DEVELOPMENT AND IMPLEMENTATION OF A WEB-BASED INTERVENTION FOR HIV PREVENTION AND TREATMENT

by

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

DEVELOPMENT AND IMPLEMENTATION OF A WEB-BASED INTERVENTION FOR HIV PREVENTION AND TREATMENT

Introduction

Globally, 39 million people are living with the Human Immunodeficiency Virus (HIV), with 1.3 million new HIV acquisitions in 2022 (World Health Organization [WHO], 2023a). Nationally, more than one million people are living with HIV (Centers for Disease Control and Prevention [CDC], 2022a). The HIV epidemic began in 1981 and continues to pose a major threat to public health in the United States. There are many things that may put someone at heightened risk of contracting HIV, such as injection drug use and having sex without a condom (CDC, 2022a). For individuals at risk of contracting HIV, preventive measures and medications are recommended (Chou et al., 2023). Using condoms properly and using clean needles or syringes when injecting drugs can greatly minimize the risk of contracting HIV (Substance Abuse and Mental Health Services Administration [SAMHSA], 2021). Additionally, those at risk may take a medication to prevent contracting HIV, known as pre-exposure prophylaxis (PrEP; brand names Truvada ®, Descovy®, Apretude™). After transmission, HIV enters a person's bloodstream and attacks their CD4 cells, a type of white blood cell important in preventing infection (Ronen et al., 2015). The virus then uses the white blood cell to multiply and continue spreading throughout the body. This weakening of the immune system can lead to a heightened susceptibility to other illnesses and infections (HIVinfo, 2021a).

Compared to the general population, substance use disorders are more prevalent among people living with HIV. Intoxication can lower inhibition and alter judgement and decision-making capabilities, increasing a person's likelihood of engaging in risky behaviors

(National Institute on Drug Abuse [NIDA], 2022). Drug use has also been associated with an accelerated disease progression and higher mortality rates (Dash et al., 2015). While people who inject drugs (PWID) account for 10% of new HIV diagnoses each year, 67% of new transmissions occur through male-to-male sexual contact (CDC 2022c). Therefore, it is important to understand how drug use may increase transmission risk through sexual contact as well as through sharing injection equipment.

HIV and Substance Use

Transmission of HIV among those with substance use disorder often occurs through risky behaviors, including through fluids passed via injection drug use and unprotected sex. Transmission can occur through sexual contact and through the use of non-sterile needles and syringes. According to a 2022 report by the CDC, nearly half of PWID aged 18 to 29 have shared syringes (CDC, 2022c). Despite this increased transmission risk due to sharing syringes, only 55% of PWID were tested for HIV in the previous 12 months, and only 3% were on PrEP (CDC, 2022c; Mistler et al., 2021). Considering the low percentage of PWID that are engaged in HIV preventative services, it is important to increase HIV prevention and treatment knowledge among people that work closely with PWID.

Because people can misperceive risk for HIV, they often do not get tested and continue engaging in risky behaviors. Indeed, 40% of new transmissions are from people who did not know they were living with HIV (CDC, 2022e). The CDC recommends that individuals who are at risk of acquiring HIV get tested every 12 months (CDC, 2022e). However, roughly 13% of people living with HIV are unaware of their positive status (CDC, 2022a). Additionally, 50% of people living with HIV are unaware of their status for three or

more years before diagnosis (CDC, 2022b). It is important for a person to be tested as quickly as possible after being exposed to HIV, and to begin treatment quickly thereafter.

For those engaging in risky behaviors but who have not contracted HIV, prevention options are available that can greatly reduce the risk of HIV acquisition. Along with cleaning injection drug use equipment and using condoms, a person who is at risk for HIV can take PrEP. When taken as recommended, PrEP is up to 99% effective at preventing contraction of HIV through sex, and at least 74% effective at preventing acquisition through injection drug use (WHO, 2023a). Pre-exposure prophylaxis can be taken as a once daily pill, or as an injection once every eight weeks. Currently, much of the PrEP marketing that is done is targeted at men who have sex with men (Keddem et al., 2023; Smit & Masvawure, 2023; Walsh-Buhi et al., 2021). While that may reach the 67% of new transmissions that are men who have sex with men, that marketing misses the 22% of people whose transmission was through heterosexual contact, or the 11% of people whose acquisition was from injecting drugs (CDC, 2023).

For those who acquire HIV, antiretroviral medications (ARVs) can be used to manage chronic illness. Antiretroviral medications prevent HIV from multiplying in a person's bloodstream, reducing the amount of virus in their body, called viral load (HIVinfo, 2021b; HIVinfo, 2021c). The goal of ARVs is to achieve viral suppression (WHO, 2023b). Viral suppression occurs when the amount of virus in a person's blood is no longer detectable. Once viral suppression is reached, a person can no longer transmit HIV to others (CDC, 2022d). People living with HIV should begin taking ARVs as soon as possible after diagnosis to achieve viral suppression quickly.

Particularly among those with co-occurring HIV and substance use disorder, treatment initiation tends to be delayed and individuals are less likely to be adherent to ARVs, often due to a delay in diagnosing HIV in PWID (Farhadian et al., 2022; Goldstein et al., 2005; Grigoryan et al., 2009). Once an individual stops taking their medication as prescribed, they are no longer virally suppressed and can transmit the virus (CDC, 2022d). One method of overcoming this challenge is to integrate HIV and substance use care (SAMHSA, 2021), or otherwise create an approach to healthcare that acknowledges the difficulties that co-occurrence of these diseases presents. In short, substance use counselors should have standard procedures in place to identify and screen people for HIV risk so that at-risk clients are made aware of preventative options that are available.

This delay often is a direct result of professionals that these individuals come in contact with (e.g., substance use treatment counselors) who are not equipped or do not feel comfortable addressing HIV with their clients. Previous literature demonstrates that many substance use counselors do not feel prepared to have HIV-related conversations with clients (Mitchell & Oltean, 2007; Shoptaw et al., 2000). One contributing factor to this unpreparedness is implicit stigma. Implicit stigma involves treating a person or group differently due to negative thoughts and assumptions one holds, with those thoughts being subconscious and outside of one's control (Stull et al., 2014). For example, a substance use counselor may assume that only men who have sex with men are at risk of acquiring HIV, and therefore not consider the benefits of PrEP for female clients. These assumptions can also result in the use of biased and stigmatizing language (Ashford et al., 2019; Parisi et al., 2023), creating an uncomfortable relationship between the client and counselor. If the

relationship is damaged, the client may be more prone to discontinuing treatment (Spector & Pinto, 2011).

Barriers to HIV conversations in substance use counseling have further been assessed. Indeed, one study found a lack of updated information and trainings, social stigma of HIV, and assumptions of a person's risk as barriers to discussing HIV with substance use treatment clients (Spector & Remien, 2015). In this study, the researchers evaluated counselors' perspectives on the integration of HIV prevention services into substance use treatment counseling. One barrier counselors noted was an assumption that their clients already know about HIV risk. For example, some counselors noted that their clients are aware of risks that come from having condomless sex. Counselors also described a hesitancy to discuss HIV due to a fear of offending their clients. The human immunodeficiency virus can be a sensitive topic to discuss, and counselors do not want to offend their clients. Finally, researchers found that many counselors were relying on outdated information. Prevention and treatment options for HIV continue to change, but counselors are not receiving updated information. In an effort to address gaps in knowledge about HIV, education programs have been incorporated in legal settings to increase individuals' knowledge of HIV and PrEP.

Learning

In an attempt to increase counselors' self-efficacy in talking about difficult topics, researchers have begun comparing the types of training counselors are receiving (e.g., integrated substance use and HIV training, skills-based vs. information-only training), as well as how they receive it (e.g., in-person trainings, virtual trainings, article readings; Kerwin et al., 2006; Madson et al., 2008; Martin et al., 2016). One randomized control trial compared an 8-hour skill-based training to a 2-hour informational training. The skill-based training

included education on how to discuss sensitive topics with clients alongside motivational interviewing. The informational training, however, was a standard presentation of information without the opportunity for counselors to practice using the new knowledge. The results showed that the skill-based training produced increases in self-efficacy and improvements in the counselors' ability to engage in conversations with clients (Hatch-Maillette et al., 2019). However, this method of training is not always feasible. Many trainings are time-intensive, and many institutions do not have time to allocate to training. These can also be limited by course availability or cost.

To overcome these barriers, many institutions have turned to virtual webinars and trainings that focus on information delivery, and less skill-building (e.g., Calder et al., 2017; Rahmati et al., 2020; Weingardt et al., 2009). These webinars typically consist of a traditional lecture-type presentation where the audience does not participate aside from asking questions at the end. While convenient, this type of information presentation is not always effective. Online learning can be accompanied by attention difficulties whereby people are less likely to engage in the lecture and more likely to experience distractions (Peper et al., 2021).

Cognitive and learning scientists study information delivery and emphasize the importance of conveying information through both audio and visual channels (Mayer, 2008). By using both channels simultaneously learners can process information more efficiently, which leads to increased retention (Zeglen & Rosendale, 2018). This dual presentation also reduces cognitive load (Mayer & Moreno, 2003; Mousavi et al., 1995) and aids in information processing. Because of these benefits, online multimedia learning has been shown to be effective at bolstering learning and facilitating the combination of new and prior

knowledge (Chudler & Bergsman, 2014; Goff et al., 2016; McClean et al., 2005; Silver & Nickel, 2005). Multimedia learning combines videos, text, graphics, and other methods of information delivery. More recently, learning scientists have demonstrated the benefit to learning provided by online tutorials as compared to textbook reading in educational settings (Kramer et al., 2018).

One aim of an online interactive tutorial is to increase knowledge retention over time using a multimedia approach. In order to bolster retention over time, it is important to practice remembering information, a process called retrieval practice (Roediger & Butler, 2011). Retrieval practice occurs any time a person is asked to recall the answer to a question or draw up information they have previously learned (Rowland, 2014). This process allows the information to be reconsolidated, strengthening the memory trace and making later retrieval easier. Creating an online tutorial allows retrieval practice to be embedded in the training curriculum. This aspect of virtual learning tools requires students to rehearse information more regularly than with traditional studying and leads to improved knowledge retention. The current project aims to incorporate these principles of learning with an online educational model, and to understand its effectiveness.

Unified Theory of Acceptance and Use of Technology

The Unified Theory of Acceptance and Use of Technology (UTAUT) lends itself to a better understanding of retrieval practice, and providing guidance for testing the implementation of new technological systems (Venkatesh et al., 2003). Authors of the UTAUT conducted a meta-analysis of 645 studies relating to technology implementation theory and combined them into one comprehensive theory. Specifically, the UTAUT

combines elements of seven psychological and technological models to create five constructs related to a person's intent to use a piece of technology.

To better understand the UTAUT, it is essential to understand seven core theories that inform the model. The Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975; Hale et al., 2002) posits that a behavior is determined by a person's intention to perform a certain behavior, which is influenced by attitudes toward the behavior and the normative beliefs a person holds (Davis et al., 1989; Sheppard et al., 1988). The Technology Acceptance Model (TAM; Davis, 1989) was created to predict uptake and acceptance of technology in the workplace, and suggests that the more useful a product is, and the easier it is to use, the more likely a person will intend to use it. While the TRA and TAM identify attitudes that affect intention, the Motivational Model (MM; Vallerand, 1997) can be used to understand the internal and external reasons that a person may use a piece of technology (Davis et al., 1992; Venkatesh & Speier, 1999). The Theory of Planned Behavior (TPB; Ajzen 1991) supports and extends the TRA, adding that attitude toward behavior, subjective norm, and perceived behavioral control are the attitudes and beliefs that influence behavioral intent or intent to act (Harrison et al., 1997; Mathieson, 1991). The Model of PC Utilization (MPCU; Thompson et al., 1991; Triandis, 1977) provides a competing view of human behavior to that suggested in the TRA and TPB, which aims to predict actual (instead of intended) use of technology. The Innovation Diffusion Theory (IDT; Rogers, 1995) is a sociological theory that explains how new innovations or pieces of technology are spread through populations slowly, not all at once. The final theory, Social Cognitive Theory (SCT; Bandura, 1986) generally suggests that a portion of a person's behavior can be explained by a person's social experiences, interactions, and influences.

The UTAUT takes the theoretical core constructs and couches them within five major domains: performance expectancy, effort expectancy, social influence, facilitating conditions, and attitude toward using technology. Each of these domains draws upon different aspects of the seven major theories, and work together to explain what influences a person to use a piece of technology and predict a person's intent to continue using the system. In the context of this study, the UTAUT helps examine the factors that influence a counselor's likelihood to use or recommend the OPEN program to others. With this base-level understanding of the theories and constructs behind the UTAUT, one can now consider the five domains.

Performance expectancy describes the degree to which an individual believes that using a system will improve their job performance. Performance expectancy encompasses five of the core constructs: perceived usefulness, extrinsic motivation, job-fit, relative advantage, and outcome expectations (see Appendix A for complete definitions of all constructs). Of all constructs, this is the strongest predictor of intention to use a piece of technology. Within the current study, higher scores on performance expectancy indicate that counselors tend to think that having completed the OPEN program will improve their job performance.

Effort expectancy is the degree of ease associated with using a technological system or accomplishing a certain technological task. Effort expectancy tends to be a stronger predictor of intent in earlier stages of new behavior, and become less salient over time as new concerns present themselves, such as job-related pressures and expectations. Effort expectancy is comprised of complexity, ease of use and perceived ease of use. Generally, the easier a new system is to use, the more likely a person is to use it.

The social influence construct captures the degree to which an individual believes that important others (e.g., upper management) want them to perform a desired action. For example, this construct is interested in the degree to which a boss influences an employee's decision to use a system. In the current study, this would equate to a boss influencing a counselor's desire to engage in HIV-related conversations. Heavily influenced by social theories, this construct includes subjective norm, social factors, and image.

Facilitating conditions are the degree to which an individual believes that infrastructure and support exist to bolster the use of technology. This captures three constructs posed by the theories: perceived behavioral control, facilitating conditions, and compatibility. The focus of the construct is on implementation of the technology and integration into work settings. In the current study, this construct examines whether the OPEN program and its content fits with the type of work the counselors are doing, and whether their current systems have the capacity to support conversations about HIV prevention and treatment.

The final dimension, attitudes toward using technology, is an assessment of the degree to which the piece of technology was generally well received. The current study aimed to develop and pilot test a technology-based sociomedical HIV education program called Online Prevention Education Now. The core constructs that comprise this dimension are attitude toward behavior, intrinsic motivation, attitude toward use, and affect. This dimension is not used as a predictor of behavioral intention, but instead as a gauge of acceptance of the OPEN program.

Current Study

The current study aimed to develop and pilot a technology-based sociomedical HIV education program. The first part of the study aimed to develop the Online Prevention Education Now (OPEN) program, an educational training that guides users through modules regarding HIV prevention and treatment, co-occurring substance use disorders and HIV, and tips for engaging clients in conversations about HIV. The second part of the study aimed to test the feasibility and uptake of implementing the OPEN program in a group of substance use treatment counselors. **H1** tested whether HIV and PrEP knowledge increased as a result of the OPEN training, and **H2** tested for reductions in stigma of people living with HIV and PrEP users. The final aim of the study was to examine uptake and acceptance of the program (**H3a**), and if individuals' attitudes toward the program reflected an intention to use the program in the future (**H3b**). The current study has been preregistered through the Open Science Framework (Villaire & Knight, 2023).

Method

Online Prevention Education Now (OPEN) Program

The OPEN program includes seven topic areas: HIV Basics, the four pillars of Ending the HIV Epidemic (Diagnose, Treat, Prevent, Respond), HIV and Substance Use, and Having the Conversation. Each topic area has a separate module within the website. Every page consists of a short, 1-minute introductory video, a question for participants to consider as they read (called "Consider the Following"), information about the topic area, and a "Check Your Knowledge" section listing three main takeaways from the section. At the end of each page a quiz is provided for participants to take and check their knowledge and understanding of the section (see Appendix B for screenshots of the OPEN program).

Each module of the OPEN program discusses a different facet of HIV and substance use disorder comorbidity. The HIV Basics section discusses how HIV can and cannot be transmitted, and a timeline of HIV in the United States. Each of the four pillars of Ending the HIV Epidemic have a separate module that includes relevant statistics and CDC-outlined goals and strategies relating to that pillar. For example, the Diagnose module includes statistics of HIV diagnoses by race/ethnicity, age, and transmission category (i.e., male-to-male sexual contact, heterosexual contact, injection drug use). The module also outlines the three CDC strategies relating to diagnosing HIV: increase testing in clinics, increase testing in non-traditional settings, and create a system to regularly screen those at risk (CDC, 2022b). The HIV and Substance Use module provides details of comorbid HIV and substance use disorder, including common symptoms. This module includes SAMHSA's 6 strategies to increased treatment and prevention service retention for individuals with HIV risk and substance use disorder (SAMHSA, 2021). Having the Conversation was a module designed to help counselors think through how to engage clients in conversation about HIV risk. Three scenarios were presented in video format, and the participant chooses one of three response options based on the scenario. The participant is able to click through the response options and read justification for why each one was or was not an ideal response. Content for the website was compiled from several reputable sources, such as the CDC, the National Institute of Drug Abuse, and the Substance Abuse and Mental Health Services Administration.

Sample

The Phase 1 sample consisted of 11 individuals who had a background in substance use and/or HIV clinical, education, or research work. Participants were recruited from a

university located in the southern United States. Three of those individuals also participated in a follow-up interview.

The original Phase 2 sample consisted of 45 individuals. Participants were all substance use treatment counselors working at prison-based substance treatment programs. Eight participants completed all measures. One participant failed an attention check and was excluded from final analysis.

Procedure

Phase 1

Participants in Phase 1 were asked to walk through the OPEN program at their own pace and complete a short feedback survey. The survey asked questions such as "Which sections of the website did you find useful?" and "How much did you like the overall look of the website?" A subset of participants (n = 3) also participated in one 30-minute recorded interview to gain further feedback on the program. Interview questions were geared towards gaining a better understanding of the user's experience with the content of the website, as well as the training program itself. Interview questions included, "If you were going to teach or learn more about co-occurring HIV and substance use disorders, what areas would you be sure to cover?" and "Is there anything relating to HIV that you wish you had more knowledge of?"

Phase 2

Phase 2 involved completion of a pre-test, working through the OPEN program, and a post-test. Participants were substance use counselors recruited from multiple prison-based substance use treatment programs. A total of 45 participants consented and completed the pre-test, while 8 participants completed both the pre-test and post-test. One participant's data

Table 1

Demographic Characteristics of Participants

Characteristic	Phase 1		Phase 2	
	n	%	*n*	%
Gender				
Male	1	9.09	3	42.86
Female	10	90.91	4	57.14
Race				
White	8	72.73	4	57.14
Black or African American	2	18.18	3	42.86
Other	1	9.09	0	0
Highest level of education				
Some college	0	0.00	2	28.57
Bachelor's degree	1	9.09	1	14.29
Master's degree	10	90.91	4	57.14
Area of focus of highest degree				
Social work	3	27.27	0	0.00
Public health	3	27.27	0	0.00
Education psychology	1	9.09	0	0.00
Community or human services	1	9.09	2	28.57
Psychology or counseling	3	27.27	4	57.14
Addiction counseling	0	0.00	1	14.29
Certification status				

Currently certified or licensed	6	54.55	4	57.14
Not currently certified or licensed	5	45.45	3	42.86

One participant's data was not included in final analysis due to failing an attention check. Participation was estimated to take between 30-60 minutes, depending on the time a person spent completing the OPEN program.

Measures

Demographic Information

Demographic information was collected during both phases of the study. This included age, gender, race and ethnicity, education, length of employment, and certifications.

Knowledge

Knowledge of HIV and PrEP was assessed before and after completing the training. Knowledge questions were developed through a combination of original questions based on material to be presented, and questions used in previous HIV training studies (Spence et al., 2022). A total of 10 questions were presented. All questions are multiple-choice, and assessed knowledge of HIV prevention, treatment, risk factors, and co-occurring substance use disorder and HIV. See Appendix C for all knowledge questions.

HIV Attitudes

Attitudes toward people living with HIV were measured using an adapted version of the Healthcare Provider HIV/AIDS Stigma Scale (HPASS; Wagner et al., 2014). The scale consists of 26 questions that are answered on a 6-point Likert scale ranging from "*Strongly Disagree*" to "*Strongly Agree*" (Cronbach's $\alpha = 0.91$). The adapted version consists of 26 of the original questions, with two being removed that ask about physician-specific behaviors

(e.g., performing a procedure or examination). Three dimensions are measured in this scale: stereotyping, prejudice, and discrimination. See Appendix D for all HIV attitudes questions.

PrEP Attitudes

Attitudes toward PrEP users were measured via Rayanakorn et al.'s (2022) PrEP survey (Cronbach's $\alpha = 0.55$). The low reliability of this measure is likely due to the small sample size obtained. Questions were assessed on a 5-point Likert scale ranging from "*Strongly Disagree*" to "*Strongly Agree*." Three subscales are measured: general attitudes and stigma, prioritization, and effectiveness. Prioritization refers to the extent to which the respondent sees PrEP as a priority for all individuals. See Appendix E for all PrEP attitude questions.

UTAUT Scale

Technology acceptance and uptake was measured using the UTAUT survey (Venkatesh et al., 2003; Cronbach's $\alpha = 0.98$). Certain items' wording was changed to reflect the technology being used (i.e., using "training" instead of "system"). The scale includes 49 questions answered on a 5-point Likert scale ranging from "*Strongly Disagree*" to "*Strongly Agree*." Five constructs are measured as subscales: performance expectancy, effort expectancy, social influence, facilitating conditions, and attitudes toward using technology. See Appendix F for all UTAUT questions.

Analytic Plan

To analyze pre-test and post-test scores on measures of knowledge, HIV attitudes, and PrEP attitudes, dependent samples *t*-tests were conducted, adjusting for multiple comparisons. Specifically, the Benjamini-Hochberg procedure was used to adjust *p*-values after running the *t*-tests (Benjamini & Hochberg, 1995). The Benjamini-Hochberg correction

provides new *p*-values to indicate statistical significance based on the *p*-values found as a result of the *t*-test. To perform the correction, *p*-values are listed in ascending order and assigned a corresponding rank (i.e,. the smallest value is ranked 1). Each value is then assigned a new critical value, using the following formula:

$$\frac{rank\ number}{total\ number\ of\ tests} * false\ discovery\ rate$$

If the original *p*-value is less than the corrected *p*-value, the test is significant. The *t*-tests were run on the total knowledge score, and each subscale of the HIV and PrEP attitudes measures. In total, seven tests were conducted.

To analyze UTAUT scores, a within-subjects multiple regression was run with the four constructs—performance expectancy, effort expectancy, social influence, and facilitating conditions—as predictors of behavioral intention. The fifth construct, attitude toward using technology, was not used as a predictor variable, in line with the prescribed use of the measure (Venkatesh et al., 2023). Instead, this construct was reported in percentages and proportions of participants who agree with a certain statement.

Results

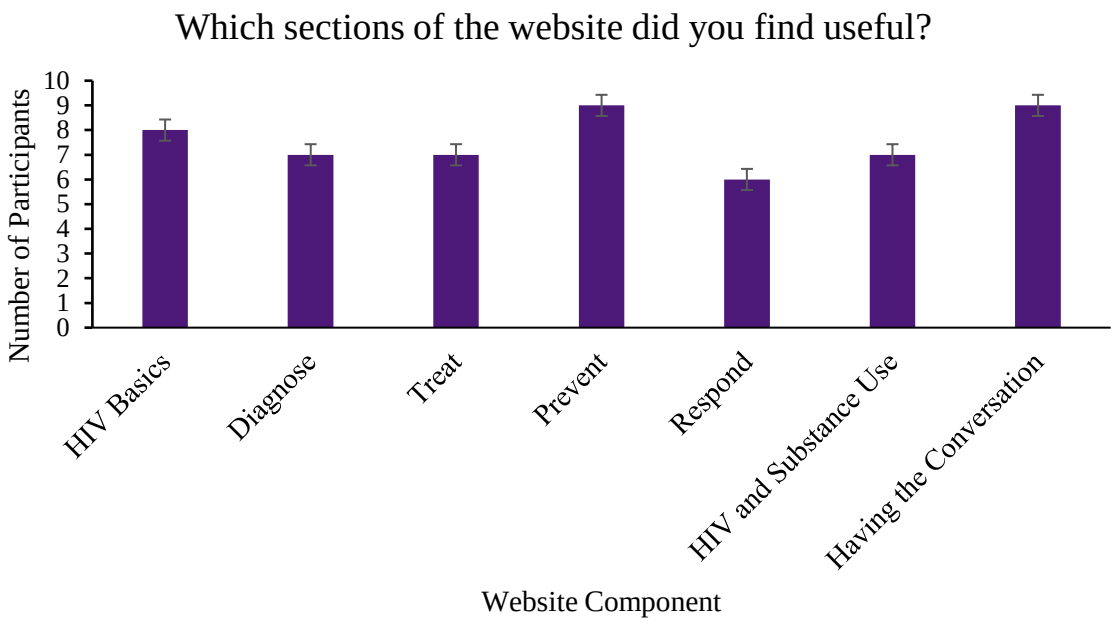
Feedback on the OPEN Program (Phase 1)

Participants were asked a combination of closed- and open-ended questions about their experience completing the OPEN program. At least half of all participants found every section of the website useful; no participant recommended removing a section (see Figure 1). All participants reported either “somewhat” or “strongly” liking the overall look of the website (see Figure 2). Participants gave feedback regarding missing elements of the webpage (e.g., back buttons), as well as content (e.g., more information about transmission via injection drug use). Participants who completed interviews gave additional feedback

regarding the content of the website, noting the need for consistent, person-first language (e.g., PWID, people living with HIV) and spelling out acronyms. Feedback was then incorporated into the OPEN program before Phase 2 of the study was deployed.

Figure 1

Participant Ratings of Usefulness of OPEN Program Components

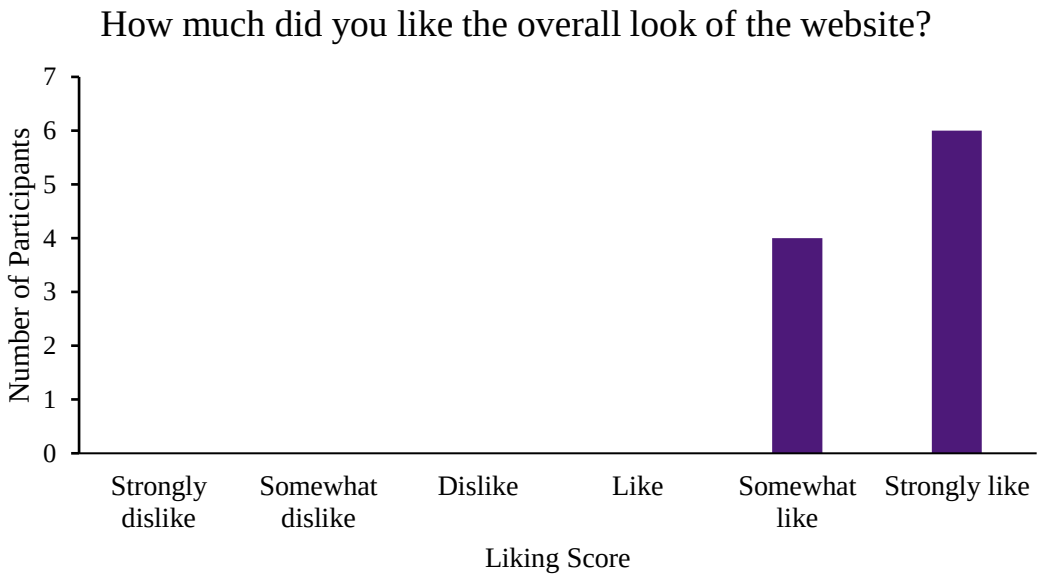


Changes in Knowledge and Attitudes (Phase 2)

Correct responses on the knowledge assessment were coded as 1, with incorrect responses coded as 0. This allowed for a maximum score of 10 on the knowledge assessment. A dependent-samples *t*-test was used to examine the change in knowledge scores between the pre-test and post-test. The results were significant, $t(6) = 3.52$, $p = .013$, $d = 1.43$, with pre-test scores ($M = 5.08$, $SD = 1.78$) being significantly lower than post-test scores ($M = 6.98$, $SD = 1.67$). After correction using the Benjamini-Hochberg procedure, the effect is significant at the $p = 0.10$ level, but not the $p = 0.05$ level (corrected $p = .014$).

Figure 2

Participant Ratings of Look and Feel of the OPEN Program



Human immunodeficiency virus attitude subscales were calculated by averaging responses for each of the three subscales: prejudice, stereotyping, and discrimination. Dependent-samples *t*-tests were used to examine the change in each subscale across the timepoints. The results of all three *t*-tests were non-significant (*p*s ≥ .055). Overall, the three subscales revealed a downward trend to the data. Specifically, prejudice, stereotyping, and discrimination all decreased over time. This trend warrants further investigation.

Pre-exposure prophylaxis stigma subscales for attitudes, prioritization, and effectiveness were calculated as averages of responses. Dependent-samples *t*-tests were used to examine change in stigma over time, and results were all non-significant after adjusting for multiple comparisons using the Benjamini-Hochberg correction (*p*s ≥ .047; see Table 2 for descriptive statistics of all *t*-tests). The three subscales revealed trends to the data between the two timepoints. Specifically, PrEP attitudes decreased over time, while prioritization and

effectiveness increased. Here, PrEP attitudes refers to negative stereotypes or assumptions a person holds about people who use PrEP. A decrease in PrEP attitudes reflects a shift toward less-stigmatizing or stereotyping thinking. These trends should be studied further, and with larger sample sizes.

Table 2

Change in Knowledge and Attitudes Over Time

	Pre-test		Post-test		*t*(*df*)	*p*	BH *p*	Cohen's *d*
	M	*SD*	*M*	*SD*				
Knowledge of HIV and PrEP	5.08	1.77	6.98	1.67	3.52(6)	.013	.014	.577
HIV Prejudice	2.14	0.83	2.00	0.87	0.94(6)	.384	.100	.403
HIV Stereotyping	2.52	1.15	1.97	1.34	2.38(6)	.055	.043	.608
HIV Discriminating	2.31	1.25	2.03	1.42	1.34(6)	.229	.071	.564
PrEP Attitudes	2.11	0.90	1.76	0.70	1.93(6)	.101	.057	.478
PrEP Prioritization	3.66	0.53	3.94	0.62	2.50(6)	.047	.029	.302
PrEP Effectiveness	4.03	0.78	4.31	0.47	1.16(6)	.290	.086	.652

Note. BH *p* = Benjamini-Hochberg adjusted *p*-value. The test is deemed non-significant if the BH *p*-value is smaller than the original *p*-value. The false discovery rate reported here is 0.10 (or 10%). *M* = mean; *SD* = standard deviation.

UTAUT as Predictors of Intention to Use OPEN

Examination of the attitudes toward using technology domain revealed relatively high levels of acceptance of the OPEN program. Overall, 71% of participants either agreed or strongly agreed that completing the training is a good idea for people in their profession, and

Table 3

Acceptance, Uptake, and Attitudes Toward Using Technology

	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly Agree	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%
Completing the training is a good idea for people in my profession	0	0.00	1	14.29	1	14.29	4	57.14	1	14.29
I liked the idea of using the training	0	0.00	1	14.29	1	14.29	3	42.86	2	28.57
Completing the training was pleasant	1	14.29	0	0.00	0	0.00	4	57.14	2	28.57
I feel capable of having HIV-related conversations with clients	0	0.00	0	0.00	0	0.00	5	71.43	2	28.57
My clients will benefit from me having completed the training	1	14.29	1	14.29	1	14.29	2	28.57	1	14.29
I find the training to be enjoyable	1	14.29	0	0.00	3	42.86	2	28.57	1	14.29
The process of completing the training is pleasant	1	14.29	0	0.00	1	14.29	3	42.86	2	27.57
The training makes my job more interesting	1	14.29	1	14.29	1	14.29	3	42.86	0	0.00
The training is okay for some jobs, but not the kind of job I want	3	42.86	2	28.57	2	28.57	0	0.00	0	0.00
I look forward to implementing this knowledge in my work	1	14.29	1	14.29	1	14.29	3	42.86	1	14.29

I was bored when completing the training	1	14.29	3	42.86	2	28.57	0	0.00	1	14.29
I generally enjoyed the training	1	14.29	0	0.00	1	14.29	3	42.86	2	28.57

all participants either agreed or strongly agreed that they feel capable of having HIV-related conversations with their clients. Additionally, 43% of participants reported looking forward to implementing the training in their work (see Table 3 for all descriptive statistics relating to attitudes toward using technology).

A multiple regression was run to predict intention of using the OPEN program in the future as a function of performance expectancy, effort expectancy, social influence, and facilitating conditions. This did not result in a significant model, $F(4, 6) = 3.42$, $p = .236$. None of the factors were significant predictors of behavioral intention ($ps \geq .544$).

Table 4

Behavioral Intention as a Function of UTAUT Domains

Effect	*β*	*SE*	95% CI		*p*
			LL	*UL*	
Constant			-8.65	8.45	.964
Performance Expectancy	.62	.77	-2.74	3.85	.544
Effort Expectancy	.11	1.29	-5.34	5.77	.883
Facilitating Conditions	.18	1.06	-4.33	4.80	.847
Social Influence	.06	.98	-4.12	4.31	.929

Note. CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

Discussion

Risk for acquiring HIV in the United States continues to pose a threat to public health. To make strides toward the CDC goal of ending the HIV epidemic, it is important to increase the awareness and knowledge of HIV and co-occurring disorders among public health professionals. Considering the prevalence of comorbid HIV and substance use disorder, equipping substance use counselors with current HIV prevention and treatment information is key to increasing HIV-related conversations with clients. The current lack of knowledge around best practices for HIV prevention and treatment (e.g., Mitchell & Oltean, 2007; Shoptaw et al., 2000) can result in counselors feeling unprepared to discuss HIV prevention with their clients or being unaware of how to properly screen clients for risk (SAMHSA, 2000). By consolidating existing literature and making it accessible and digestible, the present study sought to provide substance use counselors with the tools they need to address HIV risk among high-risk populations.

Currently, few interventions exist that target HIV education for substance use treatment providers. One such existing training is a 1-hour virtual seminar. While the information presented is useful, the presentation of the material in this format is not conducive to skill learning, as evidenced in previous studies (e.g., Hatch-Maillette et al., 2019). This seminar-style training consists also includes a pre-test and a post-test. Considering the high caseloads many substance use counselors carry, it may be difficult to find time to complete such a long training. The OPEN program takes between 15-30 minutes to complete, and is highly interactive to bolster engagement with the material.

Results from Phase 1 provided important feedback regarding what consumers want and need from an online training platform. Feedback from individuals with backgrounds in

substance use treatment and HIV prevention and treatment discussed the importance of using non-stigmatizing, person-first language. Participants further discussed the impact stigma can have on substance use treatment, consistent with prior literature that has found negative beliefs toward people living with HIV among substance use counselors (Ashford et al., 2019; Parisi et al., 2023), as well as a lack of educational training available to counselors (Specter & Pinto, 2011).

Results from Phase 2 revealed high acceptance of the OPEN program, with an intention to continue using the information presented in the training. In the UTAUT domain of Attitudes Toward Using Technology, participant responses were positive regarding the usefulness of the training. Participants tended to agree that completing the training is a good idea for substance use counselors, and that they feel capable of having HIV-related conversations. Furthermore, participants tended to enjoy the training, and look forward to implementing this knowledge in their work. This positive response to the OPEN program demonstrates high uptake in the population of substance use counselors.

The OPEN program was further demonstrated to be effective at increasing knowledge on HIV prevention and treatment. At the pre-test the average score on the knowledge assessment was a 51%. After completing the training, that average increased to 70%. Questions covered HIV prevention and treatment options, as well as basic transmission information. While there is still room for improvement of the content to increase the post-test average, this increase in knowledge demonstrates preliminary effectiveness of the OPEN program.

The clinical implications of the current study include the importance of making interventions engaging, comprehensive, and relatable. As previous literature has

demonstrated, training models that involve only reading or webinar-style information delivery do not lead to as much knowledge gain as interactive or skill-building trainings (e.g., Kerwin et al., 2006; Madson et al., 2008; Martin et al., 2016). The increase in knowledge demonstrated in the OPEN program supports these previous findings that interactive trainings bolster learning. Participant responses after completing the training also indicate a general enjoyment of completing the training. The multimedia components utilized in the OPEN program have resulted in positive feedback from users, reinforcing the acceptability of online interactive trainings.

Considering the vast amount of HIV prevention and treatment information currently available, having a comprehensive training minimizes the time professionals need to spend gathering information. Currently, information relating to HIV must be found on numerous different websites and articles. Creating a training that combines relevant information into one easy-to-read training is important to minimize the burden of learning. The OPEN program is a centralized location where information can be presented, updated, and easily accessed by users.

As well as being comprehensive, effective interventions are relatable to counselors and clients. Conveying information in a way that is easy to comprehend is important when creating interventions for the general population. Removing jargon that is used in medical or research fields is an important piece in translating science to the public. Additionally, avoiding stigmatizing language and using inclusive, person-first language helps all people feel comfortable and welcome in the conversation. When discussing a topic with pre-existing stigma like HIV and substance use, humanizing individuals in the language we use can facilitate healthier, more productive conversations.

Limitations

Limitations of the current study should be noted, including the small sample size, the generalizability, and the measures used. Recruitment of substance use counselors yielded only 8 participant who completed the pre-test, the training, and the post-test. This small sample size limits the claims able to be made in this study. The findings presented here are preliminary and should be assessed in a larger sample. Recruitment may be bolstered by offering an incentive such as continuing education credits, which many people need to retain their license or certification. Similarly, the current study examined the OPEN program in substance use counselors. The findings herein cannot be generalized to other occupations, such as parole officers or clients in substance use treatment. Finally, the measures used in the current study are not measures of actual behavioral change. Instead, they measure only intention to use the training material. Considering this, no claims can be made regarding actual change implemented by counselors following completion of the training.

Future Directions

Further investigation of the results and trends is warranted to continue improving the quality of online education being offered and expand the reach of prevention education. Due to the small sample size in the current study, future studies should re-examine the effects utilizing larger sample sizes. The OPEN program can also be examined for effectiveness in other populations such as probation and parole officers, workers at transitional facilities, and correctional staff inside correctional facilities. Future interventions could be tailored for people who use drugs, HIV treatment providers, or policymakers. Many people who work with people who use drugs have the opportunity to influence their treatment and should therefore be equipped with all of the relevant information to engage in conversations relating

to HIV prevention and treatment. Additionally, the current study's sample size warrants further replication of the study to examine the trends observed in the results.

To make the necessary strides towards addressing the epidemic of HIV in at-risk communities, there must be an emphasis on prevention and education across disciplines. Without the inclusion of relevant stakeholders in the conversation, such as PWID, HIV transmission will continue. A combination of targeted interventions focused on substance use and HIV risk for individuals along the HIV Care Cascade (HIVinfo, 2022) is necessary for comprehensive care. This comprehensive approach will create a general increase in HIV awareness and knowledge among important stakeholders in HIV prevention and treatment, contributing to the end of the HIV epidemic.

Conclusion

Due to a lack of concise, comprehensive trainings available to substance use counselors, the current study created an online educational program regarding HIV prevention and treatment and evaluated its acceptability and effectiveness. Results of the current study underscore the need for such training for substance use counselors. Feedback on the development of the program emphasized the importance of this training and offered important suggestions for improving the training. Preliminary implementation of the OPEN program revealed high levels of acceptability of the training, as well as an increase in knowledge. The findings of the study warrant further investigation into the OPEN program's effectiveness. Overall, the current study created a product that substance use treatment counselors found useful, and that can continue to be built and improved upon.

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Appendix A: Adapted UTAUT Construct Definitions

Construct	Adapted Definition	Associated Theory
Performance Expectancy	The degree to which an individual believes that completing the training will help them attain gains in job performance	
Perceived Usefulness	The degree to which a person believes that completing the training would enhance their job	TAM, TPB
Extrinsic Motivation	The perception that individuals will want to complete the training because it is perceived to be useful in achieving valued outcomes distinct from the training itself (e.g., improved pay, promotions, etc.)	MM
Job-fit	The perception that completion of the training may enhance one's job performance	MPCU
Relative Advantage	The degree to which completing this training is perceived as being better than a different kind of training	IDT
Outcome Expectations	Job-related and individual outcomes related to completion of the training	SCT
Effort Expectancy	The degree of ease associated with completion of the training	
Perceived Ease of Use	The degree to which a person believes that completing the training would be free of effort	TAM
Complexity	The degree to which a person perceives the training to be difficult to understand and use	MPCU
Ease of Use	The degree to which completing the training is perceived as being difficult	IDT

Construct	Adapted Definition	Associated Theory
Social Influence	The degree to which an individual believes that important others believe they should complete the training	
Subjective Norm	An individual's perception that most people who are important to them believe they should/should not complete the training	TRA, TAM
Social Factors	The individual's internalization of the reference group's subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations	MPCU
Image	The degree to which completion of the training is perceived to enhance one's image or status in one's social system	IDT
Facilitating Conditions	The degree to which an individual believes that infrastructure and support exist to bolster completion of the training	
Perceived Behavioral Control	Perceptions of internal and external constraints on behavior. Can include: self-efficacy, resource facilitating conditions, technology facilitating conditions	TPB
Facilitating Conditions	Objective factors in the environment that individuals agree make the training easy to do (e.g., provision of computer support)	MPCU
Compatibility	The degree to which the training program is consistent with existing needs and experiences of potential users	IDT
Attitudes Toward Using Technology	An individual's overall affective reaction to using a system	

Construct	Adapted Definition	Associated Theory
Attitude Toward Behavior	An individual's positive or negative feelings about completing the training	
Intrinsic Motivation	The perception that individuals will want to complete the training for no reinforcement other than the process of completing the training (i.e., because "they want to")	
Affect Toward Use	Feelings of joy, elation, or pleasure; or depression, disgust, displeasure, or hate associated by an individual with completing the training	
Affect	An individual's liking of completing the training	

Note. TRA = Theory of Reasoned Action; TAM = Technology Acceptance Model; MM = Motivational Model; TPB = Theory of Planned Behavior; MPCU = Model of PC Utilization; IDT = Innovation Diffusion Theory; SCT = Social Cognitive Theory.

Appendix B: Screenshots of the OPEN Program

Screenshot 1: HIV Basics Video and Consider the Following.

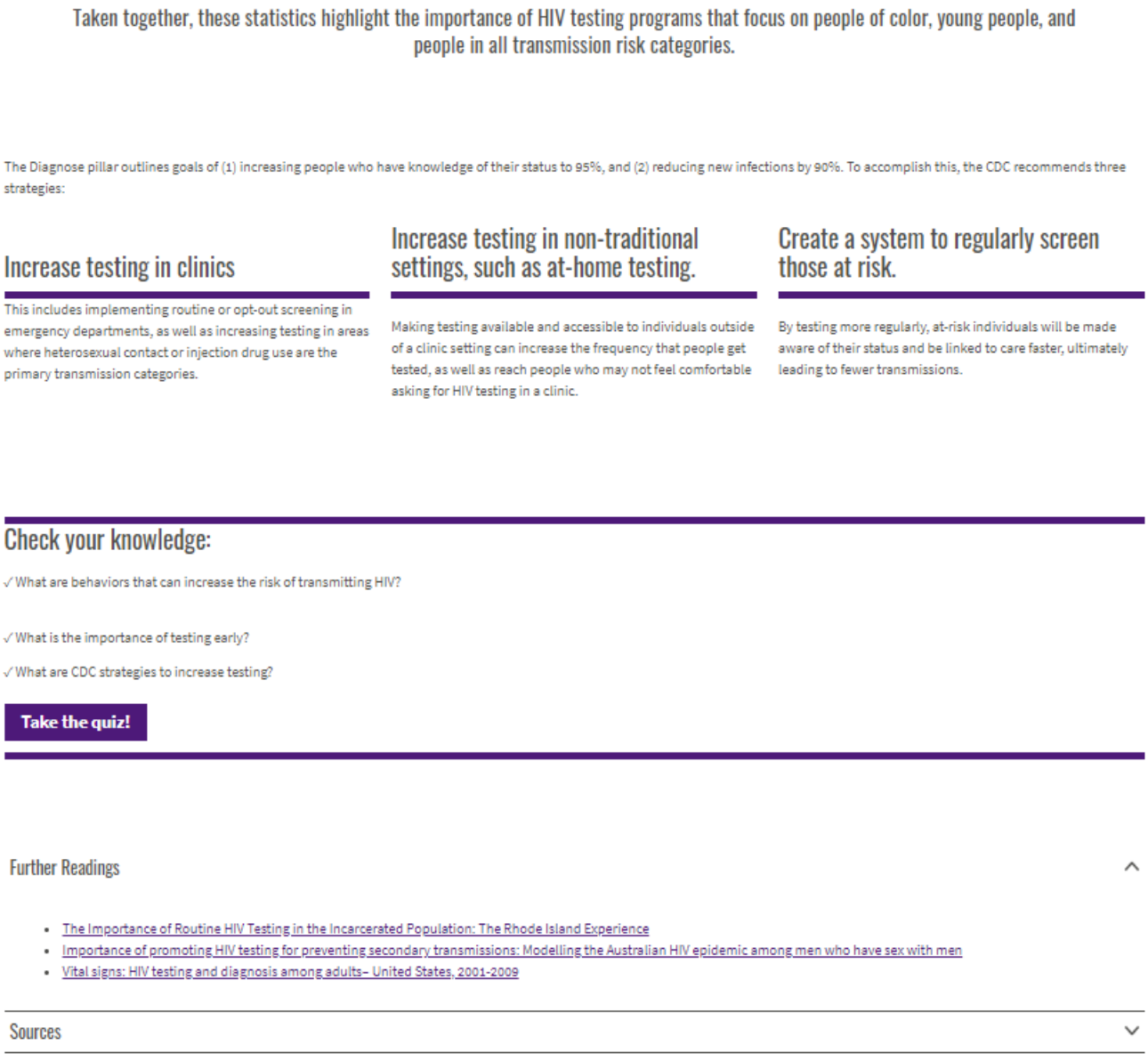
HIV Basics

> Consider the Following: How much about HIV do I know, and how much do my clients know?

What is HIV?

The Human Immunodeficiency Virus, or HIV, is a type of virus that attacks the body's immune system. If not treated, HIV can lead to Acquired Immunodeficiency Syndrome, or AIDS. While there is no cure for HIV, it can be controlled with proper medical care. Medications called antiretrovirals (ARVs, also know as antiretroviral therapy or ART) can decrease the amount of virus present in a person's blood. Once the amount of virus is undetectable, a person is virally suppressed, and can no longer transmit HIV to other people.

Screenshot 2: Diagnose Module CDC goals, Check your Knowledge, and Further Reading sections.

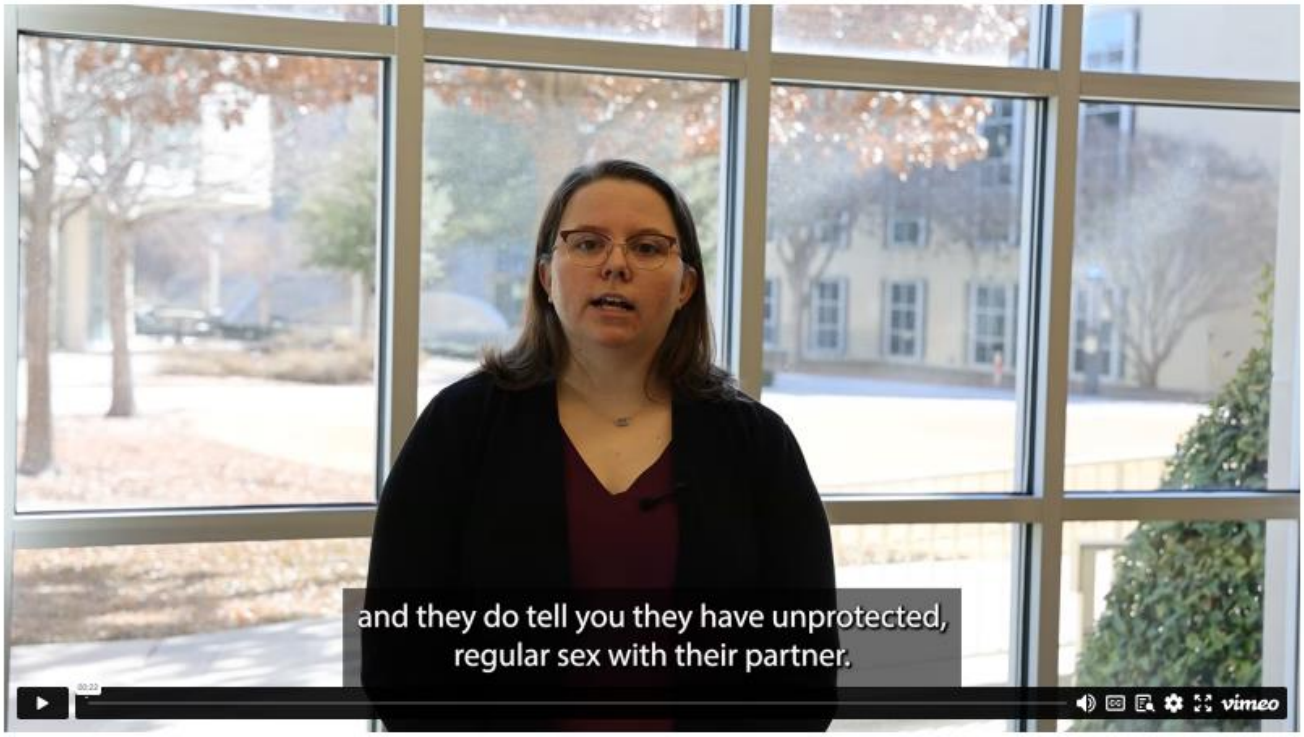


Screenshot 3: Having the Conversation Scenario 1.

Having the Conversation

Each of the videos below will present you with a scenario and ask how you would respond. Below each video you will see a list of possible responses. Read through each response and consider which seems most appropriate.

Scenario 1



Choose a response:

- Encourage them to leave their partner.
- Ask if they have ever heard of PrEP.
- Advise them to talk to their partner about their drug use.

Appendix C: Knowledge Assessment

1. In what ways can HIV be transmitted? (Select all that apply.)
    - Kissing
    - Vaginal intercourse
    - Oral sex
    - Anal intercourse
    - Sharing cups and spoons
    - Donating blood
    - Receiving blood
    - Mosquito bites
    - Accidental needle stick
    - From mother to child during pregnancy
    - Breastfeeding
    - Exposure to blood when taking care of patients
    - Touching surfaces touched by someone with HIV
    - Sharing needles when injecting drugs
2. Which of the following is NOT a pillar of Ending the HIV Epidemic?
    - Diagnose
    - Treat
    - Outreach
    - Prevent
    - Respond
3. Approximately what percentage of people are unaware of their HIV+ status?
    - 7%
    - 13%
    - 25%
    - 30%
4. What percentage of new HIV diagnoses are people who inject drugs?
    - 5%
    - 10%
    - 15%
    - 20%
5. Which age category represents the most new HIV diagnoses?
    - 13-24
    - 25-34
    - 35-44
    - 45-54
    - 55+
6. Which transmission category has the lowest rates of viral suppression?
    - Male-to-male sexual contact
    - Heterosexual contact
    - Injection drug use
7. What percentage of those who could benefit from PrEP are on it?
    - 10%
    - 25%

- 50%
- 75%

8. Which region of the United States has the highest rates of new HIV infection?
    - The Northeast
    - The South
    - The West
    - Hawaii
9. When taken correctly, PrEP can reduce your chances of sexually contracting HIV by:
    - 15%
    - 50%
    - 84%
    - 99%
10. 1 in ___ people living with HIV are not receiving care.
    - 2
    - 3
    - 4
    - 5

Appendix D: HIV Attitudes Assessment

Please rate the degree to which you agree or disagree with the following statements:

Scale options: Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree

1. HIV+ patients make me uncomfortable
2. I worry about contracting HIV from HIV+ patients
3. I would rather not come into physical contact with HIV+ patients
4. HIV+ patients present a threat to my health
5. It is a little scary to think I have touched HIV+ patients
6. I worry that universal precautions are not good enough to protect me from HIV+ patients
7. HIV+ patients present a threat to the health of other patients
8. I would be hesitant to send HIV+ patients to get blood work done due to my fear of others' safety
9. I would feel uncomfortable working alongside another healthcare provider who has HIV
10. It would be hard to react calmly if a patient tells me he or she is HIV+
11. HIV+ patients tend to have numerous sexual partners
12. HIV+ patients who have acquired HIV through sex are more at fault for contracting HIV than HIV+ patients who have acquired HIV through blood transfusion
13. I think HIV+ patients have engaged in risky activities despite knowing these risks
14. I often think HIV+ patients have caused their own health problems
15. I think if people act responsibly they will not contract HIV
16. I believe most HIV+ patients acquired the virus through risky behaviors
17. I think many HIV+ patients likely have substance use problems
18. HIV+ patients should accept responsibility for acquiring the virus
19. I tend to think that HIV+ patients do not share the same values as me
20. I think people would not get HIV if they had sex with fewer people

21. HIV+ patients who have acquired HIV through injection drug use are more at fault for contracting HIV than HIV+ patients who have acquired HIV through a blood transfusion

22. I believe I have the right to refuse to treat HIV+ patients to protect myself

23. I believe I have the right to refuse to treat HIV+ patients if I feel uncomfortable

24. I believe I have the right to refuse to treat HIV+ patients for the safety of other patients if other staff members are concerned about safety

25. I believe I have the right to refuse to treat HIV+ patients for the safety of other patients

26. I believe I have the right to refuse HIV+ patients if I am concerned about legal liability

Appendix E: PrEP Attitudes Questionnaire

Please rate the degree to which you agree or disagree with the following statements:

Scale options: Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree

1. PrEP is not an effective prevention tool in the "real world"
2. Most patients do not adhere to daily PrEP
3. PrEP will lead to risk compensation (i.e., less condom use)
4. PrEP will lead to increased STIs
5. Long-term PrEP use would cause frequent adverse events
6. Patients on PrEP are likely to be seen as HIV positive by their partners
7. PrEP would increase the likelihood patients have more sexual partners
8. PrEP would result in more needle and syringe sharing
9. Behavioral interventions have a greater impact than PrEP on HIV prevention
10. PrEP should be made available for free to ALL patients who request it
11. PrEP should be made available for free to only those with high risk of acquiring HIV infection
12. PrEP services should be provided together with condom use counselling and STI testing
13. PrEP services should be provided together with substance use treatment
14. PrEP is effective among men who have sex with men (MSM)
15. PrEP is effective among transgender women
16. PrEP is effective among couples where only one partner is HIV+
17. PrEP is effective among people who inject drugs
18. PrEP is effective among sex workers

Appendix F: UTAUT Questions

Please rate the degree to which you agree or disagree with the following statements:

Scale options: Strongly disagree, disagree, neither agree nor disagree, agree, strongly agree

1. Completing the training would enable me to engage in more HIV-related conversations with my clients.
2. Completing the training would improve my job performance.
3. Completing the training would increase my productivity.
4. Completing the training would enhance my effectiveness on the job.
5. Completing the training would make it easier to do my job.
6. I would find the training useful in my job.
7. Completion of the training will have no effect on my job performance.
8. Completing the training can decrease the time needed for certain job responsibilities.
9. Completing the training can significantly increase the effectiveness of performing job tasks.
10. Completing the training can increase the quality of care I can provide.
11. Considering all tasks, completing the training could assist on the job.
12. Completing the training will make it easier to do my job.
13. Completing the training will enhance my effectiveness on the job
14. By completing the training…
    a. I will increase my effectiveness on the job.
    b. I will have more conversations about HIV prevention and treatment.
    c. I will increase the quality of conversations I have.
    d. My coworkers will perceive me as competent.
    e. I will increase my chances of obtaining a promotion.
    f. I will increase my chances of getting a raise.
15. Completing and understanding the training is easy for me.
16. I find the content of the training useful.
17. I am able to complete the training easily.
18. I find the website easy to use.

19. Completing the training takes too much time from my normal duties.
20. Completing the training involves too much technical understanding (e.g., knowing how to operate a computer, navigating the website).
21. The training takes too long to complete.
22. Using the website is clear and understandable.
23. The information presented is clear and understandable.
24. Overall, I believe completing the training is easy.
25. People who influence my behavior think that I should complete this training.
26. People who are important to me think that I should complete this training.
27. The higher-level management of my workplace has been/will be helpful in completing this training.
28. My supervisor is supportive of completing this training.
29. In general, my workplace would support completion of this training.
30. People in my organization who have this knowledge have more prestige than those who do not.
31. People in my organization who have this knowledge have a high profile.
32. Having this knowledge is a status symbol in my organization.
33. I have the resources necessary to implement this knowledge.
34. Given the resources, opportunities, and knowledge it takes to complete and implement the training, it would be easy for me to do so.
35. This training is not compatible with my job.
36. My workplace has structure to support conversations about HIV prevention and treatment.
37. I know who I can contact for assistance or referrals regarding HIV or PrEP.
38. Completing the training is a good idea for people in my profession.
39. I like the idea of using the training.
40. Completing the training was pleasant.
41. I feel capable to have HIV-related conversations with clients.
42. My clients will benefit from me having completed the training.
43. I find the training to be enjoyable.
44. The process of completing the training is pleasant.

45. The training makes my job more interesting.
46. The training is okay for some jobs, but not the kind of job I want.
47. I look forward to implementing this knowledge in my work.
48. I was bored when completing the training.
49. I generally enjoyed the training.
50. I intend to use the content of the training on the next 3 months.
51. I predict I would use the content of the training on the next 3 months.
52. I plan to use the content of the training on the next 3 months.

VITA

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ABSTRACT

DEVELOPMENT AND IMPLEMENTATION OF A WEB-BASED INTERVENTION FOR HIV PREVENTION AND TREATMENT

by Stephanie Villaire, B.S., 2020
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Thesis Advisor: Kevin Knight, Director of Institute of Behavioral Research

Globally, 39 million people are living with the Human Immunodeficiency Virus (HIV), with 1.3 million new HIV acquisitions in 2022. Compared to the general population, substance use disorders are more prevalent among people living with HIV. The current study aimed to develop a technology-based sociomedical HIV education program, and pilot the program in a sample of substance use treatment counselors. Results demonstrated high acceptability of the Online Prevention Education Now (OPEN) program. Knowledge on HIV and PrEP increased after completing the OPEN program. Although non-significant, results show a trending decrease in stigma toward people living with HIV and PrEP users. The findings of the current study inform the feasibility and efficacy of online training courses for preventative services education.