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HIV pre-exposure prophylaxis uptake by advanced practice nurses: interplay of agency, community, and attitudinal factors

Running Head: HIV pre-exposure prophylaxis uptake by advanced practice nurses

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ABSTRACT

Aims: To identify associations among agency, community, personal and attitudinal factors that affect advanced practice nurses' uptake of HIV pre-exposure prophylaxis, an intervention consists of emtricitabine/tenofovir once-daily pill, along with sexual risk reduction education.

Design: Cross-sectional.

Methods: During March-May 2017, randomly-selected Indiana advanced practice nurses were invited to complete an online survey, consisted of several validated self-rating measures (N=1,358; response=32.3%). Final sample (N=369) was predominantly White, non-Hispanic, female advanced practice nurses in urban practices (mean age=46). Conceptual model for structural equation model included 29 original/composite variables and 5 latent factors.

Results: Final model consisted of 11 variables and 4 factors: agency, community, HIV prevention practices (including screening) and motivation to adopt evidence-based practices overall. Community had direct effects on HIV prevention practices (estimate=0.28) and agency (estimate=0.29). Agency had direct effects on HIV prevention practices (estimate=0.74) and motivation to adopt evidence-based practices (estimate=0.24). Community had indirect effects, through agency, on the two remaining factors.

Conclusion: Barriers exist against pre-exposure prophylaxis implementation, although practice guidelines are available. HIV prevention practices must be integrated across organizational structures, especially in high-risk communities, whereas practice change is more effective when focused on changing providers' attitudes toward intervention. When planning a pre-exposure prophylaxis intervention, advancing inputs from healthcare professionals, organizational leadership and community members, is crucial to success.

Impact: In settings where advanced practice nurses are primary contact points for healthcare, they may be best positioned to have an impact on implementation of HIV risk reduction strategies. Further research is needed to optimize their contributions to pre-exposure prophylaxis implementation.

Keywords: HIV; Advanced practice nursing; Pre-exposure prophylaxis; Evidence-based practice; Community-institutional relations; Risk evaluation and mitigation

INTRODUCTION

Since the first reported cases of HIV in 1981, over half a million individuals have died from HIV-related illness in the United States alone (Centers for Disease Control and Prevention, 2014). Globally, the number of cases of HIV-related illness is far greater (World Health Organization, 2018). HIV affects individuals without regard to age, race, gender, or economic status; however, disparities within and across these categories lead to varying susceptibility, such as among men who have sex with other men, who continue to bear the preponderance of the HIV disease burden (Centers for Disease Control and Prevention, 2014). African American men who have sex with other men appear to possess an elevated risk of contracting HIV, underlining racial and ethnic inequalities (Singh et al., 2017). A recent report from the Centers for Disease Control and Prevention (CDC) indicated that without intervention, 1 in 2 African American and 1 in 4 Latino men who have sex with other men will become HIV-positive in their lifetime (Centers for Disease Control and Prevention, 2016). Heterosexual men and women are also affected, accounting for 22% and 24% of new HIV diagnoses in the United States, respectively (Centers for Disease Control and Prevention, 2014).

In an attempt to reduce the transmission of HIV, in 2012 the U.S. Food and Drug Administration (FDA) approved a combination of emtricitabine and tenofovir disoproxil fumarate, a biomedical intervention to prevent the acquisition of HIV. Emtricitabine/tenofovir is one component of a treatment plan termed "PrEP," or pre-exposure prophylaxis. The PrEP treatment program consists of the combination of emtricitabine and tenofovir disoproxil fumarate, a once-daily pill, along with sexual health and sexual risk reduction education. In clinical trials, emtricitabine/tenofovir demonstrated robust efficacy, reducing the risk of acquiring HIV from sex by over 90% when used as prescribed (Beymer et al., 2017). Two years after the FDA approval of PrEP, the CDC released clinical practice

guidelines (U.S. Public Health Service, 2014) defining how health care providers should use emtricitabine/tenofovir. Despite recent advances in HIV prevention, however, significant barriers remain that prevent the identification and treatment of individuals at risk of acquiring HIV. A particular challenge is providing preventive health care to those groups identified as being at highest risk of acquiring and transmitting HIV.

Background

Barriers to PrEP referral and prescription include a general lack of knowledge about PrEP, difficulty in identifying individuals most likely to benefit from a PrEP intervention and disagreement about the optimal health care settings to prescribe PrEP (Bacon et al., 2017; Karris, Beekmann, Mehta anderson and Polgreen, 2014; Krakower, Ware, Mitty, Maloney and Mayer, 2014). Some health care providers suggest an HIV specialist care setting is the optimal venue to prescribe PrEP because those practitioners understand the care of people living with HIV and are most comfortable with the required longitudinal patient motoring. Conversely, other providers argue that the primary care setting is optimal because HIV-negative individuals, who may be at risk for newly acquiring HIV, do not routinely seek health care services from HIV care specialists. Because primary care settings comprise a broad range of patients, the diversity of patient demographics, coupled with the presumably higher number of HIV-negative persons in their care, indicate that primary care has the potential to be a successful setting for the dissemination of PrEP and prevention of HIV acquisition (Karris et al., 2014; Krakower et al., 2014).

Exploring barriers to prescribing PrEP is essential and one noticeable gap in the public health and clinical care literature is the lack of representation of advanced practice nurses (APNs) in studies examining PrEP delivery. Previous studies have included APNs in

study samples; however, most studies investigating health care providers and PrEP have included physicians as the primary participants (Hakre et al., 2016; Mullins, Lally, Zimet and Kahn, 2015).

Because APNs work in a broad range of health care settings and are often the primary point of contact for general health care, they are uniquely positioned to make a significant impact on PrEP prescription and patient referral. APNs are registered nurses who possess a master's or post-master's education and are a substantial component of the US health care workforce (Fencl and Matthews, 2017; Nursing, 2008). APNs comprise nurse practitioners, clinical nurse specialists, nurse anesthetists and nurse midwives (Nursing, 2008). Policies directing the APN scope of practice vary by US state, but in most states, APNs may apply for prescriptive authority (Indiana Professional Licensing Agency, 2017), allowing them the ability to enact evidence-based practices (EBPs) such as PrEP. Despite their critical role, we are not aware of any study that has focused solely on APNs concerning PrEP use.

Although PrEP is widely recognized as an efficacious HIV prevention tool, it is not commonly prescribed. Studies examining the adoption of PrEP offer limited insight on the role of APNs concerning PrEP (Bacon et al., 2017; Hakre et al., 2016; Mullins et al., 2015). This failure to adequately examine the unique role of APNs leads to an incomplete and misleading representation of the US primary health care model. Therefore, given their significant role in patient care, we sought to investigate how APNs perceive PrEP and the relationship of both individual and system-level influences on PrEP prescription and knowledge. In 2017 the CDC reported that Indiana ranked 18th among the 50 states in the number of HIV diagnoses, underscoring the need for prevention-based interventions (Centers for Disease Control and Prevention, 2017).

THE STUDY

Aims

Our primary research question was: Do organizational characteristics, such as awareness and adoption of EBPs and community characteristics, such as community members' perceived risk of HIV, impact HIV prevention practices among APNs and their attitudes toward EBPs? This study aimed to identify complex associations among agency, community, personal and attitudinal factors that affect their PrEP uptake and related clinical practices.

Design

This study involved cross-sectional design. The survey was conducted during March through May of 2017.

Sample

We fielded the survey in two waves in a random sample of APNs with prescriptive authority who were licensed and practicing in the State of Indiana. To accomplish this, researchers obtained a list of 4,733 APNs with prescriptive authority from the most recent Indiana Professional Licensing Agency registry to identify the number of APNs practicing with prescriptive authority in Indiana. Power analysis was conducted using the Russell-Lenth Software, available thru Java Applets for Power and Sample Size, University of Iowa (Lenth, 2007). Although structural equation modeling was the main analysis method planned for this paper, sample size determination of the statewide survey was based on regression analysis, used for another paper which is still in development. Considering a finite population of 4733 APNs in the sampling frame, π equal to 0.5 (i.e., worst case), a confidence limit of 0.95 and a margin of error of 0.05, the software estimated the need for 357 valid responses – this number was sufficient for structural equation modeling as well. On the basis of response rates in

recent, similar surveys among clinical professionals (Meyerson et al., 2018), simple random sampling was used to select 1,358 APNs from in the study population.

Data Collection

This study used a "hybrid" survey method (a physical letter inviting recipients to complete an online survey) based on procedures described by Agley et al. (Agley et al., 2017). The initial mailing to 1,358 APNs contained an invitation signed by the study's principal investigator and a co-investigator. Each letter and exterior address label were addressed directly to the APN. The letter explained the purpose of the survey and provided the following: 1) a typographical link to the survey, 2) a QR code for smartphone access to the survey, 3) the APN's random unique identifier and 4) a $5 bill (pre-incentive). As a standard procedure, any letter returned for an incorrect address was readdressed (if appropriate) and resent in two business days. The second mailing went out to 1,086 APNs who had not responded or who had initiated the survey. The second set of letters was revised to indicate a new target date and to reference the $5 bill, as the second mailing did not contain payment.

A total of 435 individuals initiated the survey by entering their unique identifier by the study close date, representing a 32.3% contact rate (12 individuals were confirmed to have moved out of Indiana and were removed from the denominator). Of those, 51 did not complete at least 80% of the survey items and 15 indicated they did not actively work as an APN in Indiana, yielding a final analytic sample of 369 APNs. This final sample exceeded the estimate provided by the power analysis.

Ethical Considerations

The study was deemed exempt by the Institutional Review Board.

Rigor of Assessments

For those APNs who completed the survey, we recorded age, ethnicity, gender, highest degree earned, years of practice and zip code for descriptive purposes. The survey included several validated self-rating measures. We assessed the following: 1) EBP implementation, using the *EBP Attitude Scale* (Aarons et al., 2010) and the *Survey to Assess Readiness for Evidence-Based Practice Implementation* (Stamatakis et al., 2012); 2) practitioners' understanding of basic HIV knowledge, using the *HIV Knowledge Questionnaire (HIV-KQ-18)* (Carey and Schroder, 2002); 3) religiosity, using the Duke University Religion Index (Hafizi et al., 2013), because provider practice has been found to be impacted by personal religious beliefs (Reyes-Estrada, Varas-Díaz and Martínez-Sarson, 2015); 4) PrEP knowledge and awareness, using a tool by Kwong et al. (Kwong, Treston and Farley, 2015); and 5) patient sexual risk assessment practices, using an instrument developed by Tellalian et al. (Tellalian, Maznavi, Bredeek and Hardy, 2013).

Data Analysis

The primary analysis for this study comprised a structural equation model, a powerful second-generation multivariate technique for testing the plausibility of a hypothesized theoretical model (Tabachnick and Fidell, 2013; Yuan, 2005). Structural equation modeling examines relationships between latent and observable variables conceptually and is valuable for identifying direct and indirect effects along with overall model fit. We conducted the CALIS (covariance analysis of linear structural equations) procedure in SAS version 9.4, using covariance structure analysis. Use of the full information maximum likelihood (FIML) method allowed us to include both complete and incomplete surveys (those that were 80% to 99% complete, per the inclusion criteria).

Most of the 98 variables were transformed into composite variables to meet the ratio of variable number to sample size required for the structural equation model. The conceptual model is shown in Figure-1. Each of the composite variables covered a group of unidimensional items in the questionnaire. Before the analysis, we screened the data for usability and normality. We transformed three variables (perceived responsibility, work in a metropolitan area and community risk) using square-root transformation to address skewness. We then created a dichotomized variable for HIV knowledge (getting all answers correct vs. any other response pattern). Further, we deleted two multivariate outliers but did not detect any multicollinearity. Finally, we dropped six demographic variables (sex, race, ethnicity, sexual orientation, job category and highest degree) owing to lack of variability.

Measurement Model: The test of the measurement model consisted of confirmatory factor analysis (CFA) with five latent factors (Waller, 1993): Community Characteristics, Agency Characteristics, Personal Characteristics, Attitudes toward EBPs and HIV Prevention Practices (Figure-1). We first fit the model with uncorrelated factors so that the covariances among the factors were fixed at zeros. Loading parameters of observed variables were unconstrained and each loaded on one factor only (simple cluster structure). Factor variances were fixed at one and were considered error variances of observed variables to be free parameters. We generated initial estimates using the McDonald method, instrumental variable method and Levenberg-Marquardt optimization. Lagrange multiplier tests were conducted to determine modifications for a better model-fit. Following the achievement of model convergence, the overall model fit was determined based on several model-fit indices. Squared multiple correlations revealed the percentages of variance for the observed variables, explained by the factors. Factor scores regression coefficients as well as standardized factor correlation and loading matrices were used to examine the factor structure. Based on the above criteria and meaningfulness, we fit a revised CFA model.

Structural Model: Path analysis was used to test the structural model (Hatcher, 1996). In the initial model, the path coefficients from each latent factor to measured variable were not constrained, nor were error variances and covariances. However, to reduce model misspecifications, the model was refitted by constraining variables under 'Attitudes toward EBPs.' The same methods and indices used in the CFA were used to complete the initial estimation and optimization and determine the overall model fit. The model converged and most model fit indices were within or close to the desirable ranges of values as per current consensus (Hooper, Coughlan and Mullen, 2008). Due to the differential scaling of variables, the analysis considered asymptotically standardized residuals, rather than raw residuals, to identify any misspecification of the model. A critical t-value of 2.0 was the significance criterion for the standardized path coefficients, variances and covariances.

RESULTS

Compared with demographics from the 2015 Indiana Nursing Survey (*Data Report: 2015 Indiana Nursing Licensure Survey.*, 2016), the analytic sample was generally representative of Indiana APNs and lacked heterogeneity: predominantly White, non-Hispanic, female nurse practitioners in urban practices (mean age, 46 years) (Table-1).

Measurement Model

The initial model—which included all 29 variables and five factors of the conceptual model—did not converge, meaning that the analysis went through an iteration but could not find a suitable solution. A subsequent model—which tested 14 variables and five factors, excluding the Personal Characteristics factor—did converge. However, according to absolute, parsimony and incremental model-fit indices, the overall model fit was not satisfactory. Finally, a revised CFA model with 11 observed variables and four correlated factors (i.e.,

excluding the Personal Characteristics factor) resulted in a good model fit to the data according to most model-fit indices (Hooper et al., 2008): root mean square error of approximation (RMSEA)= 0.0388 (Hu and Bentler, 1999); RMSEA upper 90% confidence limit= 0.0575; goodness-of-fit index (GFI)= 0.9727 (Shevlin and Miles, 1998); adjusted goodness-of-fit index (AGFI)= 0.9526 (Tabachnick and Fidell, 2013); standardized root mean square residual (SRMR)= 0.0409 (Hu and Bentler, 1999); parsimonious goodness-of-fit index (PGFI)=0.6721 (Mulaik et al., 1989); comparative fit index (CFI)= 0.979 (Hu and Bentler, 1999); Bentler-Bonett normed fit index (NFI)= 0.9436 (Hu and Bentler, 1999); and Bentler-Bonett on-normed fit index (NNFI)= 0.9696 (Hu and Bentler, 1999). The model did not meet chi-square nonsignificance (chi-square= 58.7299; degrees of freedom= 38; p-value= 0.017); however, chi-square has several severe limitations in this context (Jöreskog and Sörbom, 1993; Kenny and McCoach, 2003; McIntosh, 2007).

We found significant standardized factor loadings on the latent factors for all observed variables ($p<0.001$), except the Area variable, which was nonsignificant ($p=0.07$) but ultimately retained due to empirical evidence on higher levels of provider-based stigma associated with HIV/AIDS in rural areas (Brems, Johnson, Warner and Roberts, 2010).

Structural Model

We tested the above model by using Path analysis. The model converged and resulted in a good model fit to the data (Figure-2), with 11 endogenous manifest variables (from CFA), three endogenous latent variables (Agency Characteristics, Attitudes toward EBPs and HIV Prevention Practices) and an exogenous latent variable (Community Characteristics). Based on the retained variables, the latent factor Attitudes toward EBPs was relabeled as Motivation to Adopt an EBP. Overall, standardized path estimates of observed variables were highest for Agency Characteristics, followed by APNs' Motivation to Adopt an EBP and Community Characteristics. Community Characteristics had direct effects on HIV Prevention

Practices and Agency Characteristics. Similarly, Agency Characteristics had direct effects on HIV Prevention Practices and APNs' Motivation to Adopt an EBP. Meantime, Community Characteristics had indirect effects (through Agency Characteristics) on HIV Prevention Practices and APNs' Motivation to Adopt an EBP.

Most model-fit indices were satisfied in the path analysis as well (Hooper et al., 2008): RMSEA= 0.0461 (Hu and Bentler, 1999); RMSEA upper 90% confidence limit= 0.0642 (Steiger, 2007); GFI= 0.9690 (Shevlin and Miles, 1998); AGFI= 0.9447 (Tabachnick and Fidell, 2013); SRMR= 0.0462 (Hu and Bentler, 1999); PGFI=0.6519 (Mulaik et al., 1989); CFI= 0.9710 (Hu and Bentler, 1999); NFI= 0.9366 (Hu and Bentler, 1999); and NNFI= 0.9570 (Hu and Bentler, 1999). Again, the model did not meet chi-Square non-significance (chi-Square= 65.1505; degrees of freedom= 37; p-value= 0.0029) (Barrett, 2007).

Table-2 demonstrates that 60% (33 of 55) of intercorrelations among 11 observed variables were significant. According to asymptotically standardized residual matrix, absolute values of 62% (34 of 55) of residuals were less than one, indicating lower levels of model misspecification. The residuals distribution indicated a medium departure from normality.

DISCUSSION

In the present study, we tested several latent constructs and the relationships among them which were thought to be important in adoption and implementation of PrEP by APNs: Community Characteristics, Agency Characteristics, HIV Prevention Practices and Motivation to Adopt an Evidence-Based Practice. Our findings suggest that characteristics of health care agencies have an impact on HIV prevention practices and the motivation of APNs to adopt EBPs. While community characteristics have an impact on HIV prevention practices

and health care agency characteristics, they also indirectly (through agency characteristics) influence HIV prevention practices and APNs' motivation to adopt an EBP.

Our results suggest that characteristics of health care agencies have a significant and direct effect on how those organizations present, or make available, EBPs in the clinical setting. Interestingly, agency characteristics influenced implementation of PrEP and perception of barriers against PrEP, which constituted HIV prevention practices. Similarly, agency characteristics influenced expectations of EBP implementation, which constituted APN's motivation to adopt EBPs. These findings reflect those of implementation studies conducted by both Carlfjold et al. (Carlfjord andersson, Nilsen, Bendtsen and Lindberg, 2010) and Vasli et al. (Vasli, Dehghan-Nayeri and Khosravi, 2018), who described the importance of organizational climate in obtaining positive patient outcomes.

Another notable finding was the constituents of agency characteristics. APNs' level of awareness and access to sources of EBP examines the extent of leadership and staff awareness regarding EBP. Characteristics such as practice setting directly influence the relationship between leadership, staff and the incorporation of EBP in an organization. These results are particularly meaningful for nursing because it is an information-intensive health care profession, requiring practitioners to seek continuing education throughout their career (Indiana Professional Licensing Agency, 2018). However, this may be of greater importance for APNs. For example, Fencl and Matthews recently reported that APNs are viewed as influential resources in the health care setting, introducing new procedures and ultimately advancing clinical practice (Fencl and Matthews, 2017). Furthermore, organizational expectations from APNs should be considered when introducing HIV prevention interventions, such as PrEP, into the clinical environment.

HIV prevention practices must be integrated across organizational structures. Perceived barriers to PrEP implementation had a negative impacted on HIV prevention practices. APNs who reported feeling more favorable toward PrEP were also more comfortable conducting sexual risk assessments and PrEP screening with their patients. This parallels previous findings by Lanier et al. (Lanier et al., 2014) and Nusbaum and Hamilton (Nusbaum and Hamilton, 2002), who reported that greater self-efficacy conducting sexual health screenings led to more opportunities to offer HIV and STD screening. These findings also suggest that practice change may be more effective when focused on changing how a provider feels about PrEP and not just what a provider knows about PrEP. Barriers, including education/training, patient awareness and increased sexual risk-taking, were less important for APNs who believed PrEP to be an efficacious intervention. Increasing comfort level and self-efficacy regarding sexual health interventions may benefit other providers as well, including physicians, physician assistants and nurses who are not in advanced practice. However, despite the provider role, health care leadership should be actively engaged in addressing barriers to PrEP implementation.

While a direct relationship existed between agency and community factors, they independently affected HIV prevention practices. How APNs adopt culturally competent care may partially explain this observation. As stated in an American Academy of Nursing report, cultural competence is a continuous process of striving to achieve knowledge, skills and abilities to work within the cultural context of the patient (Giger et al., 2007). Providing culturally competent care is important when working with stigmatized populations, such as men who have sex with other men, who have a higher risk of contracting HIV and who have historically experienced inadequate care (Beyrer et al., 2012; Shover et al., 2018). Differences between individual and organizational philosophies may also explain how community and agency factors both have an impact on HIV prevention practices, yet the

effects are separate. This finding suggests that organizations and communities are likely working toward similar HIV prevention goals but are disadvantaged by lack of mutual understanding and coordination.

The current study also explored APNs' motivation to adopt EBP in general, because understanding this motivation is helpful when construing attitudes toward PrEP (Hakre et al., 2016; Karris et al., 2014). Key findings were that motivation to adopt an EBP is strongly influenced by implementation requirements by State, agency, or supervisor, whereas a given EBP is more likely to be adopted when it is appealing, meaningful and used by colleagues. By integrating our findings related to EBP and PrEP, we can deduce the following: 1) organizational climates that support EBP and clinical education ultimately have a positive impact on PrEP implementation; 2) increased awareness of EBP will generally lead to increased uptake of a PrEP intervention among APNs; and 3) positive feelings toward EBP may result in increased uptake of sexual health screening.

Limitations

The present study is not without limitations. First, a cross-sectional survey was used to collect data. Thus, the relationships described cannot be presumed as causal. The variables and associations described here require further longitudinal testing and randomized controlled trials. Second, factors were assessed via self-report and may be affected by common method variance. Third, our sample consisted of APNs currently licensed in Indiana, indicating that generalization of our findings to other states, regions, or countries should be done with caution. Finally, although our findings are representative of the APN population in Indiana, the overwhelming percentage of non-Hispanic White, female participants may preclude application of our findings to individuals of another gender, race, or ethnicity.

CONCLUSION

Practice Implications: These results suggest that the health care setting where EBP interventions such as PrEP are implemented matter (Titler, 2008). Put differently, in most settings, mere distribution of practice guidelines is not sufficient to generate successful EBP implementation; it is also essential to examine the organizational climate and take appropriate measures to address barriers at the organizational level. These findings also speak to the importance of a diverse health care team, including registered nurses, licensed practical nurses and support staff. APNs are often regarded as practice leaders; thus, positioning an APN to lead by example may be an advantageous method to influence other members of the health care team to adopt new clinical practice (Fencl and Matthews, 2017). This study also revealed that, when planning a PrEP intervention, it is not sufficient to involve only the health care professionals, the organizational leadership, or the community—all three are contributors to PrEP outcomes. Advancing inputs from all three groups while planning and implementing a PrEP intervention may create a more significant impact on adoption and implementation of individual health care and public health HIV prevention initiatives. Precisely, more meaningful interaction between factors related to community and agency are likely to amplify implementation outcomes. Furthermore, health care leadership should be encouraged to rethink how they address barriers to PrEP implementation. Also, as with any new intervention, perceptions of usability and usefulness play a role in adoption of PrEP, which suggests that as knowledge and attitudes change, so too will individual and organizational practice.

Research Implications: The current findings regarding the relationship between agency characteristics and implementation of PrEP highlight the importance of further studies aimed at understanding how PrEP and other HIV prevention practices (e.g., sexual risk assessment) are perceived across a variety of health care organizations (Lanier et al., 2014).

Moreover, despite a dearth of research on the role of APNs in HIV prevention and PrEP prescription, this study suggests that APNs in health care settings may be best positioned to have an impact on adoption of HIV risk reduction strategies. Further research is needed to optimize their contributions to PrEP implementation and HIV prevention overall. Additional longitudinal research and randomized controlled trials are required to examine the impact of PrEP practice interventions, such as the NYC Health PrEP champions program (New York City Health, 2017). These results also suggest that it is important to continually examine factors affecting knowledge, attitudes and practices of APNs concerning EBP generally and PrEP in specific. Finally, future studies can identify those providers who feel negatively about PrEP and how their beliefs in turn have an impact on PrEP prescription and referral.

Conflict of Interest Statement

No conflict of interest has been declared by the authors.

Author contributions:

Criteria	Author Initials
Made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data;	WJ, GC, JA, BM
Involved in drafting the manuscript or revising it critically for important intellectual content;	WJ, GC, JA, BM, JG, WM
Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content;	WJ, GC, JA, BM, JG, WM
Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.	WJ

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Table-1: Characteristics of Advanced Practice Nurses in the Final Sample, March-May 2017, Indiana (N=369)

Variable	Value, % or Mean (SD) [range]
Ethnicity	
Non-Hispanic, Not Latino	98.6
Hispanic or Latino	1.4
Race (multiple responses allowed)	
White	95.1
African American	3.5
Asian	0.8
Native American	0.3
Pacific Islander	0.3
Sex	
Female	95.4
Male	4.6
APN Job Category	
Nurse Practitioner	93.8
Nurse Midwife	4.6
Clinical Nurse Specialist	1.6
Highest Degree	
MSN	91.1
DNP	4.6
PhD	0.8
Other	3.5
Work Experience as an APN, y	
<1	3.5
2-5	39.1
6-10	20.7
11-20	23.9
>20	12.8
Practice Setting (multiple responses allowed)	
Community Health Clinic	14.6
Health Department	0.6
Primary Care	33.3
Urgent Care	12.1
Ambulatory Care	12.1
Emergency Department	5.5
Private Practice	18.7
Academic Setting	8.3

Area Classification for Practice Location	
Indianapolis Metropolitan	14.2
Other Urban	66.2
Rural	19.6
Religious Affiliation (multiple responses allowed)	
Christian	62.9
Catholic	26.8
Baptist	4.6
Evangelical	2.7
Nondenominational	8.7
All other religions	7.3
None	8.4
Political View (multiple responses allowed)	
Conservative	28.7
Democrat	29.8
Republican	24.9
Liberal	14.9
Moderate	13.3
Independent	13.0
Progressive	5.0
Other	2.5
None	10.2
Age, y	45.9 (10.3) [27-73]
Religiosity (DUREL)	19.0 (5.8) [5-27]

Note. APN = advanced practice nurse; DUREL, Duke University Religion Index.

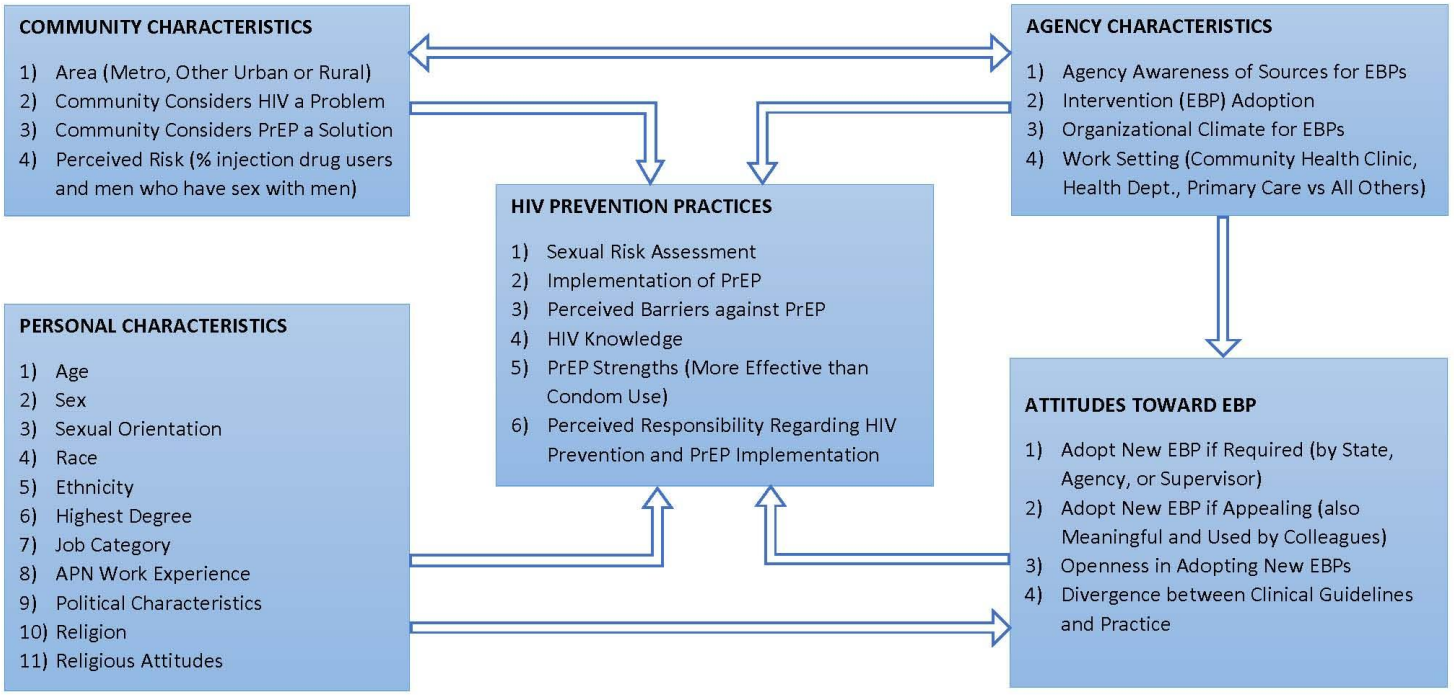
Table-2: Pearson Correlation Matrix (Left-Lower) and Standardized Residual Matrix (Right-Upper) for the Variables in the Final Model

Observed Variable	Community Considers HIV a Problem	Community Considers PrEP a Solution	Area (Metro, Other Urban or Rural)	Agency Awareness of Sources for EBPs	Intervention Adoption (EBPs)	Organizational Climate for EBPs	Sexual Risk Assessment	Implementation of PrEP and other EBPs	Perceived Barriers against PrEP	Motivated if Implementation is Required	Motivated if Appealing /Meaningful/Popular	Asymptotically standardized residual matrix (large residuals indicate model misspecification)
Community Considers HIV a Problem		-0.03	-1.56	-2.03	0.12	-1.39	2.39	-2.07	0.59	0.32	1.14	
Community Considers PrEP a Solution	0.54*		1.36	-0.30	0.49	0.40	1.50	0.70	0.15	0.92	2.33	
Area (Metro, Other Urban or Rural)	0.12 †	-0.08		0.67	-0.87	0.12	-0.16	-0.01	0.39	-0.58	-1.19	
Agency Awareness of Sources for EBPs	0.06	0.17 †	0.02		2.49	-1.59	0.06	-0.74	0.28	-0.88	-1.10	
Intervention Adoption (EBPs)	0.15 †	0.21*	-0.07	0.61*		-0.63	-2.45	-1.29	0.53	0.77	0.56	
Organizational Climate for EBPs	0.07	0.19 †	0.01	0.47*	0.57*		-0.88	2.27	0.63	-0.99	0.29	
Sexual Risk Assessment	0.21*	0.19 †	-0.02	0.16 †	0.11 †	0.11 †		-0.87	-4.67	0.44	1.15	
Implementation of	0.27*	0.40*	-0.05	0.53*	0.62*	0.56*	0.24*		0.55	-0.69	1.74	

PrEP and other EBPs												
Perceived Barriers against PrEP	-0.05	0.09†	0.02	0.12†	0.14†	0.10†	0.29*	0.21*		-0.95	-1.05	
Motivated if Implementation is Required	0.05	0.10	-0.03	0.08	0.11†	0.07	0.07	0.10	-0.10		-1.16	
Motivated if Appealing /Meaningful/Popular	0.09	0.16†	-0.08	0.11†	0.19†	0.15†	0.10	0.21*	-0.09	0.59*		
Pearson Correlation Coefficients Matrix for Intercorrelations among Observed Variables in the Final Model (* indicates p<0.0001; † indicates p<0.05)												

Note: EBP = evidence-based practice; PrEP = pre-exposure prophylaxis.

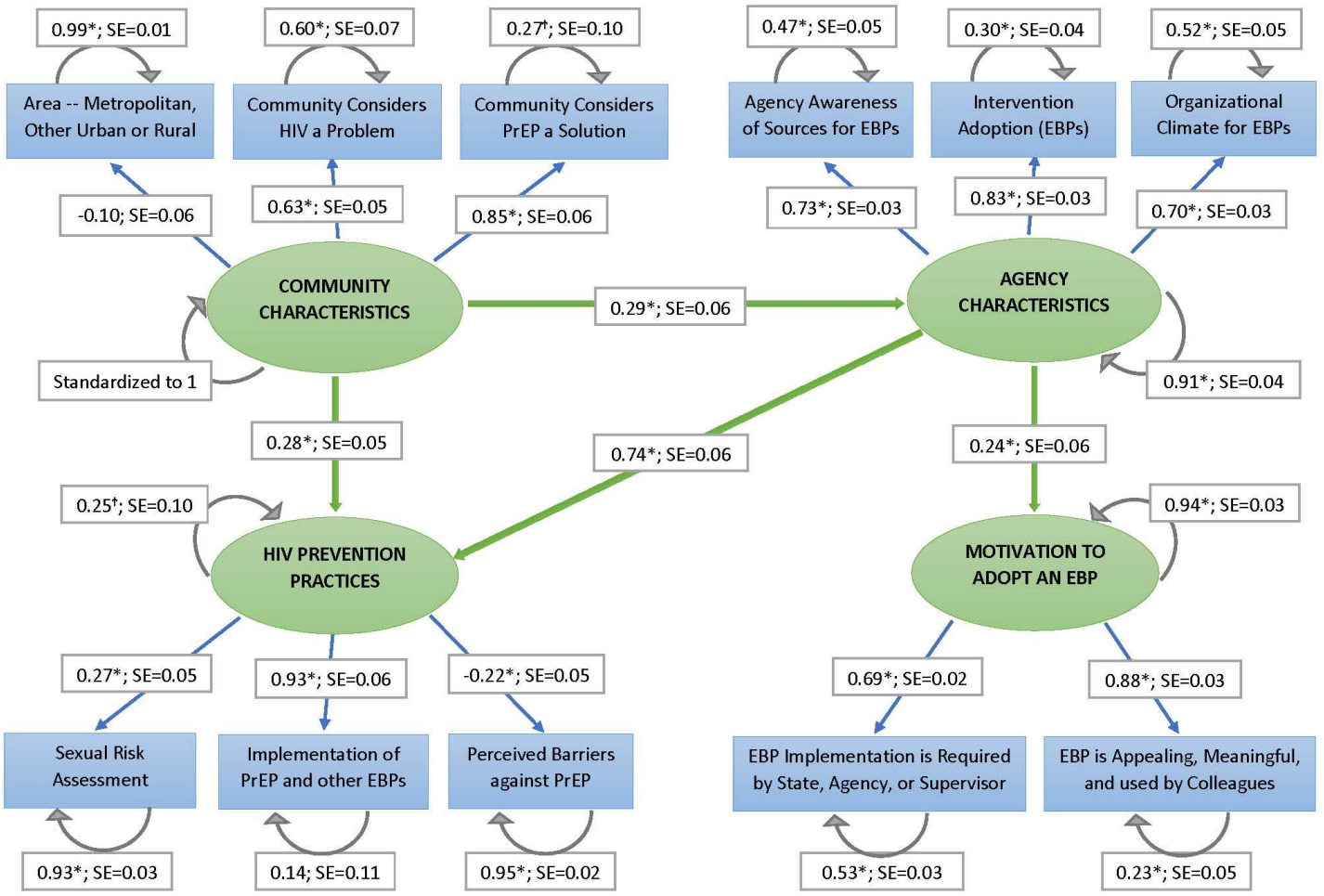
Figure-1: Conceptual Model for Adoption of HIV Pre-Exposure Prophylaxis by Advanced Practice Nurses, March-May 2017, Indiana (N=369)



EBP = Evidence-Based Practice

PrEP = Pre-Exposure Prophylaxis

Figure-2: Results of the Structural Equation Model for Adoption of HIV Pre-Exposure Prophylaxis by Advanced Practice Nurses, March-May 2017, Indiana (N=369)



Note: All path estimates and variance parameters are standardized; For standardized estimates * indicates p<0.001, † indicates p<0.05; SE= standard error