14.9)	48.1 (16.1)	**61.8 (11.1)**	13.0 (15.1)
$40,000-59,999	50.1 (10.5)	41.8 (13.4)	47.6 (13.1)	**61.3 (13.8)**	21.3 (19.2)
$60,000-79,999	51.2 (13.4)	42.4 (18.6)	46.7 (14.3)	**64.6 (15.8)**	10.6 (15.5)
$80,000-99,999	51.3 (9.6)	45.8 (14.7)	43.3 (12.1)	**64.8 (10.5)**	15.7 (18.0)
≥$100,000	49.2 (9.2)	41.5 (12.7)	45.7 (12.4)	**60.8 (9.1)**	15.8 (18.0)
Personal Contact*					
No	51.4 (10.1)	43.3 (14.5)	47.7 (12.3)	63.6 (11.9)	**15.7 (18.6)**
Yes	49.5 (9.1)	40.5 (12.5)	45.8 (14.9)	63.1 (12.7)	**21.5 (18.7)**
Educational Program*					
No	51.9 (10.2)	**44.8 (14.7)**	48.4 (12.4)	63.0 (12.0)	16.9 (18.5)
Yes	49.8 (9.6)	**40.1 (12.8)**	45.8 (13.2)	63.9 (12.1)	16.1 (17.8)
Heard of HIV*					
No					**8.8 (14.8)**
Yes					**16.9 (18.9)**
Total	51.2 (10.0)	43.1 (14.5)	47.4 (12.8)	63.7 (12.1)	16.3 (18.7)

Note: Bold indicates significance at 0.05; *Wilcoxon rank sum test was conducted; **Kruskal-Wallis test was conducted; SD- standard deviation; R&B- responsibility and blame; SC- social contact; AS- anticipated stigma

Table 2.6 Within group differences for stigmatizing attitudes, stigmatizing attitude factors, and behaviors by demographic characteristics

Variable	Attitudes Mean (SD)	R&B Mean (SD)	SC Mean (SD)	AS Mean (SD)	Behaviors Mean (SD)
Age					
18-24	25-34		25-34	25-34; 45-54; ≥55	
25-34	18-24	≥55	18-24	18-24	
35-44					
45-54				18-24	
≥55		25-34		18-24	
Education					
High school or below	Associates degree or higher	Associates degree or higher	Associates degree or higher	Associates degree or higher	All
Some college	Associates degree or higher	Associates degree or higher	Associates degree or higher	Associates degree or higher	High school or below
Associates degree or higher	All	All	All	All	High school or below
Marital Status					
Married/ Domestic Partnership					Single
Widowed/Separated/ Divorced				Single	
Single				Widowed/ Separated/ Divorced	Married/ Domestic Partnership
Employment Status					
Unemployed					Employed; Student
Employed					Unemployed; Retired
Retired					Employed; Student
Student					Unemployed; Retired
Income					
<$20,000				≥$100,000	
$20,000-39,999					
$40,000-59,999					
$60,000-79,999					
$80,000-99,999					
≥$100,000				<$20,000	

Note: p-value of 0.05 was considered significant; R&B- responsibility and blame; SC- social contact; AS- anticipated stigma

The overall mean score for high-risk behaviors was 16.3 (Table 2.5). Participants who had heard of HIV has a significantly higher mean score (16.9) for high-risk behaviors than those who had not heard of HIV (8.8). Also, those who knowingly had personal contact with someone who has HIV had a higher mean score (21.5) than those who did not have personal contact

(15.7). Individuals who were married (11.3) and had high school or below education (13.0) had significantly lower mean scores than those who were single (18.0) and had some college (18.2) and Associate's degree or higher (16.1), respectively.

Correlation Between KAB Variables

As shown in Table 2.7, behavior scores were not significantly correlated with any other variables. Overall knowledge and knowledge factors had a negative correlation with stigmatizing attitudes and stigmatizing attitudes factors. Indicating that as knowledge increases, stigmatizing attitudes decrease.

Table 2.7 Correlation between HIV knowledge, stigmatizing attitudes, and high-risk behaviors scores

	Knowledge	SBBP	MTCT	Other	Attitudes	R&B	SC	AS	Behaviors
Knowledge	1.00								
SBBP	**0.59****	1.00							
MTCT	**0.69****	**0.25***	1.00						
Other	**0.82*****	**0.35***	**0.25***	1.00					
Attitudes	**-0.36***	**-0.32***	-0.11	**-0.35***	1.00				
R&B	**-0.29***	**-0.29***	**-0.13***	**-0.23***	**0.87*****	1.00			
SC	**-0.31***	**-0.27***	-0.09	**-0.32***	**0.74*****	**0.51****	1.00		
AS	**-0.19***	**-0.12***	-0.01	**-0.25***	**0.66****	**0.43***	**0.24***	1.00	
Behaviors	0.10	0.07	0.10	0.16	-0.07	-0.05	-0.03	-0.08	1.00

Note: Bold indicates significance at 0.05; ***strong correlation; **moderate correlation; * weak correlation; SBBP- Sex, blood and blood products; MTCT- mother to child transmission; R&B- responsibility and blame; SC- social contact; AS- anticipated stigma

Association of KAB with Demographic Variables

When controlling for all other demographic variables, few significant differences remained among KAB (Table 2.8). For knowledge, the other race category was less likely to have a high level when compared to whites (Odds Ratio (OR): 0.39; 95% Confidence Interval (CI): 0.17-0.90). Participants who had an educational program were 1.77 times more likely to have a high level of knowledge than those who had not had an educational program (95% CI: 1.06-2.96). Those aged 25-34, had an Associate's degree or higher, and single were more likely

to have a high level of knowledge than those aged 18-24, high school or below, and married or in a domestic partnership (OR: 7.29, 2.75, and 3.23, respectively). Significant differences for SBBP, MTCT, and Other also occurred by race, age, and education (See Table 2.9, Appendix B).

Table 2.8 Multiple logistic regression analyses of high HIV knowledge, stigmatizing attitudes, and high-risk behaviors with demographic variables

Variable	Knowledge OR (95% CI)	Attitudes OR (95% CI)	Behaviors OR (95% CI)
Gender			
Male	Reference	Reference	Reference
Female	0.96 (0.57-1.61)	1.05 (0.64-1.73)	0.94 (0.55-1.59)
Race			
White	Reference	Reference	Reference
Black/ African American	0.72 (0.30-1.71)	0.82 (0.36-1.87)	1.59 (0.64-3.95)
Other	**0.39 (0.17-0.90)**	0.79 (0.37-1.68)	0.56 (0.25-1.26)
Age			
18-24	Reference	Reference	Reference
25-34	**7.29 (2.04-26.08)**	0.89 (0.32-2.45)	2.77 (0.84-9.11)
35-44	3.97 (0.92-17.09)	1.82 (0.51-6.52)	4.44 (0.91-21.70)
45-54	4.03 (0.84-19.4)	1.64 (0.38-7.02)	2.33 (0.47-11.46)
≥55	3.5 (0.92-13.04)	1.30 (0.40-7.02)	0.93 (0.26-3.30)
Education			
High school or below	Reference	Reference	Reference
Some college	1.30 (0.71-2.38)	0.61 (0.34-1.09)	1.82 (0.97-3.41)
Associates degree or higher	**2.75 (1.23-6.18)**	**0.25 (0.11-0.57)**	2.01 (0.86-4.69)
Marital Status			
Married/ Domestic Partnership	Reference	Reference	Reference
Widowed/ Separated/ Divorced	0.57 (0.18-1.77)	0.43 (0.14-1.34)	2.80 (0.79-9.96)
Single	**3.23 (1.24-8.41)**	0.71 (0.32-1.58)	2.01 (0.82-4.94)
Employment Status			
Unemployed	Reference	Reference	Reference
Employed	1.37 (0.62-3.00)	1.30 (0.61-2.77)	**2.96 (1.31-6.69)**
Retired	1.06 (0.29-3.80)	1.52 (0.45-5.11)	0.99 (0.27-3.64)
Student	1.07 (0.48-2.37)	0.96 (0.44-2.05)	**2.36 (1.04-5.37)**
Income			
<$20,000	Reference	Reference	Reference
$20,000-39,999	1.69 (0.78-3.65)	**0.47 (0.22-0.99)**	0.80 (0.37-1.77)
$40,000-59,999	1.51 (0.71-3.23)	0.70 (0.34-1.44)	2.09 (0.93-4.72)
$60,000-79,999	1.89 (.81-4.42)	0.93 (0.41-2.09)	0.51 (0.22-1.20)
$80,000-99,999	1.69 (0.63-4.53)	0.55 (0.21-1.44)	1.08 (0.40-2.94)
≥$100,000	1.52 (0.73-3.17)	0.72 (0.36-1.45)	1.28 (0.61-2.67)
Personal Contact			
No	Reference	Reference	Reference
Yes	0.88 (0.42-1.84)	1.03 (0.51-2.08)	1.72 (0.80-3.71)
Educational Program			
No	Reference	Reference	Reference
Yes	**1.77 (1.06-2.96)**	0.70 (0.43-1.14)	0.93 (0.56-1.56)

Note: Bold indicates significance of <0.05; OR-Odds Ratio; CI- confidence interval; Covariates for odds ratios were gender, age, race, education, marital status, employment status, income, personal contact, and education program; Outcomes were high level of knowledge (≥73.3%), high negative attitude (≥51.7%), and engaged in at least one high-risk behavior (≥20%)

Participants with income of $20,000-39,999 were less likely to have high stigmatizing attitudes than those with income <$20,000 (OR: 0.47; 95% CI: 0.22-0.99). Also, participants with an Associate's degree or higher were 75.0% less likely to have high stigmatizing attitudes than those with high school or below (OR: 0.25; 95% CI: 0.11-0.57). Those with an Associate's degree or higher were also significantly lower than high school or below for R&B, SC, and AS (See Table 2.10, Appendix C).

The only significant association for behaviors when controlling for all other demographic variables occurred in employment status with participants who were employed or students were 2.96 and 2.36, respectively, times more likely to engaged in at least one high-risk behavior than those who were unemployed.

DISCUSSION

Our results show a relatively low level of mean knowledge varying from 52.0% to 87.0% with the lowest scores being about MTCT. However, this low level of knowledge about MTCT may be due to a low risk of perinatal transmission in Tennessee, with only three new cases in 2016 (13). When comparing our results to a previous study on Chinese college students in the US, our sample consistently had fewer correct responses (4). Of the Chinese college students, 58.6% knew HIV cannot be spread by mosquitos, 82.7% knew HIV cannot be contract by toilet seats, and 97.7% knew coughing and sneezing cannot spread HIV (4). Whereas, in our sample, only 45.3% knew HIV cannot be spread by mosquitos, 67.5% knew HIV cannot be contract by toilet seats, and 68.5% knew coughing and sneezing cannot spread HIV.

Within group differences indicate that HIV knowledge and stigmatizing attitudes differ among age groups and education levels while high-risk behaviors differ among education levels. Consistently, those aged 18-24 have the lowest HIV knowledge mean score across all variables and are among the highest for having stigmatizing attitudes and high-risk behaviors. This could be due to the lack of exposure to HIV education in their primary and secondary education since our results also indicate as education level increases so does HIV knowledge and stigmatizing attitudes decrease. However, results also show that high-risk behaviors are higher among those with some college or Associates degree or higher than those with high school or below. As the majority of participants were aged 18-24 and currently enrolled in college, there may be an interaction between education level and age. Further studies are needed to determine the relationship between these two variables.

Correlation results indicate that as knowledge about HIV increases, stigmatizing attitudes about HIV and those living with HIV decreases. Stigmatizing attitudes scores ranged from the lowest mean score of 43.1% for R&B and highest mean score of 63.7% for AS. This high level of AS may contribute to why 67.4% of the sample has not ever been tested for HIV. Previous studies have shown that negative comments made by friends, family members, or acquaintances have delayed individuals from getting tested for HIV (14).

Results of the multiple logistic regression indicated that there were no differences between male and female participants across all knowledge factors. This differs from previous studies that showed males were 2.58 times more likely to have a higher level of knowledge than females (4). However, this may be due to the fact that the current study had predominantly female participants. Another study found that Black MSM had a lower knowledge level than White MSM, whereas the current study showed no differences between the two races among the

general population (15). However, the different population samples (MSM vs the general population) may contribute to this discrepancy. This study is similar to previous studies in that those with less than high school education and a high school education had significantly lower knowledge scores than those with and advanced degree (15).

One limitation of the study was due to the cross-sectional nature of the survey. While significant associations occurred between knowledge and attitudes with personal contact with someone who has HIV and having taken an educational program on HIV or STDs, the direction of association cannot be determined. Although previous studies show that school-based programs increase HIV knowledge (16-19). Another limitation is the small sample size, specifically for high-risk behaviors. Further, despite the attempt to collect a generalized sample of the high-risk county, sample participants were largely from a university population, therefore, the results may not be fully representative of the general population of this high-risk county. Future studies should target recruitment in areas known for injection drug use and paying for sex as well as recruit more HIV positive individuals so that the relationship between high-risk behaviors and HIV knowledge and stigmatizing attitudes can be better analyzed.

CONCLUSION

While this study showed few differences in mean scores across demographic variables, results showed an overall low level of knowledge and relatively high level of stigmatizing attitudes in this sample. The highest total mean score for knowledge factors was for SBBP while the lowest was for MTCT. R&B had the lowest mean score among attitude factors and AS had the highest mean score. Having taken an educational program on HIV or STDs and having a

higher level of education were both associated with having a higher knowledge. Additional data collection would be beneficial to assess a more generalized sample and to target specific populations. Community education programs should focus efforts on individuals across all demographic factors but with lower levels of education. Future studies are warranted to assess high-risk behaviors more thoroughly.

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CHAPTER 3

HIV-RELATED KNOWLEDGE, ATTITUDES, AND BEHAVIORS IN CAMBODIA

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ABSTRACT

Introduction: In 2014, 2 million people were newly infected with HIV globally. In Cambodia, there is a 0.6% prevalence rate among those aged 16-49. Previous studies have shown that HIV transmission can be contributed to an individual's knowledge, stigmatizing attitudes, and high-risk behaviors (KAB). The current study aimed to assess the KAB of the general population in Cambodia, evaluate factors associated with KAB, and analyze the relationship between KAB.

Methods: Data were obtained from the 2014 Demographic and Health Survey (DHS). HIV knowledge, stigmatizing attitudes, and high-risk behaviors were assessed using eighteen questions. Sociodemographic variables were: age, education, marital status, employment, wealth quintile, and residence location. Descriptive statistics were conducted on sociodemographic variables and individual KAB questions. Kruskal-Wallis, Wilcoxon and Bonferroni tests were used to determine differences between mean KAB scores among sociodemographic variables. Spearman's correlation was conducted to determine association between KAB scores. Finally, multiple logistic regression was conducted with dichotomized KAB variables.

Results: Overall, female participants (n=10,798) mean HIV knowledge score was 7.4 (range=0-9), mean stigmatizing attitudes score was 0.9 (range=0-4), and mean high-risk behaviors score was 0.4 (range=0-3). Male participants (n=2,167) had a mean HIV knowledge score of 7.7, mean stigmatizing attitudes score of 0.7, and mean high-risk behaviors score of 0.6 (range=0-5). Females aged 20-29, 30-39, and ≥40 were more likely to have a high level of HIV knowledge than those aged 15-19 (Odds Ratio (OR): 1.4, 1.6, and 1.6, respectively). Males who completed secondary and higher education had higher odds of having a high level of HIV knowledge (OR: 2.3 and 2.9, respectively) and lower odds of engaging in some high-risk behaviors (OR: 0.3 and 0.2, respectively) than those who had completed no education. Spearman's correlation showed

an inverse relationship between HIV knowledge and stigmatizing attitudes and high-risk behaviors as well as a positive correlation between stigmatizing attitudes and high-risk behaviors.

Conclusions: Overall, HIV knowledge was lower and stigmatizing attitudes were higher in the younger, less educated, less wealthy and rural population. However, high-risk behaviors were higher in the older population. Future studies are warranted to provide further assessment of KAB in Cambodia to show a more complete picture.

INTRODUCTION

In 2014, there were 36.9 million people living with HIV in the world with 2 million being newly infected; and there were 1.2 million deaths from AIDS-related diseases [1]. Cambodia, a Southeast Asian country, has a prevalence rate of 0.6% among those aged 16-49 [2]. Despite being one of the few countries to have accomplished the Millennium Development Goal of halting and reversing the spread of HIV, new HIV infections are still affecting at-risk groups [3]. This can be, in part, contributed to an individual's knowledge, attitudes and sexual behaviors [4]. Therefore, it is imperative to assess the knowledge, attitudes, and behaviors (KAB) of the target community prior to implementing public health programs and policies to help in the prevention of HIV.

An elevated risk of HIV infection has been attributed to the community's lack of comprehensive knowledge about HIV [5]. Adequate knowledge of HIV allows people to take the necessary precautions to prevent themselves from getting HIV [6]. Correct knowledge also helps reduce inaccurate stereotypes that lead to the stigma of HIV positive people, for instance, you cannot share food with them or shake their hands [6-7].

Stigmatizing attitudes, which are the social discrediting or devaluation associated with HIV, can also contribute to increased HIV infection rates [8]. Those who experience stigma are more likely to delay testing for HIV and, therefore, stand a greater chance of contracting HIV [7]. Positive behaviors, such as getting tested, are highly motivated by having a friend or partner's support through difficult times [7]. Given this, it is likely that those who do not live in a supportive environment do not partake in health seeking behaviors. A study conducted in Los Angeles, CA supported this theory. Participants reflected on negative comments made by family and friends that delayed the participants' testing because they felt they would be judged as a

person with HIV [7]. Delay in getting tested could allow a person to unknowingly transmit HIV to their sexual or needle-sharing partners.

It has been well proven that many sexual behaviors can contribute to an elevated risk of contracting HIV. High-risk sexual behaviors include having multiple sexual partners, having unprotected sexual intercourse, and paying for sexual intercourse. Unprotected sexual intercourse is still high among people living with HIV in Sub-Saharan African countries ranging from 40.1% to 83% [9]. Female sex workers have been shown to have 12 times higher odds of being HIV positive than all women of reproductive age [10]. This increases the chances of people paying for sexual intercourse in contracting HIV.

Previous KAB studies were focused in individual countries for target communities such as students [4, 11] and women [12]. Another KAB study focused on people living with HIV in eight sub-Saharan African countries [6]. One study focusing on college students from China showed that many students (41%) still believed that HIV can be spread by mosquitos [13]. The current study aims to assess the KAB of the general population in Cambodia, evaluate factors associated with KAB, and analyze the relationship between KAB.

METHODS

Participants

Data were obtained from the Cambodian Demographic and Health Survey (DHS) conducted in 2014. The DHS is a nationally representative, population based survey conducted in low and middle income countries (LMICs) [14]. The standardization of DHS questions, including those on HIV/AIDS-related stigma, knowledge, and behaviors, allows for the analysis

of attitudes and behaviors within countries. Details of the DHS sampling procedures are available on the DHS website [15].

Measures

Knowledge. Knowledge was assessed by the following questions: “Can people reduce their chances of getting the AIDS virus by using a condom every time they have sex?”, “Can people reduce their chances of getting the AIDS virus by having just one sex partner who is not infected and who has no other partners?”, “Is it possible for a healthy-looking person to have the AIDS virus?”, “Can people get the AIDS virus from mosquito bites?”, “Can people get the AIDS virus by sharing food with a person who has AIDS?”, “Can people get the AIDS virus because of witchcraft or other supernatural means?”, and “Can the virus that causes AIDS be transmitted from a mother to her baby: During pregnancy? During delivery? By breastfeeding?”. Each correct answer was given one point with the final score ranging from 0-9.

Stigmatizing Attitudes. Attitudes were analyzed using four questions. If respondents answered no to the following then they received one point each: “Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had the AIDS virus?”, “If a member of your family became sick with AIDS, would you be willing to care for her or him in your own household?”, and “In your opinion, if a female teacher had the AIDS virus but is not sick, should she be allowed to continue teaching in the school?”. If they respond yes to the following question then they receive one point: “If a member of your family got infected with the AIDS virus, would you want it to remain a secret or not?”. The final score ranged from 0 to 4, with a higher score indicating a greater stigmatizing attitude.

Behaviors. High-risk behaviors were assessed using the questions: "How many different people have you had sexual intercourse with in the past 12 months?" and "Was a condom used every time you had sexual intercourse with this person in the last 12 months?", "Have you ever been tested to see if you have the AIDS virus?". If an individual answers that he or she had sex with more than 1 person in the last 12 months, then that individual would receive one point. Similarly, if an individual indicated that he or she had sexual intercourse with someone who is not a spouse or live in partner without using a condom or if they had not ever been tested for HIV, the individual would receive one point each. Men were also asked if they ever had sex with another man or if they had ever paid for sex. Answering yes to either of these questions would add another point per question. For women, the final score could range from 0-3, while the final score for men could range from 0-5. Higher scores indicated engaging in a higher number of high-risk behaviors.

Sociodemographic. Sociodemographic variables collected were age, gender, educational attainment, marital status, employment status, wealth quintile, and location of residence (rural/urban). Age was categorized into four groups: 15-19, 20-29, 30-39, and ≥40. Educational attainment included none, primary, secondary, or higher completed. Marital status was divided into single, currently married or living with partner, and widowed, separated, or divorced. Employment status included employed and unemployed.

Statistical Analysis

SAS version 9.4 (SAS Institute, Cary, NC, USA) was used to conduct data management and statistical analyses. Data were stratified by gender due to distinctions in constructs for behaviors. Frequencies and percentages were used to describe sociodemographic variables as well as individual KAB questions. Due to the non-parametric distribution of the data, Kruskal-

Wallis and Wilcoxon rank sum tests were used to find significant differences between mean KAB scores among sociodemographic variables. If significance was found, Bonferroni post hoc adjustment was conducted to determine intergroup differences for variables with more than two groups. Spearman's correlation analysis was conducted to determine association between KAB scores. P-value of <0.01 was considered significant for all tests.

Finally, to control for covariates while assessing the association of KAB with sociodemographic variables, logistic regression was conducted with dichotomized KAB variables. Using the median score as a cutoff, HIV knowledge was categorized into high (≥8) and low level (≤7), stigmatizing attitudes were divided into having at least one stigmatizing attitude (≥1) and having no stigmatizing attitudes (0), and high-risk behaviors dichotomized into some risk (≥1) and no risk (0).

RESULTS

Demographic Characteristics

As shown in Table 3.1, female participants (n=10,798) had a mean age of 32.8 (±8.5) ranging from 15 to 49. Predominantly, the highest level of education received was primary school (51.0%). The majority of female participants were also married or living with a partner (98.2%), employed (72.5%), and lived in a rural area (70.3%). The highest percentage of female participants were a part of the highest wealth quintile (27.6%).

Male participants (n=2,167) had a mean age of 34.1 (±8.1) ranging from 16 to 49. Similar to female participants, male participants were predominantly married or living with a partner

(91.8%), employed (96.5%), part of the highest wealth quintile (36.1%), and lived in a rural area (64.4%). However, the highest level of education received was secondary school (46.1%).

Table 3.1 Demographic characteristics of female and male participants

Variable	Females (n=10,798) N (%)	Males (n=2,167) N (%)
Age	**Mean (SD)= 32.8 (8.5)**	**Mean (SD)= 34.1 (8.1)**
15-19	439 (4.1)	31 (1.4)
20-29	3731 (34.5)	660 (30.5)
30-39	3811 (35.3)	831 (38.3)
≥40	2871 (26.1)	645 (29.8)
Education		
None	1436 (13.3)	103 (4.7)
Primary	5504 (51.0)	797 (36.8)
Secondary	3478 (32.2)	998 (46.1)
Higher	380 (3.5)	269 (12.4)
Marital Status		
Single	34 (0.3)	144 (6.6)
Married/ Living with partner	10601 (98.2)	1989 (91.8)
Widowed/Separated/ Divorced	163 (1.5)	34 (1.6)
Employed		
No	2965 (27.5)	76 (3.5)
Yes	7833 (72.5)	2091 (96.5)
Wealth Quintile		
Lowest	1905 (17.6)	277 (12.8)
Second	1954 (18.1)	312 (14.4)
Third	1804 (16.7)	325 (15.0)
Fourth	2156 (20.0)	470 (21.7)
Highest	2979 (27.6)	783 (36.1)
Residence		
Urban	3205 (29.7)	771 (35.6)
Rural	7593 (70.3)	1396 (64.4)

Note: SD-standard deviation

Assessment of KAB Questions

In general, a higher percentage of males rather than females answered the majority of HIV knowledge questions correctly (Table 3.2). Females had a greater understanding of most mother-to-child transmission methods with 77.7%, 71.7%, and 89.8% knowing that AIDS can be transferred during pregnancy, delivery, and breastfeeding, respectively. Most individuals knew that AIDS cannot be spread by witchcraft or supernatural means (96.8% of males and 92.0% of females) and that sharing food did not spread AIDS (95.5% of males and 91.6% of females).

Table 3.2 Responses to individual knowledge, attitudes, and behaviors questions for female and male participants

Variable	Females		Males	
Knowledge				
	Correct N (%)		Correct N (%)	
Can people reduce their chance of getting the AIDS virus by using a condom every time they have sex?	9389 (87.0)		2028 (93.6)	
Can people reduce their chance of getting the AIDS virus by having just one uninfected sex partner who has no other sex partners?	9507 (88.0)		2108 (97.3)	
Is it possible for a healthy-looking person to have the AIDS virus?	6928 (64.2)		1631 (75.3)	
Can people get the AIDS virus from mosquito bites?	7990 (74.0)		1787 (82.5)	
Can people get the AIDS virus by sharing food with a person who has AIDS?	9892 (91.6)		2069 (95.5)	
Can people get the AIDS virus because of witchcraft or other supernatural means?	9935 (92.0)		2097 (96.8)	
Can the virus that causes AIDS be transmitted from a mother to her baby during pregnancy?	8391 (77.7)		1527 (70.5)	
... during delivery?	7747 (71.7)		1602 (73.9)	
... by breastfeeding?	9695 (89.8)		1917 (88.5)	
Attitudes				
	Yes N (%)	No N (%)	Yes N (%)	No N (%)
Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had the AIDS virus?	8893 (82.4)	**1905 (17.6)**	1940 (89.5)	**227 (10.5)**
If a member of your family became sick with AIDS, would you be willing to care for her or him in your own household?	9782 (91.6)	**1016 (9.4)**	2103 (97.1)	**64 (2.9)**
If a female teacher has the AIDS virus but is not sick, should she be allowed to continue teaching in the school?	9927 (91.9)	**871 (8.1)**	2039 (94.1)	**128 (5.9)**
If a member of your family got infected with the AIDS virus, would you want it to remain a secret or not?	**6022 (55.7)**	4776 (44.2)	**1097 (50.6)**	1070(49.4)
Behaviors				
	N (%)		N (%)	
Number of sexual partners in the last 12 months				
0-1	10785 (99.9)		2059 (95.0)	
>1	**13 (0.1)**		**108 (5.0)**	
High risk lack of condom use				
Yes	**40 (0.4)**		**37 (1.7)**	
No	10758 (99.6)		2130 (98.3)	
Ever tested for HIV				
Yes	4714 (43.7)		941 (43.4)	
No	**6084 (56.3)**		**1226 (56.6)**	
Ever had sex with another man				
Yes	N/A		**9 (0.4)**	
No	N/A		2158 (99.6)	
Ever paid for sex				
Yes	N/A		**135 (6.2)**	
No	N/A		2032 (93.8)	

Note: Bolded responses indicate unfavorable attitudes and behaviors

Females had higher percentages of stigmatizing attitudes for all four categories as illustrated by 17.6% of females and 10.5% of males stated that they would not buy fresh vegetables from someone with the AIDS virus and 8.1% of females and 5.9% of males indicated they would not want a teacher with AIDS to continue teaching, even if she is not sick. In regards to their own family members, 9.4% of females and 2.9% of males would not care for someone with AIDS in their own home and 55.7% of females and 50.6% of males would want the infection to remain a secret.

Contrary to stigmatizing attitudes towards AIDs, male participants engaged in more high-risk behaviors. Of males, 6.2% ever paid for sex, 1.7% did not use a condom when engaging in sex with someone other than a spouse or live-in partner, and 5.0% had more than one sexual partner in the past 12 months. Most concerning is that 56.3% of females and 56.6% of males have not ever been tested for HIV.

Assessment of KAB Mean Scores for Female Participants

Overall for female participants, mean HIV knowledge score was 7.4, mean stigmatizing attitudes score was 0.9, and mean high-risk behaviors score was 0.4 (Table 3.3). Kruskal-Wallis tests indicated that mean KAB scores were significantly different among age, educational attainment, and wealth quintile. Wilcoxon rank sum tests showed participants living in urban areas had a higher mean HIV knowledge score (7.6 vs 7.3) and lower mean stigmatizing attitudes (0.8 vs 1.0) and high-risk behaviors scores (0.3 vs 0.5). Different marital status was shown to influence mean high-risk behaviors score, while employment status influenced HIV knowledge and high-risk behaviors scores.

Table 3.3 Mean scores for KAB of female participants

Variable	Knowledge Score Mean (SD)	p-value	Attitudes Score Mean (SD)	p-value	Behaviors Score Mean (SD)	p-value
Age**		**<0.0001**		**<0.0001**		**<0.0001**
15-19	6.9 (1.8)		1.2 (0.9)		0.5 (0.5)	
20-29	7.4 (1.5)		0.9 (0.7)		0.3 (0.4)	
30-39	7.4 (1.5)		0.9 (0.7)		0.4 (0.5)	
≥40	7.3 (1.7)		1.0 (0.8)		0.7 (0.5)	
Education**		**<0.0001**		**<0.0001**		**<0.0001**
None	6.7 (2.0)		1.2 (0.9)		0.6 (0.5)	
Primary	7.2 (1.6)		0.9 (0.8)		0.5 (0.5)	
Secondary	7.7 (1.3)		0.8 (0.6)		0.3 (0.5)	
Higher	8.2 (0.9)		0.7 (0.6)		0.2 (0.4)	
Marital Status**		0.7095		0.0401		**<0.0001**
Single	7.5 (1.5)		0.9 (0.8)		1.0 (0.7)	
Married/ Living with partner	7.4 (1.6)		0.9 (0.8)		0.4 (0.5)	
Widowed/Separated/ Divorced	7.3 (1.7)		1.1 (0.8)		0.6 (0.5)	
Employed*		**0.0003**		0.9877		**<0.0001**
No	7.3 (1.7)		0.9 (0.8)		0.4 (0.5)	
Yes	7.4 (1.6)		0.9 (0.8)		0.5 (0.5)	
Wealth Quintile**		**<0.0001**		**<0.0001**		**<0.0001**
Lowest	7.0 (1.8)		1.2 (0.9)		0.6 (0.5)	
Second	7.2 (1.7)		1.0 (0.8)		0.5 (0.5)	
Third	7.2 (1.6)		0.9 (0.8)		0.5 (0.5)	
Fourth	7.5 (1.5)		0.8 (0.7)		0.4 (0.5)	
Highest	7.7 (1.3)		0.8 (0.6)		0.3 (0.5)	
Residence*		**<0.0001**		**<0.0001**		**<0.0001**
Urban	7.6 (1.3)		0.8 (0.6)		0.3 (0.5)	
Rural	7.3 (1.7)		1.0 (0.8)		0.5 (0.5)	
Total	**7.4 (1.6)**		**0.9 (0.8)**		**0.4 (0.5)**	

Note: p-value of 0.01 was considered significant; *Wilcoxon rank sum test was conducted; **Kruskal-Wallis test was conducted; SD= standard deviation

Results of the Bonferroni post hoc tests specified where the significant differences occur for each variable. Table 3.4 states which groups within the variable significantly differed from the stated group. In regards to mean HIV knowledge score, those aged 15-19 (6.9) had a significantly lower score than those aged 20-29 (7.4), 30-39 (7.4), and ≥40 (7.3). Those aged ≥40 had significantly lower scores than those aged 20-29 and 30-39. In general, as education and wealth quintile increased, mean HIV knowledge score also increased.

Mean stigmatizing attitudes scores were significantly lower for those aged 20-29 and 30-39. Overall, mean stigmatizing attitude scores and mean high-risk behaviors scores increased as

wealth quintile and educational attainment decreased. Results also showed that those who are single have a significantly higher mean high-risk behaviors score (7.5) than those who are married or living with a partner (7.4) and those who were widowed, divorced, or separated (7.3).

Table 3.4 Results from the Bonferroni post hoc for female participants

Variable	Knowledge group difference	Attitudes group difference	Behaviors group difference
Age			
15-19	All	All	20-29; ≥40
20-29	15-19; ≥40	15-19; ≥40	All
30-39	15-19; ≥40	15-19; ≥40	20-29; ≥40
≥40	All	All	All
Education			
None	All	All	All
Primary	All	All	All
Secondary	All	None; Primary	All
Higher	All	None; Primary	All
Marital Status			
Single			All
Married/ Living with partner			All
Widowed/Separated/ Divorced			All
Wealth Quintile			
Lowest	All	All	Third; Fourth; Highest
Second	Lowest, Fourth; Highest	All	Fourth; Highest
Third	Lowest, Fourth; Highest	Lowest; Second; Highest	Lowest; Fourth; Highest
Fourth	All	Lowest; Second	All
Highest	All	Lowest; Second; Third	All

Note: p-value of 0.01 was considered significant

Assessment of KAB Mean Scores for Male Participants

Male participants had a mean HIV knowledge score of 7.7, mean stigmatizing attitudes score of 0.7, and mean high-risk behaviors score of 0.6 (Table 3.5). Results determined that mean KAB scores were significantly different among educational attainment and wealth quintile. Similar to female participants, male participants living in urban areas had a higher mean HIV knowledge score (7.9 versus 7.7) and lower mean high-risk behaviors score (0.5 vs 0.6). Marital status did not have an effect on mean HIV knowledge or stigmatizing attitudes scores, but was shown to influence mean high-risk behaviors score.

Table 3.5 Mean scores for KAB of male participants

Variable	Knowledge Score Mean (SD)	p-value	Attitudes Score Mean (SD)	p-value	Behaviors Score Mean (SD)	p-value
Age**		0.3811		**<0.0001**		**<0.0001**
16-19	7.4 (1.7)		1.3 (0.9)		1.1 (1.1)	
20-29	7.7 (1.3)		0.7 (0.7)		0.6 (0.7)	
30-39	7.8 (1.3)		0.6 (0.7)		0.5 (0.6)	
≥40	7.7 (1.4)		0.7 (0.8)		0.6 (0.6)	
Education**		**<0.0001**		**<0.0001**		**<0.0001**
None	7.1 (1.9)		1.0 (0.9)		0.8 (0.6)	
Primary	7.5 (1.4)		0.8 (0.8)		0.6 (0.6)	
Secondary	7.9 (1.1)		0.6 (0.6)		0.5 (0.7)	
Higher	8.1 (1.0)		0.6 (0.5)		0.4 (0.7)	
Marital Status**		0.4842		0.0733		**<0.0001**
Single	7.8 (1.2)		0.8 (0.6)		1.2 (0.9)	
Married/ Living with partner	7.7 (1.3)		0.7 (0.7)		0.5 (0.6)	
Widowed/Separated/ Divorced	8.0 (1.1)		0.7 (0.6)		1.2 (1.2)	
Employed*		0.9505		0.4365		0.3582
No	7.8 (1.2)		0.7 (0.6)		0.6 (0.7)	
Yes	7.7 (1.3)		0.7 (0.7)		0.6 (0.7)	
Wealth Quintile**		**<0.0001**		**0.0041**		**<0.0001**
Lowest	7.3 (1.6)		0.9 (0.8)		0.8 (0.6)	
Second	7.7 (1.4)		0.7 (0.8)		0.7 (0.6)	
Third	7.6 (1.3)		0.7 (0.8)		0.6 (0.6)	
Fourth	7.8 (1.3)		0.7 (0.7)		0.5 (0.7)	
Highest	7.9 (1.2)		0.6 (0.6)		0.4 (0.7)	
Residence*		**0.0003**		0.6109		**<0.0001**
Urban	7.9 (1.2)		0.7 (0.6)		0.5 (0.7)	
Rural	7.7 (1.4)		0.7 (0.8)		0.6 (0.6)	
Total	**7.7 (1.3)**		**0.7 (0.7)**		**0.6 (0.7)**	

Note: p-value of 0.01 was considered significant; *Wilcoxon rank sum test was conducted; **Kruskal-Wallis test was conducted; SD= standard deviation

Table 3.6 shows the results of the Bonferroni post hoc tests for male participants. Participants with secondary or higher education had significantly higher mean HIV knowledge score and significantly lower mean stigmatizing attitudes and high-risk behaviors scores than those with no or primary school education. Those aged 15-19 had a higher mean stigmatizing attitudes and high-risk behaviors score than those older. Being single or widowed, separated, or divorced equated with a significantly higher mean high-risk behavior score than those who were married or living with their partner. For all mean KAB scores, the lowest quintile significantly differed from the highest quintile. The lowest quintile had a lower mean HIV knowledge score and higher mean stigmatizing attitudes and high-risk behaviors scores.

Table 3.6 Results from the Bonferroni post hoc for male participants

Variable	Knowledge group difference	Attitudes group difference	Behaviors group difference
Age			
16-19		All	All
20-29		15-19	15-19
30-39		15-19	15-19; ≥40
≥40		15-19	15-19; 30-39
Education			
None	Secondary; Higher	Secondary; Higher	Secondary; Higher
Primary	Secondary; Higher	Secondary; Higher	Secondary; Higher
Secondary	None; Primary	None; Primary	None; Primary
Higher	None; Primary	None; Primary	None; Primary
Marital Status			
Single			Married/ Living with partner
Married/ Living with partner			All
Widowed/Separated/ Divorced			Married/ Living with partner
Wealth Quintile			
Lowest	Fourth; Highest	Highest	Fourth; Highest
Second			Highest
Third			Highest
Fourth	Lowest		Lowest
Highest	Lowest	Lowest	Lowest; Second; Third

Note: p-value of 0.01 was considered significant

Correlation of KAB Scores

The Spearman's correlation analyses showed that for both females and males an inverse relationship occurred between HIV knowledge and stigmatizing attitudes (r=-0.184 for females; r=-0.124 for males) and high-risk behaviors (r=-0.120 for females; r=-0.074 for males) (Table 3.7). Results also portrayed a significant relationship between stigmatizing attitudes and high-risk behaviors (r=0.0143 for females; r=0.064 for males).

Table 3.7 Correlation between KAB scores for female and male participants

	Females		Males	
	Correlation Coefficient	p-value	Correlation Coefficient	p-value
Knowledge-Attitudes	-0.184*	<0.0001	-0.124*	<0.0001
Knowledge-Behaviors	-0.120*	<0.0001	-0.074*	0.0006
Attitudes-Behaviors	0.143*	<0.0001	0.064*	0.0029

Note: p-value of 0.01 was considered significant; * weak correlation

Assessment of KAB Categories with Sociodemographic Variables

Multiple logistic regression analyses confirmed certain associations remained after controlling for covariates (Table 3.8). Females aged 20-29, 30-39, and ≥40 were more likely to have a high level of HIV knowledge than those aged 15-19 (Odds Ratio (OR): 1.4, 1.6, and 1.6, respectively). Similarly, females who had completed higher, secondary, and primary school were 3.7, 2.1, and 1.4, respectively, times more likely to have a high level of HIV knowledge than those who had not completed any level of education. Females who were employed (OR: 1.2; 95% Confidence Interval (CI): 1.1-1.3), part of the highest wealth quintile (OR: 1.3; 95% CI:1.1-1.5), and live in an urban area (OR: 1.2; 95% CI: 1.0-1.3) were also more likely to have a high level of HIV knowledge than those who were not employed, part of the lowest wealth quintile, and live in rural areas.

When reviewing stigmatizing attitudes and high-risk behaviors, females aged 20-29 and 30-39 were less likely to have at least one stigmatizing attitude and engage in some high-risk behaviors than those aged 15-19. However, women ≥40 were 3.1 (95% CI: 2.5-3.8) times more likely to engage in some high-risk behaviors than those aged 15-19. Women who were employed and lived in urban areas are 1.3 (95% CI: 1.2-1.5) and 1.4 (95% CI: 1.3-1.6), respectively, times more likely to engage in some high-risk behaviors than their counterparts.

For male participants, many relationships between KAB variables and sociodemographic variables were no longer significant after controlling for covariates. Males aged ≥40 were 4.4 (95% CI: 1.8-10.5) times more likely to engage in some high-risk behaviors than those aged 15-19. Those who completed secondary and higher education had significantly higher odds of having a high level of knowledge (OR: 2.3 and 2.9, respectively) and lower odds of engaging in

some high-risk behaviors (OR: 0.3 and 0.2, respectively) than those who had completed no level of education.

Table 3.8 Multiple logistic regression analyses of high knowledge, at least one negative attitude, and some risk behaviors with sociodemographic variables of females and males in Cambodia

	Females			Males		
Variable	Knowledge OR (95% CI)	Attitudes OR (95% CI)	Behaviors OR (95% CI)	Knowledge OR (95% CI)	Attitudes OR (95% CI)	Behaviors OR (95% CI)
Age						
15-19	Reference	Reference	Reference	Reference	Reference	Reference
20-29	**1.4 (1.2-1.8)**	**0.6 (0.5-0.8)**	**0.4 (0.3-0.5)**	1.5 (0.7-3.2)	0.4 (0.1-1.1)	1.6 (0.7-3.8)
30-39	**1.6 (1.3-2.0)**	**0.5 (0.4-0.7)**	0.9 (0.7-1.1)	1.7 (0.8-3.7)	0.3 (0.1-0.8)	1.9 (0.8-4.5)
≥40	**1.6 (1.3-2.0)**	**0.6 (0.5-0.8)**	**3.1 (2.5-3.8)**	1.8 (0.8-3.9)	0.3 (0.1-0.8)	**4.4 (1.8-10.5)**
Education						
None	Reference	Reference	Reference	Reference	Reference	Reference
Primary	**1.4 (1.2-1.6)**	**0.8 (0.7-0.9)**	**0.8 (0.7-0.9)**	1.4 (0.9-2.1)	0.7 (0.4-1.1)	0.5 (0.3-0.9)
Secondary	**2.1 (1.9-2.4)**	**0.7 (0.6-0.8)**	**0.5 (0.5-0.6)**	**2.3 (1.5-3.5)**	0.6 (0.4-1.1)	**0.3 (0.2-0.6)**
Higher	**3.7 (2.8-4.9)**	0.8 (0.6-1.1)	**0.3 (0.2-0.4)**	**2.9 (1.7-4.8)**	0.6 (0.3-0.9)	**0.2 (0.1-0.4)**
Marital Status						
Single	Reference	Reference	Reference	Reference	Reference	Reference
Married/ Living with partner	1.0 (0.5-2.1)	1.2 (0.6-2.5)	**0.1 (0.0-0.1)**	1.2 (0.8-1.8)	0.8 (0.5-1.3)	**0.1 (0.1-0.2)**
Widowed/Separated/ Divorced	1.0 (0.5-2.1)	1.9 (0.8-4.3)	**0.1 (0.0-0.3)**	2.3 (1.0-5.6)	0.8 (0.4-1.9)	0.3 (0.1-0.8)
Employed						
No	Reference	Reference	Reference	Reference	Reference	Reference
Yes	**1.2 (1.1-1.3)**	1.1 (1.0-1.2)	**1.3 (1.2-1.5)**	1.0 (0.6-1.7)	0.8 (0.5-1.3)	1.1 (0.7-1.8)
Wealth Quintile						
Lowest	Reference	Reference	Reference	Reference	Reference	Reference
Second	1.0 (0.9-1.2)	**0.8 (0.7-0.9)**	0.9 (0.8-1.1)	1.3 (0.9-1.8)	0.8 (0.5-1.1)	0.8 (0.5-1.1)
Third	1.0 (0.9-1.1)	**0.7 (0.6-0.8)**	**0.8 (0.7-0.9)**	1.1 (0.8-1.5)	0.8 (0.6-1.2)	0.8 (0.5-1.1)
Fourth	1.2 (1.0-1.3)	**0.7 (0.6-0.8)**	**0.6 (0.5-0.7)**	1.0 (0.7-1.4)	0.8 (0.6-1.2)	**0.4 (0.3-0.6)**
Highest	**1.3 (1.1-1.5)**	**0.8 (0.6-0.9)**	**0.4 (0.3-0.5)**	0.8 (0.6-1.2)	0.8 (0.6-1.1)	**0.2 (0.2-0.4)**
Residence						
Urban	**1.2 (1.0-1.3)**	1.0 (0.9-1.1)	**1.4 (1.3-1.6)**	0.9 (0.7-1.1)	0.8 (0.6-1.0)	1.0 (0.7-1.2)
Rural	Reference	Reference	Reference	Reference	Reference	Reference

Note: Bold indicates significance of <0.01; OR-Odds Ratio; CI- confidence interval; Knowledge was modeled as having a high level. Attitudes were modeled as responding in a negative way to at least one question. Behavior was modeled as having some risk; Covariates for odds ratios are age, education, marital status, employment status, wealth quintile, and residence. Knowledge was also adjusted for attitudes and behaviors. Attitudes were also adjusted for knowledge and behaviors. Behaviors were also adjusted for knowledge and attitudes.

DISCUSSION

The results showed that for both females and males an inverse relationship occurred between HIV knowledge and stigmatizing attitudes and high-risk behaviors. Results also portrayed a significant relationship between stigmatizing attitudes and high-risk behaviors.

While direction of association cannot be determined between KAB, it is theorized that knowledge and attitudes impact behaviors. Therefore, our results indicate that increasing HIV knowledge and decreasing stigmatizing attitudes reduces high-risk behaviors taken among the general population in Cambodia. Previous studies confirm this as greater stigma has been shown to delay individuals in getting tested [7]. Peltzer and Pengpid found that greater knowledge and lower AIDS stigma attitudes were associated with higher knowledge on HIV status [16].

As this is the first study to assess KAB among the general population in Cambodia, there are no country-specific studies to compare our results to. However, studies have been done on sub-populations in Cambodia and other Southeast Asian countries. An older study, conducted in 1999, assessing knowledge of HIV transmission among female sex workers in Cambodia determined that 43.6% correctly knew that mosquitos cannot transmit HIV [17]. From our sample of females from the general population, 74.0% knew that HIV cannot be transmitted by mosquitos. This may signify a large increase in correct knowledge about mosquito transmission in 15 years.

A study conducted in 2010 on migrant workers in Thailand, of which 10% were Cambodian, showed a mean knowledge score of 68.7% for males and 68.5% for females [18]. In the current study, males had a mean HIV knowledge score of 85.6% and females had a mean HIV knowledge score of 82.2%. In general, the previous study on migrant workers had a lower level of education and wealth quintile. For those having no education and being a part of the lowest quintile, our study found that females had a mean HIV knowledge score of 74.4% and 77.8%, respectively, and males had a mean HIV knowledge score of 78.9% and 81.1%, respectively. All scores are higher than the previous study indicating that the general population in Cambodia has a higher level of HIV-related knowledge than migrant workers in Thailand.

Of male high school students (mean age 17.9) in Lao People's Democratic Republic, 59.3% knew that sharing food or drinks with someone who is HIV positive could not transmit HIV, 25.7% knew mosquitos could not transmit HIV, and 80.7% knew having one partner could reduce chances of transmitting HIV [19]. From our sample of males, 95.5% knew that sharing food or drinks with someone who is HIV positive could not transmit HIV, 82.5% knew mosquitos could not transmit HIV, and 97.3% knew having one partner could reduce chances of transmitting HIV. In regards to attitudes, 76.7% of male high school students would be willing to care for a relative, 48.7% would buy food from a positive shopkeeper, and 41.3% believed a teacher should be able to continue teaching [19]. Of males in the general population in Cambodia, 97.1% would be willing to care for a relative, 89.5% would buy food from a positive shopkeeper, and 94.1% believed a teacher should be able to continue teaching. Our study indicates that males aged 16-19 have lower mean knowledge and higher attitudes than the overall general population. Further analyses would need to be conducted to determine if males aged 16-19 differ from the male high school students from Lao People's Democratic Republic; however, this further emphasizes the need to educate the younger population.

A Vietnamese study assessed the level of HIV knowledge and attitudes among women in the general population [20]. Similar to the current study, the authors found that women with a higher level of education, lived in urban areas, and were a part of a higher economic status were more likely to have a high level of HIV knowledge (OR: 3.0, 1.3, and 1.9, respectively) [20]. However, while Vietnamese women with a higher educational attainment were 2.5 times more likely to report a positive attitude [20], Cambodian women in the current study who have a higher education did not have a significantly different stigmatizing attitude than those who had no educational attainment.

A limitation of this study is that temporality cannot be established due to the utilization of data from a cross-sectional study. Another limitation was the exclusion of participants who did not complete the survey. This was done due to the combination of many variables to form KAB scores.

This study was also limited by the data that were available. Nine questions were used to assess knowledge, four questions to assess attitudes, and three or five behaviors for women and men, respectively, were assessed. These questions only assess the most common misconceptions and attitudes regarding HIV and AIDS. A future study should consider having more comprehensive knowledge and stigmatizing attitudes questions and should include behaviors on sex work (being paid for males and females and ever paying for females) and injection drug use. Also, the sampling methods used by DHS should provide a generalizeable assessment of the population in Cambodia; however, it cannot be certain that this sample provides a full picture of the general population's KAB.

CONCLUSIONS

To conclude, our study found an association between higher HIV knowledge and fewer stigmatizing attitudes and behaviors as well as an association between more stigmatizing attitudes and more high-risk behaviors. Therefore, increasing HIV knowledge was associated with reduced stigmatizing attitudes and high-risk behaviors taken in this sample. Also, reducing stigmatizing attitudes may decrease high-risk behaviors taken. Among females, mean HIV knowledge scores were lowest among those aged 15-19 and ≥40, living in rural areas, and unemployed as well as increased with education level and wealth quintile. Mean stigmatizing

attitudes and high-risk behaviors scores decreased as wealth quintile and education level increased. Participants living in rural areas had higher mean stigmatizing attitudes and high-risk behaviors than those living in urban areas. For males, mean HIV knowledge increased while mean stigmatizing attitudes and high-risk behaviors decreased with increasing education level and wealth quintile. HIV knowledge was lower and stigmatizing attitudes were higher in the younger, less educated, less wealthy and rural population. However, risk behaviors were higher in the older population potentially indicating that measured HIV knowledge and stigmatizing attitudes may not completely determine the process in which behavioral decisions are decided. It is recommended that HIV and AIDS education efforts in Cambodia should focus on groups with lower knowledge, higher stigmatizing attitudes, and more high-risk behaviors to further reduce the spread of HIV.

Competing Interests

The authors declare that they have no competing interests.

Author's Contributions

C.C. wrote the paper and performed data analyses. M.Q., M.A.L., and Y.L. critically revised and contributed to the design of the study.

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CHAPTER 4

COMPARISON OF HIV-RELATED KNOWLEDGE, ATTITUDES, AND BEHAVIORS IN NORTHEAST TENNESSEE AND CAMBODIA

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ABSTRACT

HIV outbreaks occurred almost simultaneously in the United States (2014-2015) and in Cambodia (2015). The populations of these locations may have similar knowledge, attitudes, and behaviors (KAB), which may have contributed to these outbreaks. This study aimed to compare KAB among the populations of a high-risk county in Northeast Tennessee and Battambang province in Cambodia to determine if there were similarities or difference in KAB in these two locations that were at high-risk for or recently experienced an HIV outbreak. Descriptive and logistic regression analyses were conducted on individual questions and dichotomized KAB variables. Battambang participants were more likely to have a high level of HIV/AIDS knowledge (OR: 4.44; 95% CI: 2.14-9.24) and less likely to have at least one stigmatizing attitude (OR: 0.47; 95% CI: 0.24-0.94) and one high-risk behavior (OR: 0.16; 95% CI: 0.08-0.33) compared to Northeast Tennessee participants. Future studies are warranted to assess additional KAB variables.

Keywords: HIV, KAB, Stigma, Cambodia, Tennessee

INTRODUCTION

In 2014 and 2015 HIV outbreaks occurred in Scott County, Indiana in the United States (US) and Battambang Province in Cambodia, respectively. Both outbreaks were found to be associated with unsafe injection equipment. The outbreak in Cambodia was due to the reuse of injection equipment by unlicensed physicians while the outbreak in Indiana happened due to sharing of equipment by people who used injection drugs (1). It is suggested that HIV spread rapidly in these areas because of poor screening and prevention efforts (1). However, lack of knowledge on HIV and stigmatizing attitudes in the community may contribute to poor screening and prevention efforts.

In 2017, a study identified counties under similar conditions of Scott County, Indiana (2). One of these counties is located in Northeast Tennessee. In 2015, Tennessee was ranked 16th of the 50 states for new diagnosed HIV cases with 712 new cases (3). Cambodia has an adult HIV prevalence rate of 3,326 per 100,000 people (4). Despite decreasing rates of HIV among the general population in Cambodia, HIV infections persist among at-risk populations, such as men who have sex with men (MSM), transgender persons, and commercial sex workers (5).

Even though Cambodia is a middle-income country and the US is a high-income country, both countries suffered unexpected HIV outbreaks back to back due to unsafe injection equipment. The general population of these seemingly different locations may be similar in regards to knowledge, attitudes, and behaviors (KAB). Previous studies have shown that knowledge can influence behaviors as well as attitudes towards HIV and those living with HIV (6-7). Negative attitudes, also called stigma, are also correlated with behaviors (8-9). Therefore, the purpose of this study was to compare KAB among the general population of a high-risk

county in Northeast Tennessee and Battambang province in Cambodia to assess differences and similarities in KAB across the two settings.

METHODS

Participants

Tennessee data were obtained from a cross sectional survey conducted from October to November of 2017. The survey used a multipronged approach to recruit participants including: door to door surveys, flyers, and an online survey system at a local university. Participants had to be 18 years or older and a current resident of the county the survey was conducted in.

Cambodian data were obtained from the Demographic and Health Survey (DHS) conducted in 2014. Sampling procedures for DHS can be found on the DHS website (10). Surveys were conducted on those aged 15 and older. For the purposes of this study, those under 18 were excluded from analyses. Analyses were also limited to a Battambang province, the location of the HIV outbreak in 2015.

There are two notable differences between the surveys. First, the survey conducted in Tennessee referred to HIV while the survey conducted in Cambodia referred to AIDS. While there are distinctions between the two, the nomenclature used may be the most common, or used interchangeably, among the general populations of each location. For the analyses of the current study, HIV and AIDS were used interchangeably. Second, the Tennessee survey used true or false knowledge questions and a Likert scale for the attitude questions. The Cambodian survey used yes or no questions for both knowledge and attitude questions. To adjust for this, the current study coded “strongly agree” or “agree” as “yes” and “strongly disagree” or “disagree” as “no” for knowledge and attitude questions.

Measures

Knowledge. Nine questions assessed the participants' knowledge. These questions asked about condom use, multiple sexual partners, whether mosquitos, sharing food, or supernatural means can cause someone to get HIV/AIDS, whether a healthy-looking person and have HIV/AIDS, and mother to child transmission. Possible scores ranged from 0-9 with 9 meaning all questions were answered correctly.

Attitudes. Each participant was asked if they would be willing to care for a relative sick with AIDS in their own households, if they would be willing to buy fresh vegetables from a market vendor who had the AIDS virus, if they thought a female teacher who has the AIDS virus but is not sick should be allowed to continue teaching, and if they would want to keep a family member's HIV positive status secret. If the participant responded no to the first three questions or yes to the last question, then they were awarded one point each. Scores range from 0-4, with the higher score indicating a more stigmatizing attitude towards HIV or people living with HIV.

Behaviors. Behaviors assessed for both women and men included number of people the participant had sexual intercourse with in the past 12 months, condom use in the last 12 months, and ever been tested for HIV. The participant received one point each if the participant answered that he or she had sex with more than one person, had sexual intercourse with someone who is not a spouse or live in partner without using a condom, or had never been tested for HIV. The final score ranged from 0-3. As the score increases the individual has a greater risk of contracting HIV.

Sociodemographic. Age, gender, educational attainment, marital status, employment status, and wealth quintile were used as covariates. Age was categorized as 18-24, 25-29, 30-39, and ≥40.

Educational attainment was divided into having completed primary school or some high school (primary), having completed secondary school or having a high school equivalent (secondary), and having completed a higher degree (associates, bachelors, etc.) (higher). Marital status included currently married, domestic partnership, or live-in partner (married/living with partner) and divorced, widowed, separated, or single (single). Employment status included employed, student, or retired (yes) and unemployed (no).

Statistical Analyses

All statistical analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC, USA). Chi-square analysis was conducted to compare sociodemographic variables across samples. In order to determine differences in individual KAB questions between residents from Cambodia and Tennessee, multiple logistic regression analyses were conducted. The outcome variables were correctly answered knowledge questions, positive attitudes, and high-risk behaviors. Residence, Cambodia or Northeast Tennessee, was the main exposure with sociodemographic variables used as covariates. Odds ratios (OR) and 95% confidence interval (CI) were reported for each individual question.

Simple and multiple logistic regression analyses were also conducted to compare overall KAB scores by residence. To conduct this, the outcome variables, KAB, were dichotomized with the model showing high level of knowledge (≥7), at least one stigmatizing attitude, and at least one high-risk behavior. The main exposure of interest was residence with all other variables used as covariates. Unadjusted and adjusted OR and 95% CI were reported.

RESULTS

Participant Characteristics

Northeast Tennessee had a total of 313 participants while Battambang had 581 participants (Table 4.1). Of the Northeast Tennessee participants, the largest proportions were female (66.1%), 18-24 years old (68.7%), completed at least secondary education (71.3%), single (77.3%), employed (87.2%), and part of the lowest income quintile (31.0%). Battambang participants were predominantly female (80.9%), 30-39 years old (34.4%), had completed at least primary school (60.6%), married (99.1%), employed (60.6%), and part of the highest wealth quintile (28.9%).

Table 4.1 Characteristics of participants from Northeast Tennessee and Battambang

	Northeast Tennessee (n=313)	Battambang (n=581)	p-value
Variable	N (%)	N (%)	
Gender			<0.0001
Male	106 (33.9)	111 (19.1)	
Female	207 (66.1)	470 (80.9)	
Age			<0.0001
18-24	215 (68.7)	92 (15.9)	
24-29	18 (5.7)	121 (20.8)	
30-39	13 (4.2)	200 (34.4)	
≥40	67 (21.4)	168 (28.9)	
Education			<0.0001
Primary	7 (2.2)	352 (60.6)	
Secondary	223 (71.3)	204 (35.1)	
Higher	83 (26.5)	25 (4.3)	
Marital Status			<0.0001
Single	242 (77.3)	5 (0.9)	
Married/Living with partner	71 (22.7)	576 (99.1)	
Employed			<0.0001
No	40 (12.8)	229 (39.4)	
Yes	273 (87.2)	352 (60.6)	
Wealth/Income Quintile			<0.0001
Lowest	97 (31.0)	60 (10.3)	
Second	45 (14.4)	77 (13.3)	
Third	45 (14.4)	116 (20.0)	
Fourth	61 (19.5)	160 (27.5)	
Highest	65 (20.7)	168 (28.9)	

Assessment of Individual KAB Questions

Of the nine knowledge questions, a higher proportion of Battambang participants than Northeast Tennessee participants correctly answered eight (Table 4.2). The one question that had a greater percentage of Northeast Tennessee participants answer correctly was "Is it possible for a healthy-looking person to have the AIDS/HIV virus?" with 88.8%, while of Battambang participants only 82.3% answered correctly. However, when controlling for sociodemographic variables, there was not a significant difference between the two locations. Multiple logistic regression analyses showed that seven of the nine knowledge questions were significantly different. Battambang participants were 15.4 times more likely than Northeast Tennessee residents to know that sharing food with someone who has HIV/AIDS does not transmit HIV. Battambang participants were also more likely to know that HIV/AIDS cannot be transmitted by mosquitos (OR: 9.85; 95% CI: 4.62-21.00), wearing a condom every time they have sex can reduce chances of getting HIV/AIDS (OR: 3.54; 95% CI: 1.25-10.02), and HIV/AIDS can be transmitted to a baby while breastfeeding (OR: 9.87; 95% CI: 4.91-19.84).

Fewer Northeast Tennessee participants had positive attitudes towards HIV/AIDS and those living with HIV/AIDS. Participants from Battambang were 22.6 times more likely to believe that a female teacher who has HIV/AIDS but is not sick, should be allowed to continue teaching. Battambang participants were also more likely to indicate that they would buy fresh vegetables from a shopkeeper who had HIV/AIDS (OR: 8.79; 95% CI: 3.76-20.56) and would be willing to care for a family member who was sick with HIV/AIDS (OR: 6.59; 95% CI: 2.06-21.06).

Table 4.2 Multiple logistic regression for individual KAB questions, Battambang vs Northeast Tennessee

Variable	Northeast Tennessee (Reference)	Battambang	Adjusted OR (95% CI)	p-value
	Knowledge			
	Correct n (%)	Correct n (%)		
Can people reduce their chance of getting the AIDS/HIV virus by using a condom every time they have sex?	273 (87.2)	539 (92.8)	**3.54 (1.25-10.02)**	**0.0175**
Can people reduce their chance of getting the AIDS/HIV virus by having just one uninfected sex partner who has no other sex partners?	242 (77.3)	520 (89.5)	**2.87 (1.15-7.13)**	**0.0235**
Is it possible for a healthy-looking person to have the AIDS/HIV virus?	278 (88.8)	478 (82.3)	1.00 (0.36-2.77)	0.9990
Can people get the AIDS/HIV virus from mosquito bites?	137 (43.8)	428 (73.7)	**9.85 (4.62-21.00)**	**<0.0001**
Can people get the AIDS/HIV virus by sharing food with a person who has AIDS/HIV?	215 (68.7)	546 (94.0)	**15.42 (5.51-43.19)**	**<0.0001**
Can people get the AIDS/HIV virus because of witchcraft or other supernatural means?	261 (83.4)	529 (91.1)	**3.03 (1.08-8.52)**	**0.0354**
Can the virus that causes AIDS/HIV be transmitted from a mother to her baby during pregnancy?	188 (60.1)	428 (73.7)	**2.05 (1.06-3.94)**	**0.0323**
... during delivery?	188 (60.1)	367 (63.2)	1.79 (0.94-3.42)	0.0767
... by breastfeeding?	128 (40.9)	489 (84.2)	**9.87 (4.91-19.84)**	**<0.0001**
	Attitudes			
	Positive n (%)	Positive n (%)		
Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had the AIDS/HIV virus?	179 (57.2)	516 (88.8)	**8.79 (3.76-20.56)**	**<0.0001**
If a member of your family became sick with AIDS/HIV, would you be willing to care for her or him in your own household?	239 (76.4)	562 (96.7)	**6.59 (2.06-21.06)**	**0.0015**
If a female teacher has the AIDS/HIV but is not sick, should she be allowed to continue teaching in the school?	196 (62.6)	553 (95.2)	**22.60 (8.03-63.40)**	**<0.0001**
If a member of your family got infected with the AIDS/HIV virus, would you want it to remain a secret or not?	177 (56.6)	377 (64.9)	1.26 (0.66-2.40)	0.4798
	Behaviors			
	n (%)	n (%)		
More than 1 sexual partner	61 (19.5)	1 (0.2)		
High risk lack of condom use	87 (27.8)	1 (0.2)		
Never tested for HIV	211 (67.4)	178 (30.6)	**0.19 (0.09-0.38)**	**<0.0001**

Note: OR-Odds Ratio; CI- confidence interval; bold indicates significance at a 0.05 level

Regarding behaviors, more Northeast Tennessee participants admitted to engaging in high-risk behaviors. Only 1 (0.2%) of Battambang participants had more than one sexual partners in the previous 12 months while 61 (19.5%) of Northeast Tennessee participants had more than one sexual partner. HIV testing had the highest proportion of both locations with 67.4% of Northeast Tennessee participants and 30.6% of Battambang participants never having been tested for HIV. However, Battambang participants were 81.0% less likely to have never been tested than Northeast Tennessee participants (OR: 0.19; 95% CI: 0.09-0.38).

Assessment of KAB Scores

Results of the multiple logistic regression analyses (Table 4.3), showed that Battambang participants were 4.44 times more likely to have a high (answered seven or more questions correctly) level of HIV knowledge than Northeast Tennessee participants. Battambang residents were also less likely to have at least one stigmatizing attitude (OR: 0.47; 95% CI: 0.24-0.94) and at least one high-risk behavior (OR: 0.16; 95% CI: 0.08-0.33).

Table 4.3 Simple and multiple logistic regression analyses of knowledge, attitudes, and behaviors scores by residence

	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Knowledge				
Northeast Tennessee	Reference	0.8654	Reference	**<0.0001**
Battambang	3.27 (2.44-4.38)		**4.44 (2.14-9.24)**	
Attitudes				
Northeast Tennessee	Reference	**<0.0001**	Reference	**0.0333**
Battambang	**0.25 (0.19-0.34)**		**0.47 (0.24-0.94)**	
Behaviors				
Northeast Tennessee	Reference	**<0.0001**	Reference	**<0.0001**
Battambang	**0.12 (0.08-0.16)**		**0.16 (0.08-0.33)**	

Note: OR-Odds Ratio; CI- confidence interval; Bold indicates significance at a 0.05 level; Knowledge was modeled as having a high level (≥7). Attitudes were modeled as responding in a negative way to at least one question. Behavior was modeled as having at least one high-risk behavior; Covariates for adjusted odds ratios are gender, age, education, marital status, employment status, and wealth/income quintile. Knowledge was also adjusted for attitudes and behaviors. Attitudes was also adjusted for knowledge and behaviors. Behaviors were also adjusted for knowledge and attitudes.

DISCUSSION

Our results indicate that Battambang residents had higher knowledge, fewer stigmatizing attitudes, and engaged in fewer high-risk behaviors than Northeast Tennessee residents. Due to the cross-sectional nature of this study, definitive conclusions cannot be drawn as to why these differences occurred; however, it is theorized that external factors, such as policies and laws and personal contact with someone who has HIV, can affect individual KAB. Also, the results may be influenced by the differences in sociodemographic variables (age, education, marital status, etc.) between samples.

Contrary to their intended purpose, HIV criminalization laws undermine the public health goals of reducing new HIV infections by discouraging individuals from knowing their status and increases HIV-related stigma (11-12). Individuals working with HIV prevention organizations have noted that punitive laws "publicly legitimizes high degrees of stigma and discrimination" (12). Policies and laws that create an enabling environment to facilitate access to testing and treatment sites as well as to ensure human rights have been shown to be central to an effective response to HIV (13).

While there are similarities in policies in Tennessee and Cambodia, such as disclosing HIV status prior to sexual relations, there are differences that may inadvertently promote a stigmatizing attitude or high-risk behaviors in Tennessee. For example, it is legal to carry condoms in both Cambodia and Tennessee. However, in Tennessee, if someone is suspected of sex work, and they have a condom in their possession, this may be used as proof of sex work (14). This may lead sex workers to not carry condoms, making it more likely that they will engage in unprotected sex. While sex work is illegal in Tennessee, individuals may engage in sex work in private facilities in Cambodia (14-15).

The Cambodian *Law on the Control of Drugs 2012*, makes it an offense for the keeping or transporting of equipment used for consumption of narcotics, including needles (15). However, the offense does not apply to the provision of health care services or harm reduction services for drug users authorized by a competent authority. Under Tennessee code, it is illegal to possess drug paraphernalia (14). In the steps to determine whether an item is considered drug paraphernalia, the court or police officer will consider the following: statements by the owner or person in control of the object, prior convictions, existence of residue of controlled substance, instructions or descriptive materials provided with the object concerning use, and expert testimony (14). Needles are typically considered as drug paraphernalia by expert testimony (14). While these laws are intended to assist in preventing sex work and injection drug use, they also impede harm reduction services for residents of Tennessee.

Also, the higher presence of HIV in Cambodia may assist in increasing knowledge and decreasing stigmatizing attitudes. In locations where there is a higher prevalence of HIV, people are more exposed to individuals who are HIV positive and public campaigns for HIV, potentially engaging in more conversations and education than locations where HIV prevalence is lower. In their analysis on stigma in 26 Sub-Saharan African countries, Chan and Tsai found that increased personal contact with people living with HIV was associated with a lower desire for social distance in the general population (16). This is consistent with previous literature discussing contact hypothesis, which proposed that contact with an individual with a certain disease will decrease fear, misunderstanding, and prejudice (17-18).

Unfortunately, this paper was limited by the data available. While the two HIV outbreaks occurred due to injection equipment, knowledge on transmitting HIV by injection equipment was unable to be assessed for the general populations. Whether individuals had personal contact with

someone who has HIV to determine if this external factor influenced results was also unable to be assessed. As shown by the large confidence intervals, the sample size was relatively small for certain variables. Future studies should implement more strategies to attract a larger sample size that could potentially be more representative of the general population of the populations being assessed. Despite this, our results did show that significant differences exist between Battambang and the Northeast Tennessee county. While this may be due to external factors or to the differences in sociodemographic variables, this finding is worth future exploration. This study would need to be replicated to further explore these differences and to gather more detail to understand relationships from external factors.

CONCLUSION

This study found that participants from the Battambang Province in Cambodia had significantly higher knowledge, fewer stigmatizing attitudes, and engaged in fewer high-risk behaviors than participants from a high-risk county in Northeast Tennessee. Future studies are needed to determine associations between our results and policies/laws, personal contact, and other differences between the two locations. Despite the fact that this was a pilot study with some data limitations, the study does indicate that HIV prevention efforts are needed in both locations to increase knowledge and testing for HIV and decrease stigmatizing attitudes. Increases in knowledge and testing for HIV and decreased attitudes in these populations could assist in reducing the potential for future HIV outbreaks in these high risk, low resource areas.

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CHAPTER 5

CONCLUSION

In 2014, there were 36.9 million people living with HIV and 1.2 million deaths from AIDS-related diseases globally.[1] While there have been successful programs to reduce the burden of HIV, health disparities still occur in racial minorities, age groups, and at-risk populations, such as men who have sex with men (MSM) and injection drug users.[5] As shown, KAB can greatly impact the outcome of HIV prevalence within a community. Having a greater understanding of each of these and analyzing the relationship between KAB then creating interventions based on the results can have a positive influence on HIV infection and related outcomes.

The current study aimed to: 1) assess the KAB among the general population in a high-risk county in the United States, 2) analyze the KAB among the general population of Cambodia, and 3) compare KAB across samples from a high-risk county in Northeast Tennessee and Battambang province in Cambodia.

Results indicated that a significant inverse correlation between HIV knowledge and stigmatizing attitude existed across both samples. Therefore, an educational program to increase HIV knowledge may reduce stigmatizing attitudes towards HIV and those living with HIV. While not significant in Northeast Tennessee, the Cambodian data also showed that high-risk behaviors were also inversely correlated with knowledge. These results demonstrate that an educational program may be beneficial in further decreasing the burden of HIV in a population.

Across both samples HIV knowledge was lower among participants with a lower education and in the lower income level. Also, mean stigmatizing attitude scores decreased as education level decreased among Northeast Tennessee participants. Among Cambodian females,

mean stigmatizing attitudes and high-risk behaviors scores decreased as wealth quintile and education level increased as well as were highest among those living in rural areas. For Cambodian males, mean HIV knowledge increased while mean stigmatizing attitudes and high-risk behaviors decreased with increasing education level and wealth quintile.

Northeast Tennessee participants had an overall low level of HIV knowledge and relatively high level of stigmatizing attitudes. However, having taken an educational program on HIV or STDs and having a higher level of education were both associated with having a higher HIV knowledge. This study found that participants from the Battambang Province in Cambodia had significantly higher knowledge, fewer stigmatizing attitudes, and engaged in fewer high-risk behaviors than participants from Northeast Tennessee.

An overall limitation of this study was the relatively small sample size with the majority of participants being university students and aged 18-24. To assess a more generalized sample, future studies should use methodology that may recruit more individuals, such as offering an incentive. The analyses were also limited on knowledge and attitude questions for the comparison study. Since the HIV outbreaks in Scott County, Indiana and Battambang Province, Cambodia occurred due to the reuse of injection equipment, analyzing the knowledge and attitude questions associated with injection equipment would have been beneficial. However, even with limitations, this study was the first to conduct a KAB in Northeast Tennessee and Cambodia, which may serve as baseline data for grants or HIV programs. This study also developed and ran psychometric evaluations on a KAB survey for a high-risk county.

Future studies are needed to assess the associations between our results and policies and laws, personal contact with someone who has HIV, and other potential differences between the two locations. Research efforts should also focus on assessing high-risk behaviors more

thoroughly in both locations and other HIV knowledge and stigmatizing attitudes in Cambodia. Based on the results, it is recommended that education programs in both locations focus on individuals with a lower level of education and income. Community programs should also make HIV testing more known and available across all demographic characteristics. The results of this study established basic information that can be used for prevention efforts in these communities as well as provide guidance for other communities at-risk of an HIV outbreak. In the aftermath of an outbreak, this KAB information will allow public health professionals to target populations to ensure they are tested and to educate the general population.

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APPENDICES

Appendix A

HIV-Related KAB Survey for Northeast Tennessee

1. By what gender do you identify?
    a. Male
    b. Female
    c. Transgender
    d. Other (please specify):
2. In what month and year were you born?

3. How old were you at your last birthday?

4. What is the highest level of education you completed?
    a. Some high school
    b. High school diploma or the equivalent
    c. Some college
    d. Associate degree
    e. Bachelor's degree
    f. Master's degree
    g. Professional or doctoral degree
5. How long have you lived in Washington County?

6. What is your total household income?
    a. Less than $20,000
    b. $20,000 to $39,999
    c. $40,000 to $59,999
    d. $60,000 to $79,999
    e. $80,000 to $99,999
    f. $100,000 or more
7. What is your employment status?
    a. Employed
    b. Unemployed
    c. Retired
    d. Student

8. What is your ethnicity or race?
    a. American Indian or Alaskan Native
    b. Asian
    c. African American or Black
    d. Hispanic or Latino
    e. Native Hawaiian or Other Pacific Islander
    f. White
    g. Other
9. What is your marital status?
    a. Married
    b. Domestic Partnership
    c. Widowed
    d. Divorced
    e. Separated
    f. Single, never married
10. Have you ever heard of a virus known as HIV?
    a. Yes
    b. No
11. Have you ever heard of a syndrome known as AIDS?
    a. Yes
    b. No

If you answered no to question 10, please skip questions 12 and 13.

12. For each statement, please check "true", "false", or "I don't know". If you do not know, please do not guess; instead check "I don't know.

	True	False	I don't Know
People can reduce their chances of getting HIV by having just one uninfected sexual partner who has no other sexual partners.			
People can reduce their chances of getting HIV by using a condom every time they have sex.			
HIV can be transmitted by mosquito bites.			
People can get HIV by sharing food with a person living with HIV.			
People can get HIV because of supernatural means.			
Only gay people can get HIV.			
A healthy-looking person can have HIV.			
HIV can be transmitted from an HIV positive mother to her child during pregnancy.			
HIV can be transmitted from an HIV positive mother to her child during delivery.			
HIV can be transmitted from an HIV positive mother to her child while breastfeeding.			
Risk of transmission from mother to child can be reduced if the mother is taking medication to treat HIV during pregnancy.			
HIV is found in high concentrations in saliva, tears, and urine.			
HIV can be transmitted by blood and blood products.			

	True	False	I don't Know
Drug use may increase the risk of getting HIV.			
A person cannot get HIV by performing oral sex on someone who has HIV.			
Coughing and sneezing spread HIV.			
HIV can only be spread by sex.			
A person can get HIV from a toilet seat.			
A woman can get HIV if she has receptive anal sex with a man.			
There are life sustaining medicines that treat but do not cure HIV.			
Rinsing out injection equipment (needles/ syringes) with cold water kills HIV.			
People with HIV should be tested for hepatitis B or hepatitis C.			
People with hepatitis B or hepatitis C should be tested for HIV.			
Treatment for HIV is also a prevention.			

13. Please state the degree in which you agree or disagree with the following statements.

	Strongly Disagree	Disagree	Agree	Strongly Agree
I would buy fresh fruits and vegetables from a shopkeeper who was infected with HIV.				
If a family member became sick with HIV, I would want this to remain a secret.				
If a family member became sick with HIV, I would be willing to care for him/her in my own household.				
If a teacher has HIV but was not sick, he/she should not continue teaching.				
If a spouse knows that his/her partner has a disease that can be transmitted during sex, he/she is justified in asking that a condom be used when having sex with that partner.				
A spouse is justified in refusing to have sex with his/her partner when he/she knows the partner is having sex with another person.				
People with HIV should be ashamed of themselves.				
I would be ashamed if someone in my family had HIV.				
People are hesitant to take an HIV test due to fear of other people's reaction if the test result is positive.				
People talk badly about people living with HIV.				
I could not be friends with someone who has HIV.				

	Strongly Disagree	Disagree	Agree	Strongly Agree
I would limit my contact with a person whom I know is infected with HIV.				
People who inject drugs deserve to have HIV.				
I am disgusted by persons who were infected through homosexual relations.				
Reinforcement of traditional sexual values (sex only between a man and a woman) will help control HIV.				
The spread of HIV is linked to the decline of moral values.				
Transmitting HIV should be punishable by law.				
Transmitting HIV is a crime only if done so intentionally				
I feel compassion for people infected with HIV.				
I feel sympathetic towards people who are infected with HIV.				
Needle exchange programs increase drug use.				
I do not want a needle exchange program in my community				
It is possible to have a safe and loving relationship with a person infected with HIV.				

14. Do you personally know someone who has HIV?
    a. Yes
    b. No
15. Have you ever been tested to see if you have HIV?
    a. Yes
    b. No
16. Where was the test done?

17. How long ago was the test done?

18. Have you ever tested positive for HIV?
    a. Yes
    b. No
19. Do you know of a place where people can go to get tested for HIV?
    a. Yes
    b. No
20. Where is that?

21. How many different people have you had sexual relations with in your lifetime?

22. How many different people have you had sexual relations with in the past 12 months?

23. How old were you when you first had sexual relations?

24. In the last 12 months, did you pay anyone in exchange for having sexual relations?
    a. Yes
    b. No
25. In the last 12 months, was a condom used every time you had sexual relations with your last sexual partner?
    a. Yes
    b. No
    c. Not applicable/ I have not had sex in the last 12 months
26. What was your relationship with this partner?
    a. Spouse
    b. Live-in partner
    c. Partner who does not live with you
    d. Casual acquaintance
    e. Other (please specify):
    f. Not applicable/ I have not had sex in the last 12 months
27. Have you injected drugs in the last 12 months?
    a. Yes
    b. No
28. Have you ever shared needles with another person?
    a. Yes
    b. No
    c. I don't inject drugs
29. Do you clean your needle after use?
    a. Yes
    b. No, I reuse the same needle
    c. No, I dispose of the needle
    d. I don't inject drugs
30. If yes, how do you clean the needle?

31. Have you ever participated in an educational program about HIV or STDs?
    a. Yes
    b. No
32. If so, where did that program occur?

33. Have you ever seen an advertisement for venues that offer testing or treatment for HIV?
    a. Yes
    b. No

Appendix B

Table 2.9 Multiple logistic regression analyses of SBBP, MTCT, and Other with demographic variables

Variable	SBBP OR (95% CI)	MTCT OR (95% CI)	Other OR (95% CI)
Gender			
Male	Reference	Reference	Reference
Female	0.60 (0.35-1.04)	1.22 (0.73-2.04)	1.06 (0.62-1.80)
Race			
White	Reference	Reference	Reference
Black/ African American	**0.38 (0.15-0.96)**	1.08 (0.45-2.59)	0.46 (0.19-1.10)
Other	**0.36 (0.16-0.83)**	**0.35 (0.16-0.76)**	0.56 (0.25-1.23)
Age			
18-24	Reference	Reference	Reference
25-34	**4.51 (1.33-15.32)**	2.65 (0.84-8.35)	**10.08 (2.36-43.10)**
35-44	3.89 (0.85-17.76)	1.51 (0.40-5.77)	**8.09 (1.51-43.33)**
45-54	1.54 (0.33-7.29)	1.69 (0.38-7.45)	4.30 (0.84-22.10)
≥55	0.93 (0.26-3.36)	3.55 (0.96-13.17)	4.15 (1.00-17.26)
Education			
High school or below	Reference	Reference	Reference
Some college	1.86 (0.98-3.54)	0.97 (0.53-1.77)	1.06 (0.58-1.93)
Associates degree or higher	**2.64 (1.14-6.12)**	1.42 (0.63-3.23)	**2.70 (1.16-6.28)**
Marital Status			
Married/ Domestic Partnership	Reference	Reference	Reference
Widowed/Separated/ Divorced	0.69 (0.21-2.29)	1.48 (0.47-4.65)	0.94 (0.28-3.09)
Single	1.50 (0.62-3.65)	2.27 (0.95-5.39)	**4.98 (1.81-13.71)**
Employment Status			
Unemployed	Reference	Reference	Reference
Employed	0.87 (0.38-1.99)	1.61 (0.74-3.51)	**2.72 (1.22-6.06)**
Retired	0.52 (0.14-1.94)	0.53 (0.15-1.87)	1.52 (0.42-5.55)
Student	0.57 (0.24-1.32)	1.15 (0.52-2.51)	**2.49 (1.11-5.58)**
Income			
<$20,000	Reference	Reference	Reference
$20,000-39,999	2.13 (0.95-4.75)	0.97 (0.45-2.07)	1.22 (0.56-2.65)
$40,000-59,999	1.52 (0.70-3.29)	0.99 (0.47-2.07)	1.64 (0.76-3.57)
$60,000-79,999	1.66 (0.69-3.98)	1.35 (0.57-3.18)	1.77 (0.73-4.28)
$80,000-99,999	**4.47 (1.47-13.65)**	1.47 (0.52-4.11)	1.27 (0.47-3.42)
≥$100,000	1.86 (0.88-3.94)	1.16 (0.56-2.40)	1.60 (0.75-3.39)
Personal Contact			
No	Reference	Reference	Reference
Yes	0.91 (0.43-1.93)	1.69 (0.78-3.67)	1.11 (0.52-2.37)
Educational Program			
No	Reference	Reference	Reference
Yes	**2.13 (1.26-3.59)**	1.55 (0.93-2.58)	1.60 (0.94-2.70)

Note: Bold indicates significance of <0.05; OR-Odds Ratio; CI- confidence interval; SBBP- Sex, blood and blood products; MTCT- mother to child transmission; Covariates for odds ratios were gender, age, race, education, marital status, employment status, income, personal contact, and education program; Outcomes were SBBP (≥87.0%), MTCT (≥50.0%), and other behavior (≥60.0%)

Appendix C

Table 2.10 Multiple logistic regression analyses of R&B, SC, and AS with demographic variables

Variable	R&B OR (95% CI)	SC OR (95% CI)	AS OR (95% CI)
Gender			
Male	Reference	Reference	Reference
Female	0.94 (0.57-1.55)	**1.77 (1.07-2.93)**	1.36 (0.81-2.27)
Race			
White	Reference	Reference	Reference
Black/ African American	0.56 (0.24-1.31)	0.84 (0.37-1.93)	0.67 (0.29-1.56)
Other	0.65 (0.30-1.41)	0.72 (0.34-1.54)	**0.36 (0.17-0.79)**
Age			
18-24	Reference	Reference	Reference
25-34	0.68 (0.24-1.97)	0.49 (0.16-1.48)	0.84 (0.31-2.34)
35-44	2.23 (0.60-8.26)	1.16 (0.33-1.14)	0.96 (0.26-3.47)
45-54	2.41 (0.54-10.74)	1.89 (0.44-8.17)	0.79 (0.17-3.64)
≥55	2.34 (0.69-7.90)	1.49 (0.45-4.95)	0.76 (0.23-2.51)
Education			
High school or below	Reference	Reference	Reference
Some college	0.77 (0.42-1.40)	0.65 (0.36-1.17)	0.55 (0.29-1.03)
Associates degree or higher	**0.36 (0.16-0.83)**	**0.34 (0.15-0.76)**	**0.32 (0.14-0.71)**
Marital Status			
Married/ Domestic Partnership	Reference	Reference	Reference
Widowed/Separated/ Divorced	**0.29 (0.09-0.97)**	0.41 (0.13-1.31)	**0.28 (0.08-0.91)**
Single	1.00 (0.45-2.24)	0.99 (0.45-2.21)	1.25 (0.56-2.77)
Employment Status			
Unemployed	Reference	Reference	Reference
Employed	1.33 (0.62-2.86)	0.71 (0.33-1.54)	0.83 (0.37-1.84)
Retired	2.51 (0.71-8.83)	0.90 (0.27-3.01)	1.68 (0.49-5.83)
Student	1.03 (0.47-2.22)	0.53 (0.24-1.15)	0.84 (0.38-1.88)
Income			
<$20,000	Reference	Reference	Reference
$20,000-39,999	**0.45 (0.21-0.96)**	0.70 (0.33-1.47)	0.55 (0.26-1.19)
$40,000-59,999	0.64 (0.31-1.33)	0.96 (0.46-2.0)	**0.41 (0.19-0.86)**
$60,000-79,999	0.66 (0.29-1.51)	0.97 (0.43-2.21)	0.74 (0.31-1.75)
$80,000-99,999	1.03 (0.38-2.78)	0.71 (0.27-1.84)	0.77 (0.28-2.09)
≥$100,000	0.52 (0.26-1.06)	0.63 (0.31-1.28)	**0.47 (0.23-0.97)**
Personal Contact			
No	Reference	Reference	Reference
Yes	1.12 (0.55-2.29)	0.96 (0.47-1.96)	1.44 (0.70-2.98)
Educational Program			
No	Reference	Reference	Reference
Yes	0.73 (0.44-1.20)	0.85 (0.52-1.39)	1.11 (0.67-1.84)

Note: Bold indicates significance of <0.05; OR-Odds Ratio; CI- confidence interval; R&B- responsibility and blame; SC- social contact; AS- anticipated stigma; Covariates for odds ratios were gender, age, race, education, marital status, employment status, income, personal contact, and education program; Outcomes were R&B (≥41.7%), SC (≥50.0%), and AS (≥62.5%)

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