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Prescribing HIV PrEP and the Need for Education Among Care Providers

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Walden University
2016

Abstract

Prescribing HIV PrEP and the Need for Education Among Care Providers

by

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MPH, Kaplan University, 2012

Second Certificate of Masters', University of Lome (Togo), 2003

Bachelor in Litterature, University of Lome (Togo), 2002

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Community Health

Walden University

November 2016

Abstract

Preexposure prophylaxis (PrEP) is an innovative biomedical approach that has been used over the past 6 years to avert the spread of human immunodeficiency virus (HIV). Under-prescribing of PrEP could increase the probability of HIV exposure among serodiscordant couples/partners and those who do not practice safe sex. Previous PrEP research has not assessed the association between awareness of PrEP, years of experience of providers, provider types, and the frequency of PrEP prescription among physicians. Precaution adoption model framed this study, which aimed to evaluate the bond between the independent variables relating to awareness of PrEP, years of experience, and provider types with the outcome of the frequency of PrEP prescription among physicians. A cross-sectional design was applied to survey 100 physician participants. Kendall's tau-*b* correlation test and Fisher's exact test were used to analyze the research questions. Eighty-seven percent of the surveyed physicians had low awareness about PrEP, and 90% never prescribed PrEP. Lack of awareness was the primary barrier to prescribing PrEP at the providers' level. Kendall's tau-*b* correlation test showed that higher awareness of PrEP and years of experience were associated with the frequency of PrEP prescription at 95% confidence interval. However, Fisher's exact test showed an insignificant difference between provider types and the frequency of PrEP Prescription. These findings support the notion that independent of specialty, the more physicians know about PrEP and the more years of experience they have, the more they prescribe it. The results and recommendations could enhance positive social change by providing information to develop an inclusive PrEP education curriculum for health care professionals.

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Dedication

I would like to dedicate this work to my wife and my children for their support and sacrifices and, to my father and my mother as a tribute to their memory. Dad, you have been a strict and rigorous person who taught me humility, honesty, and determination for higher achievement. Mom, your premature death has taught me to fight for survival since my early childhood. I also dedicate this to the poor and people from underserved communities to remind them that so much could be done with little. Finally, I am grateful to the United States for the given opportunity to achieve this high level of education.

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I would like to use this platform to express my sincere gratitude to my dissertation committee chair, Dr. Hadi Danawi, who is an incarnation of simplicity and rigor. This work would not be possible without his guidance. Dr. Danawi, your mentorship is much appreciated.

I would like to thank Dr. Aimee E. Ferraro, the second committee member who has a substance of a genius. She provided the expertise that I need to master my research methodology skills. As an Angel, she is always there for me when I need her. Thank you to Wendy Kelly, my supervisor whose, commitment to fight HIV/AIDS has inspired me to understand that every evidence-based prevention tool to end the pandemic must be explored and promoted. Thank you to the Wiley Global for the permission to adapt their precaution adoption process model stage algorithm to this study. Next, I would like to thank all my professors at Walden University for sharing with me. Finally, thank you to my family, cousins and the many friends who have accompanied me with their support and prayers on this journey. Thank you.

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Chapter 1: Introduction to the Study

Introduction

The human immunodeficiency virus (HIV) is still among the top three public health concerns in the United States (Centers for Disease Control and Prevention [CDC], 2013a). Despite the large amounts of money and steady effort put into research and prevention programs, the United Stated registers 50,000 new HIV cases yearly (CDC, 2013a). HIV preexposure prophylaxis, (PrEP) is a revolutionary, novel biomedical intervention in the last 6 years. For different reasons, using PrEP to prevent HIV makes sense (World Health Organization, WHO, 2013). For example, antiretroviral therapy (ART) has 96% efficacy against HIV transmission to the uninfected people who are at higher risk. These individuals include serodiscordant partners, men who have sex with men (MSM), needle-sharing drug users and sex workers (CDC, 2013a; Rosenthal et al., 2013; Wade, et al., 2013). However, Cairn (2013) reported that physicians do not prescribe PrEP very often in some geographic areas because they lack information about it.

In this chapter, I first present background information, including ignorance about and barriers to using PrEP, conflicting perceptions about PrEP, the high cost of PrEP and health insurance, and the need for further PrEP studies. Then I cover the following topics: problem statement, the purpose of the study, research questions and hypotheses, theoretical/conceptual framework for the study, its nature, definitions, assumptions, limitations, scope, and delimitations, and the significance.

Background

According to Cairns (2013), Truvada, the primary PrEP medication is underprescribed in the United States since its approval in 2012 by the U. S. Food and Drug Administration (FDA). PrEP has been presented to be operative in preventing HIV among HIV-negative populations

(CDC, 2013a; Rosenthal et al., 2013; Wade et al., 2013). Only 2,000 doses were prescribed nationally in 2013, and less than 1% was used for prophylactic purposes. Cairns showed that among authorized PrEP prescribers, only 37% prescribed it. This underprescription could have been due to a lack of knowledge about PrEP it.

Ignorance About, and Barriers to, PrEP

People who are exposed to HIV and therefore need PrEP are not only unaware of being exposed but are also unaware of existing PrEP services. Many people in serodiscordant relationships are unaware of PrEP (Mijiti et al., 2013). A study in Xinjiang, China, showed that 97.2% of participants (all of whom were in serodiscordant relationships) had never heard about PrEP (Mijiti et al. 2013). Brooks et al., (2011) ran a semistructured qualitative research study and identified three barriers to PrEP: excessive cost, fear of side effects, and fear of the need for lifetime use. Brooks et al. also identified two factors that recommend PrEP: freedom from having to use condoms and freedom from fear about HIV infection. There is a significant link between awareness about PrEP and a higher desire to use PrEP (Young, Li, & McDaid, 2013). More than 70% of HIV specialists are likely to prescribe PrEP if they have a positive perception of it (Puro, Palummieri, De Carli, Piselli, & Ippolito, 2013).

Conflicting Perceptions About PrEP

Puro et al. (2013) stated that there are conflicting attitudes towards, and perceptions about PrEP. Some patients believe that HIV specialists are more likely than primary care providers to prescribe Truvada for HIV treatment of HIV-positive patients (Cairns, 2013). Others believe that HIV specialists are less likely than primary care providers to prescribe Truvada to prevent HIV in HIV-negative populations (Cairns, 2013). Some public health promoters assume that the underprescription of PrEP is

because providers believe that PrEP is toxic and that patients would prefer behavioral

interventions to biomedical interventions (Cairns, 2013; Puro et al., 2013). Thus, there is

a significant association between the undesirable attitudes towards prescribing PrEP and

the misinformation about PrEP.

High Cost of PrEP and Health Insurance

According to Horberg and Raymond (2013), the cost of PrEP and its coverage by health

insurance are factors that influence providers' decisions to prescribe it. They stated that the high

cost of PrEP can dissuade its prescribers and users. PrEP-related expenses include medications,

laboratory, and professional fees. Some indirect costs are those related to the providers' training

and treatment of adverse drug events. In their study, Horberg and Raymond estimated the total

cost for the first year of HIV PrEP for private funders was over $17,000. Private insurance

companies cover HIV PrEP that their associates have prescribed (i.e., providers with whom they

are in a care management partnership). Their study also revealed that, under the Affordable Care

Act, PrEP coverage varies accordingly to the available qualified health insurance plans. The

Ryan White program, a government health care initiative that helps with the cost of medication

covers HIV medication only for HIV-positive individuals. Other public health coverage

programs, including Medicare, and Medicaid, the leading coverage programs for HIV

prescriptions in the United States, do not cover PrEP. Exploring the cost of PrEP and its

coverage issues in depth in further studies is desirable.

Further Studies on PrEP

First, many global health organizations recommended research on HIV prevention, and

vaccines. These international institutions include United Nations International Children's

Emergency Fund, United Nations Program on HIV/AIDS, WHO, and CDC (WHO, 2013a). All

of these organizations agreed that the time had come to promote universal accessibility to HIV prevention and treatment services. Second, further studies are needed to detect gaps in PrEP provision. Further studies could address the following topics: PrEP implementation technical problems, barriers to prescribing PrEP, compliance with the PrEP regimen, the conflicting relationship between PrEP and the use of condoms, PrEP ethical issues, PrEP and HIV law, and policy. These studies are necessary to address gaps in the integrated treatment and prevention approach to HIV (Treatment Action Group (TAG), 2013). Third, counseling and educational interventions are essential to boost efforts to publicize PrEP (Brooks, et al., 2011). Fourth, detailed HIV PrEP guidelines need to be developed to improve physicians' readiness to provide PrEP and behavioral interventions to people at risk for HIV infection (Puro, et al., 2013). That said it was apparent that multisector studies of PrEP could provide insights to improve its implementation. These studies could target clinical, social, economic, cultural, and policy implications (Albert, Warner, & Hatcher, 1998).

Problem Statement

Individuals who refuse to practice abstinence or use condoms, persons in serodiscordant relationship, and sex workers also belong to the population at higher risk for HIV infection (Albert, Warner & Hatcher 1998; Civic & Wilson, 2013). Even though some health insurance companies cover HIV PrEP (Hoberg, 2013; Liu, et al., 2014), physicians are reluctant to prescribe it (Krakower & Mayer, 2013). What remains unknown is why.

Purpose of the Study

This survey study was an attempt to investigate the barriers to prescribing HIV PrEP and the need for education among care providers in the Quad Cities in Illinois and Iowa. I examined how researchers could use HIV PrEP awareness, providers' years of service, and provider types

as predictors of the frequency of PrEP prescription among care providers. A better understanding of the knowledge, behavior, and attitudes of physicians regarding the PrEP will better indicate where additional education may be needed. Three independent variables (awareness of HIV PrEP, the number of years of service as a primary care provider or HIV specialists, and provider type), and one outcome variable (frequency of PrEP prescription) were analyzed to test the hypotheses.

Nature of the Study

Study Variables

The outcome variable or dependent variable in this study was the frequency of PrEP prescription. The independent variables included HIV PrEP awareness, the number of years of service as a primary care provider or HIV specialist, and the difference between provider types. The three independent variables were split into multiple levels (i.e., dummy variables), and there was only one dichotomous outcome variable (i.e., the frequency of PrEP prescription: low versus high). These conditions justified the applicability of the logistic regression analysis to this study. I also included some secondary variables (i.e., covariates) such as gender (i.e., male versus female), geographic location (i.e., Iowa versus Illinois) and HIV specialist versus a non-HIV specialist. I used SPSS software to analyze the data. Multiple logistic regression (regression on dummy variables), analysis of variance (ANOVA) and analysis of covariance were used to answer the hypotheses. Logistic regression was suitable to examine whether there was a difference between provider types (i.e., family practitioners, pediatricians, internists, obstetricians/gynecologists, and infectious disease/HIV specialists) and the outcome variable (i.e., the frequency of PrEP prescription). Researchers use logistic to assess the internal variance

within the research population groups as opposed to the difference between them (CERG

Resources, n. d.).

Study Design

I used a cross-sectional design to explore whether there is an association between the

independent variables and the outcome variable. Cross-sectional design helps inquirers to

establish a relationship between the research variables. It also offers an opportunity to select

random participants who provide representative data to explain the study variables (Frankfort-

Nachmias & Nachmias, 2008). The cross-sectional design fit this quantitative study that

generated numerical and broad data to describe the research problem. The quantitative methods

help the researcher to describe the relationship between the study variables through statistical

analysis (Creswell, 2009).

I designed my survey, so I needed to pilot test my survey instrument. A minimum of

eight returned surveys was desirable (i.e., 42.11% response rate) to accept the result as valid. To

do so, I selected 10% of my 185 estimated sample size including the primary care providers and

HIV specialists to participate in the pilot test. In essence, I needed 19 participants for my pilot

study. I also needed a minimum of 78 returned surveys corresponding to 80% confidence

interval to accept the results of the actual study as valid. My plan to reach that goal was to

increase the sample size. I started the survey with 185 participants (i.e., 119 corresponding to

95% power increased by 54%). The breakdown was 74 family practitioners, 21 pediatricians, 57

internists, 18 obstetricians/gynecologists, and 15 infectious disease / HIV specialists. The

calculated sample size was 119 for 95% power to which I added 54% to increase the response

rate (Table 2). I added the 15 of the 17 physicians from the infectious disease subpopulation to

which proportional sampling was not applied to have $N = 185$. I excluded the pilot test

participants from the actual study to avoid the sampling related biases. I collected data through self-administered paper-based survey questionnaires. The pilot test step was vital to ensure the validity of the survey instrument before the actual study data collection.

<p style="text-align:center">Research Questions and Hypotheses</p>

Three research questions and their allied null and alternative hypotheses guided this study.

Note that provider type is an independent variable composed of five dummy variables: family practitioners, pediatricians, internists, obstetricians/gynecologists, and infectious disease/HIV specialists.

Research Question 1**:** What is the association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*o1: There is no association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

*H*a1: There is an association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

Research Question 2: What is the association between the number of years of service as a primary care provider or HIV specialist and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*o2: There is no association between the number of years of service as a primary care provider or HIV specialist and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

*H*a2: There is an association between the number of years of service as a primary care provider or HIV specialist and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

Research Question 3: What is the association between provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*o3: There is no association between provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

*H*a3: There is an association between provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

Theoretical or Conceptual Framework

PrEP services have played a significant role in preventing HIV-negative individuals from HIV infection. Other HIV prevention programs combine behavioral, biomedical, and structural interventions (Underhill, Operario, Mimiaga, Skeer, & Mayer, 2011). Public health professionals have identified numerous theoretical frameworks that apply to the HIV prevention field. Many of those theories like precaution adoption process model (PAPM) are useful to define PrEP-related concepts.

Developed by Janis and Mann in 1977, PAPM explains the process in individuals' decisions making and the conversion of the decision into action in seven stages (Glanz, Rimer, & Viswanath, 2008). The first stage is the unawareness of the health issue phase. In the second stage, people learn about the problem for the first time but feel not concerned about it. The third stage, the decision-making phase explains how people are engaged by the health issue, and start

thinking about the responses. At this point, people can decide to stay at this stage or resolve to do nothing. This category of people falls under Stage 4 and "halting" PAPM. The third possibility is to move to the next Stage 5 through precaution adoption. Stage 6, behavior initiation phase, allows people to acting. The last, Stage 7, is when people maintain their new behavior over time (Glanz, et al., 2008, p.126).

Lack of information about PrEP is often associated with PrEP underprescription among care providers (White, Mimiaga, Krakower, & Mayer, 2012). The focus of this study was to explore HIV/AIDS health-protective behaviors by determining how primary care providers and HIV specialists make decisions to prescribe PrEP and how they translate their decisions into actions. For this reason, it was appropriate to adopt the PAPM as a theoretical framework and the concept of implementation intentions to guide this study.

PAPM allows inquirers to identify the stages that people go through when they start "health protective behaviors" (Glanz, et al., 2008). It also provides indicators that help researchers to determine the factors favoring behavior change from one stage to another (e.g., from awareness to action). The model allowed me to identify barriers to PrEP provision at each stage. See the adapted visual representation of the model (Figure 1) bellow.

| Stage 1 Never hear of HIV PrEP (Unaware) | → | Stage 2 Aware of HIV PrEP, not engaged in PrEP service (Low perceived susceptibility) | → | Stage 3 Deciding about Prescribing PrEP | → | Stage 5 Have decided to Prescribe PrEP | → | Action Implementation intention intervention (following through where & how of PrEP prescription) | → | Stage 6 Prescribed PrEP |

Barriers to HIV PrEP Prescription
Being aware, years of experience & being a primary care provider vs. an HIV specialist

| Pre-Action Prescription intention (Where and how to get PrEP information: Education needs) | Stage 4 Have decided not to prescribe PrEP (low perceived susceptibility) |

Figure 1. Visual representation of PAPM constructs showing the relationship between

implementation intentions concept and the gaps in HIV PrEP Prescription. Adapted from

"Integrated Precaution Adoption Process Model and Implementation Intentions Concept Applied

to Breast Cancer Screening," by K. K. Engelman, A. P. Cupertino, C. M. Daley, T. Long, A.

Cully, M. S. Mayo, E. F. Ellerbeck, M. V. Geana, & A. Greiner, 2011, Engaging diverse,

underserved communities to bridge the mammography divide. Copyright 2011 by Engelman et al., licensee BioMed Central Ltd.

Applying Gollwitzer's (2006) implementation intentions concept to this study helped me examine how PrEP service implementation intentions can enhance the primary care providers and HIV specialists' willingness to prescribe it. The implementation intentions are a goal-directed behavior where people perform behavior B if they met a condition C (Gollwitzer & Sheeran, 2006). The concept is effective in enhancing past behavior that leads to the prediction of new behavior (Orbeil, Hodgldns, & Sheertan, 2014). If it is applied, the concept can help primary care providers and HIV specialists to meet their PrEP prescription goals. Gollwitzer (n.d.) explained the concept as a motivation driver for individuals to adopt healthy behavior. The connection between the study variables and precaution adoption process model constructs is presented in Table 1.

Table 1

Linkage Between PAPM Constructs and Study Variables

PAPM constructs	Independent variables			Outcome variable
	HIV PrEP awareness	Number of years of service	Difference between provider type	Frequency of HIV PrEP prescription
Stage 1: Unaware of Issue	Never heard of HIV PrEP	As a factor leading to that situation	As a factor leading to that situation	
Stage 2: Unengaged by issue	Never thought about prescribing HIV PrEP	As a factor leading to that situation	As a factor leading to that situation	
Stage 3: Undecided about acting	Undecided about prescribing HIV PrEP	As a factor leading to that situation	As a factor leading to that situation	
Stage 4: Do not want to act	Do not want to prescribe HIV PrEP	As a factor leading to that situation	As a factor leading to that situation	

(Table continues)

PAPM constructs	HIV PrEP awareness	Number of years of service	Difference between provider type	Frequency of HIV PrEP prescription
Stage 5: Decided to Act	Plan to prescribe HIV PrEP	As a factor leading to that situation	As a factor leading to that situation	
Stage 6: Acting	Prescribing HIV PrEP	As a factor leading to that situation	As a factor leading to that situation	
Stage 7: Maintenance	Prescribing HIV PrEP	As a factor leading to that situation	As a factor leading to that situation	

Definition of Terms

Antiretroviral therapy (ART): It consists of the use of the retroviruses inhibitors drugs to treat HIV. It is also known as highly active antiretroviral therapy (AIDS info, 2008). ART combines three or more HIV drugs that act on different stages of HIV life cycle (AIDS info, 2008).

Biomedical interventions: HIV prevention techniques, biomedical interventions consist of the use of clinical, medical, and public health prevention methods to reduce physiologically and biological risk factors for HIV infection (Effective Interventions, 2012). They help to decrease HIV infectiousness, to prevent HIV infection, and to reduce susceptibility to HIV

(Effective Interventions, 2012). In addition to the vaccine, preventive treatments and males'

circumcision, the biomedical interventions include sexually transmitted infections (STIs)

treatment and diaphragm use (Mayer, Margie Skeer, & Mimiaga, 2010).

HIV preexposure prophylaxis (*PrEP)*: It is HIV drug-based preventive intervention that

allows HIV-negative persons who are vulnerable to HIV infection to use antiretroviral drugs like

Truvada to reduce HIV transmission risks (AIDS info, 2008).

Primary care providers: Health care practitioners, primary care providers play a medical

caring role in the community by offering preventive care and healthy lifestyle education services

to their patients (MedlinePlus, 2014). Their primary tasks are to diagnose and treat common

medical conditions and refer clients to specialists as needed (MedlinePlus, 2014). Primary care

providers include physician assistants, nurse practitioners, family practitioners, internists,

pediatricians and obstetricians/gynecologists

Serodivergent relationship: The concept describes the situation where an HIV-negative

person is in sexual relation with his or her HIV-positive partner. The other terms that describe

these kinds of relationships include serodiscordant, discordant, magnetic or HIV-

positive/negative (AIDS.gov, 2012).

Assumptions

Although the FDA has approved PrEP drugs like Truvada, PrEP for HIV prevention was

underprescribed by physicians in the Quad Cities area. I assumed that awareness about PrEP, the

number of years in the medical field, and provider types have an influence on PrEP prescription

in the Quad Cities. As a result, there was a need for a quantitative study to explore the barriers to

PrEP prescription.

Proactively, it is important to foresee additional HIV PrEP education for primary care providers and HIV specialists in the Quad Cities area. The data that I collected were from doctors. Data from assistant physicians and nurse practitioners might not reflect their attitudes regarding PrEP prescription because they work under the supervision of others doctors.

Scope and Delimitations

In this study, I focused on PrEP prescription effectiveness in the Quad Cities Illinois/Iowa. The barriers to prescribing PrEP were assessed at the physicians' level only. I delimited the research to a quantitative, cross-sectional study design. The study participants were family practitioners, pediatricians, internists, obstetricians/gynecologists, and infectious disease/HIV specialists, who were practicing. They must live in the geographic area of 70 miles radius from Rock Island city in Illinois as of May 15th, 2015. I excluded physician assistants and nurse practitioners from this study. The independent variables were limited to the PrEP awareness, the number of years of service as a primary care provider or HIV specialists, and provider's type. The unique outcome variable in this study was the frequency of PrEP prescription. The study included some demographic variables like gender, age, and geographical location (living in Iowa versus Illinois or urban versus rural). Race and religious beliefs were other independent variables that could be used in this study, and therefore could be considered exploratory in nature in explaining the lack of PrEP prescription among care providers. However, they were excluded to keep the study simple.

I chose the word barriers over causes and knowledge for two reasons. First, the word barrier aligns to the research problem. The study was about identifying the factors that can explain HIV PrEP under prescription at the prescribers' level to recommend further educational action. Second, using the word cause would only be appropriate in an experimental study. In this

cross-sectional survey study, I only explored the association between variables. Therefore, it was not appropriate to investigate the cause and effects relationship in this study. Furthermore, the word knowledge gives readers the impression that I focused on HIV PrEP prescription awareness only. In the title, I preferred the expression HIV *PrEP* to the name Truvada because Truvada is a component of PrEP. Moreover, Truvada has both treatment and preventive functions whereas PrEP is a prophylaxis procedure. Prevention is the best strategy to limit HIV infection (Mayer, et al., 2010). Thus, using PrEP helped me to narrow the study to HIV prevention among HIV-negative populations that are highly exposed to HIV infection.

Limitations

Some intentional and unintentional biases can raise questions regarding the ability of one's research to provide valid and trustful results (Creswell, 2009). The potential biases in this study that I was working on included the following:

1- Participant selection (i.e., there are fewer HIV specialists in the research geographic area than other groups that fall under primary care specialties). This type of bias can create an underrepresentation of HIV specialists in the study sample population. I used a proportional sampling method to avoid the participant selection bias.

2- It is also possible to perceive PrEP for certain subpopulations more than others or assuming that HIV specialists are better off in terms of PrEP awareness and prescribe more PrEP than other primary care providers. Being aware of that allowed me to be careful while interpreting and analyzing data.

3- Nonresponse and low participation rates could be potential threats to my research validity. I increased my sample size by 54% to mitigate that problem. Soriano (2013, p. 91) suggested an increase in the research population sample size by 43% as a solution to low participation rates issue in a study. I selected 185 then increased that to 300 subjects for my study. Developing understandable survey instruments can help to reduce nonresponse

4- Biases can also arise from researcher's experience. I examined some research parameters like PrEP prescription or low PrEP literacy as good or not because of my background in HIV/AIDS field. Being aware of the problem alerted me to be neutral. I interpreted and concluded on the study results and findings based on the outputs from valid and reliable data collection instruments and statistical tests only.

5- The perceived efficacy of PAPM to conceptualize PrEP awareness and provision could constitute a theory bias in the study. Sampson Jr., (2012) acknowledged theory bias in a study when one perceived the efficiency in certain constructs to conceptualize research problems. I worked closely with my chair and committee members to minimize all theory related biases.

Significance

PrEP is an HIV prevention biomedical intervention within the primary health care setting, as opposed to specialized care. The rate of new HIV incidences is still alarming inside and outside of the United States (Krakower & Mayer, 2012). Since HIV is still rampant in the world, addressing tailored educational and training needs of health care providers in primary health care

settings becomes a must. The results and findings of this study could provide CDC and other international public health organizations like WHO with valuable information to develop detailed guidelines for PrEP education and service. Various insights from this study could help providers determine effective PrEP guidelines and related services, and in turn, limit the risk of HIV proliferation in the community. The study could inspire public health practitioners to develop a suitable education approach to improving PrEP literacy among health care providers. Educating people about PrEP is vital to arose positive social change regarding stimulating a universal access to PrEP services. This study also helped to understand how and why primary care providers and HIV specialists underprescribed PrEP in the studied geographic area. I explored the lack of PrEP prescription contributing factors like low PrEP literacy, the number of years of service in the medical field and provider types. Finally, the findings and recommendations provided insights to improve HIV/AIDS policies.

Summary

The lack of funding for antiretroviral and the difficulty of monitoring HIV PrEP clients were some barriers to HIV PrEP prescription among HIV specialists (Puro et al., 2013). The information above was a benchmark against which I compared the study results based on the information that I collected from primary care providers and HIV specialists. Combined with other behavioral interventions, when it is suitable, PrEP reduces the risk of HIV infection in HIV-negative populations. For this reason, consistent efforts should be made to enhance HIV PrEp prescription among HIV specialists and primary care providers (Golub, Gamarel, Rendina, Surace, & Lelutiu-Weinberger, 2013). In this research, I examined the association between HIV PrEP awareness, the number of years of service as a primary care provider or HIV specialist, provider types and the frequency of PrEP prescription.

In Chapter 2, I discuss existing peers review literature on HIV PrEP, literature search strategies and HIV PrEP-related issues and concepts. Following the literature review, I describe the research methods in Chapter 3, present the research findings in Chapter 4, and in Chapter 5, go over the discussion, inferences for social change, and proposed the recommendations for future study.

Chapter 2: Literature Review

Introduction

Essential to this research is the concept that people perform behavior B if they met a condition C (Gollwitzer & Sheeran, 2006). There are the plethora of studies of HIV epidemics as well as studies of approaches that have been applied to mitigate its occurrence (CDC, 2011). The combination of the behavioral and biomedical interventions is a successful evidence-based approach of controlling HIV propagation (CDC, 2011). However, the education based on abstinence and condom use only has shown its limits in reducing the risks of HIV infection (CDC, 2013b). PrEP regimen is recommended to HIV-negative people who might be at higher risk for the HIV infection like serodivergent couples/partners (AIDS.gov, 2012). Many studies and publications have contributed to HIV PrEP-related literature in the last 6 years. The purpose of this literature review is to explore various studies on PrEP to inform the background of my research topic and identify gaps in the literature. I highlight the gaps upon which this study was designed to justify the conduct of this study to the reader.

Literature Search Strategy

The key terms that I used for the web search entry included *HIV pre-exposure prophylaxis, HIV PrEP, HIV PrEP guidelines,and Truvada prophylaxis HIV* (Duncan & Duncan, 2012). I also used *PrEP Prescription, HIV PrEP prescription frequency, HIV PrEP, cost and insurance,* and *HIV PrEP Literacy* for internet search. I searched literature through many Walden University Library databases such as Medline, Academic Search Alumni Edition, *Journal of American Medical Association*, Pubmed, and Health Sciences: An SAGE-Full Text Collection and CINAHL Plus. Google Scholar allowed me to search for PrEP fact sheets and scholarly articles. The CDC and the WHO websites provided me additional

information resources to explore official PrEP guidelines and protocols. They allowed me to

explore studies, conference reports, and other publication on PrEP. I filtered the search by peer

review articles after the publication date of 2010.

Literature Review on the Concepts and Key Variables

Understanding PrEP

PrEP is an HIV prevention regimen for HIV-free persons prone to ongoing substantial

"risk of HIV infection" (Aids.gov, 2014). It consists of one pill of Truvada daily as a preventive

measure to reduce HIV transmission risks (AIDSinfo, 2008). Truvada is "a combination of

emtricitabine and tenofovir disoproxil fumarate," both belonging to the HIV nucleoside reverse

transcriptase inhibitor drugs that stop HIV from making copies. Its dosage for PrEP requires

"200 mg of emtricitabine and 300 mg of tenofovir disoproxil fumarate" in a single pill

(Choopanya et al., 2013). Truvada can be (a) used with other antiretroviral drugs to treat HIV-

positive patients and (b) used alone to prevent HIV infection in HIV-negative populations. When

taken consistently, it has decreased the risk of HIV transmission among HIV-negative

populations (Choopanya et al., 2013). Truvada is a component of PrEP that is a routine

procedure. PreP regimen has four implementation phases. The first consists of assessing

significant risk for HIV infection. The second is about establishing PrEP candidates' eligibility

clinically (i.e., documented HIV-negative status, documented hepatitis B virus

infection/immunization status, and checking for (a) no contraindicated medication, (b) no signs

of severe HIV infection, and (c) healthy liver and good functioning kidneys). The third consists

of prescribing Truvada (a steady oral dose of Truvada on the daily basis). The fourth is a follow-

up. The follow-up services include every 3 months or 6 months for HIV and STI tests,

counseling for medication adherence, renal function assessment, pregnancy test for females,

clean needles/syringes exchange, and substance abuse treatment services (Smith, 2014). The CDC recommended PrEP in addition to the following:

- Consistent and correct use of condoms,

- Getting tested periodically for HIV and sexually transmissible diseases,

- Adopting less risky sexual behaviors, and

- Using sterilized drug injection equipment or participating in a drug treatment program (Aids.gov, 2014).

Effectiveness and Awareness of PrEP

Every new drug has to be proven safe and effective before its commercialization (FDA, 2014). The effectiveness of HIV PrEP is a point of debate, with many misconceptions about its implementation (Wade et al., 2013). Because understanding PrEP regimen related issues are in flux, it is important to update readers on the current publications and studies of the HIV PrEP. Choopanya, et al. (2013) found tenofovir disoproxil fumarate effective to reduce HIV infection risks down to 49%, (95% *CI*, 9.6 to 72.2; p = 0.01). Paltiel et al. (2009) conducted a cohort study on the effectiveness of PrEP among MSM in the United States. The study provided data for a computer-stimulated HIV infection and care as an archetype of PrEP. The results showed PrEp effective to decrease the risk of HIV infection up to 19% down and to improve patients' mean life expectancy by 0.8% (Paltiel, et al., 2009).

Care providers should know more about HIV PrEP (Rosenthal, et al., 2013). White, et al. (2012) conducted two successive online survey studies separated by 4 month period interval with $N = 178$ and $N = 115$ respectively for the physicians in Massachusetts. The results showed an increase from 79% to 92% ($p < 0.01$) of HIV PrEP knowledge among care providers. Up to 96%

of the surveyed physicians believed that formal PrEP guidelines from CDC would increase their readiness to prescribe PrEP (White, et al., 2012). The problem of PrEP unawareness has crossed the United States' borders. Rosenthal et al. (2013) conducted a cross-sectional study of HIV-positive clients to assess PrEP awareness level of the physicians in France. The study targeted 23 representative infectious diseases and internal medicine departments. Only 41.8% of the surveyed people aware of the PrEP, and about 8.3% declared that they had discussed PreP information with their friends and relatives (Rosenthal et al., 2013). Duncan and Duncan (2012) found Google.co.uk and Bing to be popular search websites where people have access to HIV PrEP information. In this section, I covered HIV PrEP effectiveness and its awareness level among potential PrEP candidates and physicians, which had not been linked to reporting in the literature for the Quad Cities in Illinois.

Challenges of Prescribing PrEP

Prescribing PrEP could be challenging to some care providers because of the divergent view on it (Puro et al., 2013). HIV specialists have different attitudes towards and insights regarding prescribing PrEP (Puro et al., 2013). In 2012, Puro et al. conducted a survey study with $N = 311$ of HIV specialists selected through a convenience sampling method to explore HIV specialists' attitudes and perceptions about prescribing PrEP in Italy. They used participants' readiness to prescribe PrEP as a criterion to classify them into two groups (i.e., people who have positive and those who have negative views about PrEP). They applied univariate and multivariate regression analysis to assess the relationship between different attitude towards PrEP prescription and certain factors. The results illustrated the contradictory attitudes towards PrEP prescription among care providers. For example, 70% of the surveyed physicians had

optimistic attitudes towards PrEP and were willing to prescribe it. On the another hand, 30% had

a negative view about PrEP. Puro et al. also found an association between the insufficient

information, potential toxicity and cost, and underprescription of PrEP. Their study also revealed

an association between the lack of provision of information, concerns about toxicity, lack of

formal guidelines, and the positive or negative attitudes of HIV specialists towards PrEP

prescription.

　　　　Providers did not prescribe PrEP to their patients very often in the United States.

Krakower and Mayer (2013) reported in a study that only 4% of participants had prescribed

PrEP. Among 43% of HIV/AIDS specialists, who admitted that they had received HIV PrEP

prescription requests from their patients, only 19% had prescribed it. Before PrEP initiatives,

HIV prevention strategies included condom promotion, perinatal interventions, male

circumcisions, and harm reduction interventions (CDC, 2013a). CDC (2013) remarked that

despite these prevention efforts, the United States experienced around 50,000 new HIV

infections in 2013. PrEP is effective in preventing HIV infection (CDC, 2013a; Rosenthal et al.,

2013; Wade et al. 2013). However, the illiteracy about PrEP can lead to its underprescription

(Castillo, 2013). Many researchers found a substantial association between primary care

providers' PrEP knowledge and increased PrEP prescription (Kalichman, Ramachandran & Catz,

1999; Young, Li & McDaid, 2013).

　　　　Mansergh, Koblin and Sullivan (2012) addressed PrEP implementation challenges for

MSM and their communities. Some of the challenges include misapprehension of PrEP, charges,

possible epidemiological effects, lack of suitable PrEP messaging, and inadequate usage of PrEP.

Jay and Gostin (2012) also published an article that identified many ethical challenges such as

increase of unsafe sex practice, "behavioral disinhibition," health care disparities due to the high

cost, and drug dependency associated with HIV PrEP. Naswa and Marfatia (2011) raised the same concerns about PrEP. Furthermore, Golub et al. (2013) found a significant association between free access to PrEP and (a) a sense of protection, (b) PrEP acceptance, and (c) PrEP adherence. Thus, it is imperative to identify and address the challenges appropriately to make PrEP services affordable.

The above studies did not address PrEP prescription attitudes and perception among primary care providers who can prescribe PrEP. They also did not include HIV PrEP education needs. Those gaps in the literature justify the relevance of my dissertation topic.

HIV PrEP Education and Literacy Improvement Needs

Education is the key strategy to enhance PrEP literacy. Krakower and Mayer (2012) stated that the higher HIV infection incidence rate in the United States requires multilevel prevention approaches including PrEP education enhancement within care providers. In articles review study, Krakower and Mayer evaluated primary care providers' knowledge about PrEP. They used five indicators (a) attitudes to identify potential PrEP clients, (b) PrEP counseling skills, (c) PrEP drug monitoring abilities, (d) the level of understanding antiretroviral drug resistance, and (e) HIV transmission process to assess health care providers' PrEP literacy level. The study allowed Krakower and Mayer to portray the need for additional education on HIV PrEP for the primary care providers. It is important to develop PrEP curricula and programs for health care professionals and clients to solve HIV PrEP low literacy problem. According to Jukkala et al. (2009), improving primary care providers' PrEP use for HIV prevention could enhance health outcomes, and reduce unnecessary clinical services (Jukkala et al., 2009).

In addition, the acceptance of PrEP is often associated with the clients' health literacy level (Barragán et al., 2005). In a prospective survey study with 372 participants at an urgent care center, Barragan et al., (2005) evaluated whether there is an association between participants' health literacy and their readiness for HIV screening. The finding showed that low literacy level clients were more likely than high literacy level clients to accept HIV testing. Drainoni et al., (2008) also found that HIV health literacy was vital for both HIV-positive patients and care providers. Young et al., (2013) conducted a cross-sectional study with 1,515 gay and bisexual men. They explored the relationship between knowledge of and willingness to use PrEP and readiness to participate in a PrEP research in Scotland. The findings showed a significant relationship between awareness of PrEP and rose in the clients' readiness to use PrEP (Young et al., 2013).

The reviewed literature provides insights for better understanding of HIV PrEP issues. It contains arguments and empirical data that support the idea of enhancing primary care providers' HIV health literacy to ensure a smooth transition between the shifts from HIV/AIDS special care to the primary care settings. However, there are still gaps in the literature regarding the identification of subsequent research theory that will help to depict PrEP under prescription behavioral mainstream issues that were not addressed through educational interventions in the Quad Cities. For that reason, I use PAPM to determine the factors that explain the behavior displayed by the providers under each of the seven stages of the PAPM regarding their attitude towards PrEP Prescription.

Guidelines for HIV PrE Prescription

When used properly, the HIV PrEP regimen can protect people at higher risk of getting HIV (Scheibe, 2012). Despite this indication, the lack of a PrEP guideline could lead to its misuse, and the existence of several PrEP guidelines could be confusing and lead to chaos in the PrEP implementation process. In 2011, the CDC mentioned the lack of a comprehensive PrEP implementation guidelines and the nonexistence fixed PrEP protocol. Significant data from many PrEP studies allowed the CDC to develop interim guidance for PrEP prescription to at higher risk for HIV populations (CDC, 2011; Scheibe, 2012).

PrEP interim guidance developed by CDC (2011) included (a) the necessity to prescribe HIV PrEP to at higher risk heterosexual adults and (b) the prohibition to prescribe TDF/FTC (Truvada) as PrEP for HIV-positive clients. The interim guidance also endorsed the mandatory use of HIV PrEP for serodiscordant couples who planned to have a baby (CDC, 2013a). Furthermore, the interim guidance encouraged women to prove their pregnancy status through a documented pregnancy test to be eligible to start the HIV PrEP regimen. It required care providers to discuss PrEP benefits and risks with women who plan to have a baby before PrEP initiation. It required a mandatory submission of pregnancy information about PrEP clients to the Antiretroviral Use in Pregnancy Registry. The guidelines also recommended physicians inform clients about the Truvada adherence. To PrEP prescribers, reporting PrEP adverse effects to the FDA's MedWatch is a must (CDC, 2011). The CDC developed PrEP prescription guidance for MSM population. According to CDC, the regulation requires steady updates as needed.

An updated interim guideline for PrEP, published by the CDC in 2013b, authorized the institutionalization of PrEP services in intravenous drug users' services. It also banned PrEP prescription to individuals who have a creatinine clearance level less than 60 ml/min (CDC, 2013b). Lastly, the updated guidance advises prescribers to target people at "very high risk for

HIV infection" (CDC, 2013b). It recommended that physicians monitor the behaviors that can put their clients at higher risk for HIV infection and control their HIV and pregnancy status routinely (CDC, 2013b).

The WHO, (2012) developed a document that recommended evaluating and grading the evidence for serodiscordant status among couples or partners before prescribing PrEP to the potential clients. It suggested HIV PrEP use as additional prevention intervention for the uninfected partners in the countries where HIV infection arise among serodiscordant couples/partners (WHO, 2012). Scheibe (2012) also developed an HIV PrEP guideline for Southern Africa countries. There is a need for further investigations to assess the impact of the multiple HIV PrEP prescription guidelines on its implementation in the practice.

HIV PrEP and Stigma

People could become refractory to PrEP if they are stigmatized. The effects of stigma on the use of HIV PrEP were diversely appreciated (Smith, et al., 2012). Smith et al. (2012) stated that it is crucial to know whether stigma will enhance the status of people who use PrEP or not. Kenworthy and Bulled (2013) examined the ethical issues surrounding PrEP services in the developing country (Lesotho). They showed that there were many disparities in the distribution of PrEP services in the world and that stigma is associated with underprescription of PrEP. HIV prevention through PrEP initiatives needs effective structural and institutional support to reduce HIV PrEP-related stigma (Wheelock, et al., 2012).

The frequency of PrEP prescription is distributed disproportionally across the United States. Cairns (2013) found that physicians in the Northern America prescribe more HIV PrEP than those living in the Southern America where women benefit the most from PrEP services.

The reasons that explain these disparities were not assessed in the Cairns' study. However, the study is of an inspirational relevance for further researches on PrEP.

Promoting PrEP could have an undesirable impact on other HIV prevention behavioral interventions such as abstinence and the use of condoms and vice versa. Wade et al., (2013) developed the key themes that could assist researchers while investigating the impact of the behavioral interventions on HIV PrEP. The themes included (a) the motivations to use PrEP, (b) barriers to PrEP use, (c) facilitators to PrEP use, (d) sexual decision-making in the context of PrEP, (e) prospective PrEP education content, and (f) perceived effective characteristics of PrEP delivery personnel (Wade, et al., 2013). These themes could be adapted as a survey instrument to assess patients' willingness to accept PrEP and or providers' readiness to prescribe it. Golub et al., (2013) showed that more than 55% of the surveyed MSM and transgender women were ready to use PrEP services. Numerous are the studies that investigated PrEP awareness, acceptance and use within diverse populations. Those studies targeted MSM, serodiscordant couples/partners, sex workers, and needle-sharing drug users (CDC, 2013d; Rosenthal et al., 2013; Wade et al., 2013). However, none of the studies has explored PrEP literacy among primary care providers, and HIV specialists. More specifically, no research that targeted primary care providers and HIV specialists had been done to assess their PrEP prescription frequency in the Quad Cities Area in the United States.

Literature Review on the Theoretical Foundation

The PAPM has been applied to many studies in the public health field. Glanz, Rimer, & Viswanath, 2008 cited several studies that used PAPM. For example, they mentioned Blalock, DeVellis, Giorgino et al. (1996) who applied PAPM to their prevention of osteoporosis study. They also cited Clemow, Costanza, Haddad et al. (2000) who used PAPM as a theoretical

framework for their study of mammography issues. They finally give credit to Weinstein & Sandman (2004) who adopted PAPM in a study of home radon testing problems. Costanza et al., (2007) also used PAPM in a colorectal cancer study. It was applied to a comprehensive sexual education study (Stanger-Hall, 2011) and to a cyberbullying study (Chapin, 2014). The PAPM has also been used for modeling HIV prevention efforts (Jacobson, 2010), preventing HIV in the aging population (Jacobson, 2010), and explaining HIV serodiscordant experiences (Lelaka, 2014). Most of the studies that used PAPM have generated quantitative cross-sectional data (Block et al. 1996; Chapin, 2014; Costanza, et al. 2007; & Lelaka, 2014). The literature review provided additional evidence for why PAPM theory was a good choice for this study.

Literature Review on the Methods Used in Previous PrEP Studies

Among all research methods, the quantitative cross-sectional survey has been the most applied to the studies on HIV PrEP (Duffus, 2011 & Whiteside, Harris, Scanlon, Clarkson, 2014). Whiteside, et al. (2014) used a cross-sectional design to examine "the self-perceived risk of HIV and attitudes about PrEP" in STD clinics in South Carolina (United States). They recruited 405 clients by using convenience-sampling methods. They gave a $20 gift card as an incentive to each surveyed person upon the survey completion. Furthermore, they used SAS version 9.2 to treat the research data and a multivariable logistic regression model to analyze the effect of the demographic variables on the participants' attitudes about PrEP. Finally, they used ordinal logistic regression models to assess the differences in PrEP perceptions among different groups. Leonardi, Lee, and Tan, (2012) used a survey approach to examine awareness of PrEP and the participants' preparedness to use HIV PrEP in Toronto, Canada. They collected data from 256 participants, recruited on the voluntary basis, through self-administered questionnaires.

They run several statistical analysis tests including exploratory logistic regression models, multivariate logistic regression model, and the multivariate model.

This literature review explored HIV PrEP effectiveness and awareness, HIV PrEP prescription and challenges, HIV PrEP education and literacy improvement needs, guidelines for PrEP prescription, and HIV PrEP stigma. I examined some studies and articles related to the PAPM, the theoretical framework of this study. I also reviewed the methods applied to other HIV PrEP studies.

It appeared that none of the reviewed articles and texts discussed how awareness of PrEP, providers' years of experience and provider types influence the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad Cities. This study scrutinized whether there is an association between the independent variables and the outcome variable. The results helped me to justify the following assumptions:

1. The more providers know about HIV PrEP, the higher frequency of PrEP prescription will be.

2. The more years of experience providers had, the higher frequency of PrEP prescription will be.

3. Being a primary care provider versus HIV specialist may increase the frequency of PrEP prescription.

Summary and Gaps in the Literature

The existing literatures that have explored HIV PrEP intervention present the fact that PrEP is effective (CDC, 2013; Wade, Mayer, Elsesser, Mimiaga, O'Cleirigh, & Safren, 2013). The literature review also revealed that awareness about PrEP could lead to its prescription

among physicians (Krakower, & Mayer, 2012). There were three of the studies that examined HIV PrEP underprescription problems (Cairns, 2013; Golub, Gamarel, Rendina, Surace, & Lelutiu-Weinberger, 2013; Krakower & Mayer, 2013). Other studies demonstrated that HIV PrEP acceptance is often associated with people's health literacy level.

Evidence from the literature revealed that no study investigated the frequency of HIV PrEP prescription among primary care providers, nor assessed the barriers of HIV PrEP prescription at primary care providers' level exclusively in the Quad Cities. In addition, none of the existing studies have used the PAPM theoretical framework to explain the barriers of HIV PrEP prescription. I remarked that multiple logistic regression is commonly used in HIV PrEP studies that I explored. However, none of the reviewed articles has used the logistic regression on dummy variables, multiple linear regression or analysis of variance (ANOVA) as statistical analysis tools. These gaps in the literature and methodology motive me to explore the elements that have a bearing on PrEP prescription so that public health education efforts can be tailored to fill the gaps. The next chapter of this dissertation proposal not only details the research methodology but also describes the statistical procedures used to test the research hypotheses.

Chapter 3: Research Method

Introduction

In this study, I scrutinized whether the frequency of PrEP prescription among primary care providers and HIV specialists is associated with PrEP awareness, the number of years of service, and provider's types respectively. Explicitly, I explored the barriers to HIV PrEP prescription and education needs among care providers. The setting was the great Quad Cities area up to 70 miles radius from the city of Rock Island in Illinois. One hundred physicians participated in the study. I used the Internet research tools to search for an updated list of primary care providers and HIV specialists practicing in the Quad Cities for May 15, 2015 as an ample frame. I (a) defined in deep the study population (i.e., the whole set of significant units of analysis), (b) explained the sample design (i.e., the subset of the study population), (c) determined the sample size (i.e., subgroup of sampling units from a research population; Frankfort-Nachmias & Nachmias, 2008, pp.162-185), and (d) used SPSS and G*power analysis tools for potential statistics tests. In this chapter, I discuss the research design and the justification for its use for this study. I also discuss the target population and setting, research parameters, estimated sample size, and the participants' eligibility criteria. Next, I provide information on the instrumentation, data collection, and statistical methods. Additionally, I discuss the threats to internal, external, and constructs validity. The chapter ends with a summary preceded by the discussion on the ethical procedures.

Design and Approach

The method of inquiry for the study was descriptive, a cross-sectional quantitative study of barriers associated with the frequency of PrEP prescription among primary care providers, and HIV specialists. Parameters like awareness of PrEP, the number of years spent as a prescriber in

the medical field and the provider types were assessed. For the independent variables, the

frequency of HIV PrEP prescription was analyzed to test the following questions and

hypotheses:

Question 1: What is the association between HIV PrEP awareness and the frequency of

PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*01: There is no association between HIV PrEP awareness and the frequency of

PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

*H*a1: There is an association between HIV PrEP awareness and the frequency of PrEP

prescription among primary care providers and HIV specialists in the Quad-Cities.

Question 2: What is the association between the number of years of service as a primary

care provider or HIV specialist and the frequency of PrEP prescription among primary care

providers and HIV specialists in the Quad-Cities?

*H*02: There is no association between the number of years of service as a primary

care provider or HIV specialist and the frequency of PrEP prescription among primary care

providers and HIV specialists in the Quad-Cities.

*H*a2: There is an association between the number of years of service as a primary care

provider or HIV specialist and the frequency of PrEP prescription among primary care providers

and HIV specialists in the Quad-Cities.

Question 3: What is the difference between provider types and the frequency of PrEP

prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*03: There is no difference in providers' type and the frequency of PrEP prescription

among primary care providers and HIV specialists in the Quad-Cities.

*H*a3: There is a difference in provider type and the frequency of PrEP prescription

among primary care providers and HIV specialists in the Quad-Cities.

Justification for Using This Design and Approach

The cross-sectional design allowed me to use questionnaires to collect information from a random sample of primary care providers regarding their attitude and experience towards PrEP prescription at one in time. Frankfort-Nachmias and Nachmias (2008) stated that cross-sectional design is not only appropriate to describe the association between variables but also to ask survey participants questions about their attitudes, backgrounds, and experience. In addition, the cross-sectional design offers wide data collection tools including electronic mail and paper-based surveys through mail questionnaires (Hall, 2008) that I used as data collection methods. Hall (2008) acknowledged that the survey is one of the most common data collection techniques for cross-sectional designs. A cross-sectional design is open to different data collection methods including the Internet, face-to-face interviews, self-administrated/mailed questionnaires, and phone interviews (Hall, 2008). Whiteside et al. (2014) applied a cross-sectional design to HIV PrEP study in STD clinics. Despite its applicability to various studies, a cross-sectional design has some methodological limitations. Some weaknesses of the cross-sectional design include non-response biases associated to low response from the participants and the difficulty of estimating the research outcome precisely with a small sample size (Barratt & Kirwan, 2009). I addressed the weaknesses by selecting a large sample size to increase the response rate.

Methodology

Target Population and Setting

The study population included primary care providers who can prescribe in the Quad Cities area in the United States as of May 15, 2015. The setting was health care facilities (i.e.,

Genesis Group, Trinity Unity Care, and other medical groups' facilities). The sampling units included prescription drug prescribers (i.e., family practitioners, pediatricians, internists, obstetricians/gynecologists and infectious disease/HIV specialists). The sampling frame was based on the available updated online lists of the primary care providers operating within 70 miles radius of the City of Rock Island as of May 15, 2015. The search criteria included (a) Sorting by the distance within 70 miles radius from the city of Rock Island and (b) specialty.

Research Parameters

The research parameters included HIV PrEP awareness, the number of years of service, and the provider types as predictors for the frequency of PrEP prescription. The study targeted the cities of Davenport, Bettendorf, Clinton, De Witt, Wilton, Le Claire, Muscatine, Blue Grass, Eldridge, Orion, and Durant, Iowa City, in Iowa. I also included Rock Island, Milan, Silvis, East Moline, Moline, Alpha, Cambridge, Fulton, Cordova, Colona, Aledo and Coal Valley, Peoria, in Illinois. In this study, I examined five subpopulations including, family practitioners, pediatricians, internists, obstetricians/gynecologists and infectious diseases physicians including HIV specialists. The last sub-population served as a control stratum for comparison purpose.

The potential PrEP prescribers accounting for the five sampling subpopulations included 440 family physicians, 106 obstetricians/gynecologists, 341 internists, 124 pediatricians, and 17 infectious disease/HIV specialists. There were 963 physicians working in the area as of May 15, 2015 from which, I selected the sample population through appropriate probability sampling methods. I projected to use the physicians' list available at the Illinois Department of Public Health as a supplement to the sampling frame to avoid incomplete sampling frame error. Frankfort-Nachmias and Nachmias (2008) defined incomplete sampling frame as the missing of

some sampling units from the list. The survey response rate is often very low among physicians (Kellerman & Herold, 2001; Pit, VO, & Pyakurel, 2014; VanGeest, Johnson, & Welch, 2007).

Sample Size

I ran *G*Power* software to calculate the sample size. Power analysis allows researchers to derive the sample size and sample size estimate for a study (Trochim, 2006a). It consists of running the *F*-test (i.e., linear multiple regression fixed model with *R*-square deviation from zero). I took into account the parameters for two-tailed analysis like effect size *f* square of 0.15, an alpha of 0.05, and an input power of 80%, 90% or 95% as needed. The three predictors involved in this analysis are HIV PrEP awareness, the number of years of service, and the differences in specialties. The results for 80% power shows *N* of 78, *N* of 100 for 90% power, and *N* of 119 for 95% power. I started with *N*= 120 (i.e., given by 95% power) plus additional 54% (i.e., plus 65 = 185 total) preliminary participants. The graphs below show the results from the *G*power* F-test.

F tests – Linear multiple regression: Fixed model, R² deviation from zero
Number of predictors = 3, α err prob = 0.05, Effect size f² = 0.15
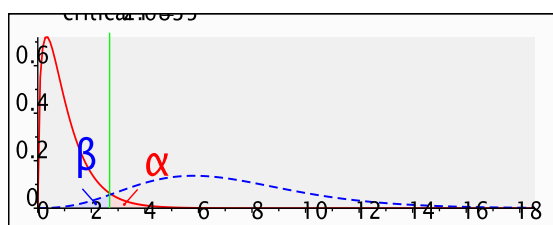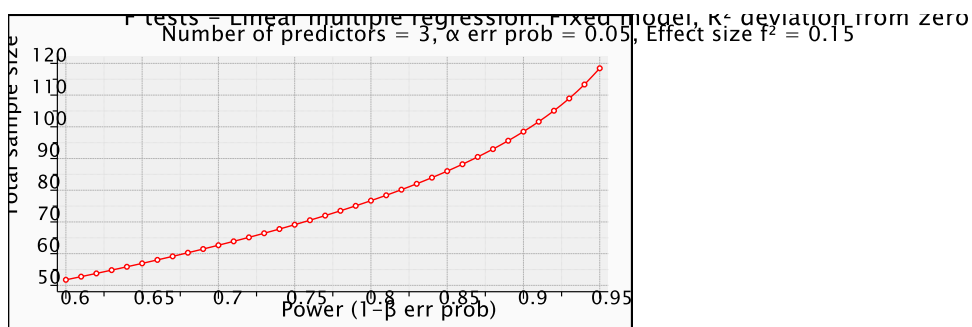
Figure 2. Using *G*Power* graphs to generate the sample size.

For the confidence interval (*CI*) = 80%, the graph showed sample size $N = 78$; for a *CI* = 90%, the graph showed $N = 100$; for a *CI* = 95%, the graph showed $N = 120$.

Since the sample size was determined, I set the 18% proportion strategy to determine the sample size for each stratum. If a stratum has a population < 20, the entire population was taken into account, and the 18% proportion is not applied. I summarized the breakdown of the sample size per provider type in Table 2. Next, I verified the representativeness of the sample size based on the size of an acceptable standard error calculation. This process is the obligatory path to determine the accuracy of the study results. I incorporated the values of the effect size, power, and alpha level in the analysis.

Table 2

Breakdown of the Sample Size per Provider Type

Provider types	Number in the sample frame per 70 miles radius from the city of Rock Island	Sample size selection criteria/strategy (sample size/total population*100)	Projected sample size per provider type
Family practitioners	440	16.63% proportion	74
Pediatricians	124	16.63% proportion	21
Internists	341	16.63% proportion	57
Obstetricians/ Gynecologists	106	16.63	18
Infectious disease/HIV specialists	17	Not applied*	17 - 2* = 15
Total	1,028	16.63% proportion	170
Actual total sample size is	74+21+57+18+15*		= 185

Note. *Proportion not applied if the total population in the stratum is less than 20.

2* is the number of the selected participants for the pilot study and excluded from the actual

study

I requested a change in the procedure, and I was authorized by the IRB committee to increase the number of participants from 185 to 300 to scale up the response rate close to 30% that was found during the pilot study. I added 23 participants to each subpopulation group shown on the preliminary breakdown of the actual study population group. The final breakdown showed 97 (74 + 23) family practitioners, 44 (21 + 23) pediatricians, 80 (57 + 23) internists, 41 (18 + 23) obstetricians/gynecologists, and 38 (15 + 23) infectious disease/HIV specialists.

Eligibility Criteria for Participants

Participants were registered and licensed physicians who practiced in the geographical area defined previously as of May 15, 2015. They must have belonged to an infectious diseases specialty or any of the types of physicians that fall under primary care practice. They included family practitioners, pediatricians, internists, obstetricians/gynecologists, and infectious disease/HIV specialists.

Characteristics of the Selected Sample

The sample design of the study was a proportional stratified random sample with five strata: family practitioners, pediatricians, internists, obstetricians/gynecologists, and infectious disease/HIV specialists. The population consists then of $N = N1+N2+N3+N4+N5$ with $N1$ family doctors, $N2$ pediatricians, $N3$ internists, $N4$ obstetrician/gynecologists, and $N5$ infectious disease/HIV specialists. Knowing the definite number in each stratum, I selected a proportional sampling fraction of 18% from each stratum. Next, I applied the simple random sampling procedure to each list to select the participants for the study. Overall, I began with proportionate sampling strategies by stratifying the population into appropriate subcategories and then took a random sample within each subcategory. The number of participants, who I recruited from each

subcategory, was identical to their proportion in the study population (Wadsworth Cengage

Learning, 2005). However, I expanded the sample size to all individuals in the strata that

contained less than 20 people to avoid obtaining a low response from one group. I also used very

aggressive follow-up strategies including mailing reminders and in-person doctors' office visits

to collect the completed questionnaires. I also planned, if necessary, to give a blank

questionnaire to those who might lose their early questionnaire for immediate completion during

the on-site follow-up visits.

Instrumentation

In this section, I focused on the questionnaire that I used to collect my data. I divided the

questionnaire into six fragments. The first fragment contained three questions related to the

demographic information (i.e., area zip code, gender, and age). The second part consisted of one

closed-ended question. A set of eight answers was offered to choose that most closely reflects the

level of participants' awareness of PrEP. The third category also had one closed-ended question

on the frequency of PrEP prescription. Participants were offered a set of eight responses and

have had to choose one that most describes how often they prescribe PrEP. I built the fourth,

fifth, and sixth groups of questions on the similar model. The respondents were offered multiple

choices of answers and were asked to choose one answer that most closely describes their

opinion. The questionnaire covered the number of years of service as a primary care provider or

as HIV specialist, the difference in specialties, PrEP prescription attitudes, and barriers

respectively (Appendix A).

I used the modified Glanz et al. (2008) PAPM stage clarification algorithm to develop the

survey questions. It helped me to investigate the first null hypothesis: There is no association

between HIV PrEP awareness as an independent variable and the frequency of PrEP prescription

as an outcome among primary care providers and HIV specialists in the Quad Cities. I

represented the modified algorithm to clarify PAPM stage in the Table 3.

Table 3

Modified PAPM stage Algorithm to Assess PrEP Awareness

Questions and answers	Corresponding PAPM stage
1. Have you ever heard about HIV Pre-exposure Prophylaxis (PrEP)? No Yes [go to question 3]	Stage 1
2. Have you ever prescribed PrEP to a client? Yes No, [go to question 3]	Stage 6
3. Which of the statements below describes better your opinions about prescribing PrEP?	
I have never thought about prescribing PrEP to clients	Stage 2
I am undecided about prescribing PrEP to clients	Stage 3
I am resolved to not prescribe PrEP to clients	Stage 4
I am resolved to prescribe PrEP to clients	Stage 5

Source. Adapted from "Precaution Adoption Process Model: Stage Classification Algorithm," by K.

Glanz, B. K. Rimer, & K. Viswanath, 2008, *Health Behavior and Health Education:*

Theory, Research, and Practice (4th Ed.), p. 136. Copyright 2008 by John Wiley & Sons, Inc.

Note. The permission to adapt the Table is available in Appendix B.

Glanz et al., (2008) used the algorithm to describe how Weinstein et al., (1998) applied PAPM to their home radon testing study in Columbus, Ohio. The algorithm not only inspired me to develop the questionnaire but also assisted me during data interpretation process. Next, I tested the questionnaires for reliability and validity through a pilot study.

Pilot Tests

I needed a minimum of eight returned surveys (i.e., 42.11% response rate) to consider the pilot test result as valid. To reach that goal, I started the survey with 19 physicians (i.e., 10% of $N = 185$ projected for the main study) to avoid nonresponse bias. The breakdown of the 19 participants is as follow, 6 family practitioners, 3 pediatricians, 4 internists, 4 obstetricians/gynecologists, and 2 infectious disease/HIV specialists. I passed out the self-administered questionnaire to the participants. I asked them to give me feedback in writing format regarding items and instructions that they found unclear or difficult to understand. I involved my Chair, my second committee member, and the Institutional Review in the pilot test process monitoring to ensure that the process was compliant with the standards. A copy of the questionnaire is inserted in Appendix A.

Data Collection and Analysis

I collected quantitative, categorical data including nominal and ordinal data in this study. I gathered primary data through the self-administered paper-based survey. I used the United States' postal mailing system to distribute the questionnaires. I mailed the survey to185 physicians at the beginning. I needed minimum 78 of returned surveys corresponding to 80% confidence interval to accept the results as valid. My plan to reach that goal was to increase the sample size. For example, I started the survey with 185 participants (i.e., 120 corresponding to

95% confidence interval increased by 54%). In addition, I included a survey monkey link in the mail for those who might not be comfortable with mailing back the survey. A questionnaire cover letter and a stamped return envelope were included in the mailing.

The study had one ordinal outcome (i.e., the frequency of HIV PrEP prescription). Also, it had two nominal independent variables (i.e., HIV PrEP awareness and the difference in provider's type), and one ordinal independent variable (i.e., the number of year of service). I included individuals (e.g. persons who can prescribe HIV PrEP), and groups (e.g. different medical specialties) as the research units of analysis. In a study, the unit of analysis is who or what about which an investigator may generalize (Long, 2013). I have planned to ask for PrEP prescription records from the Illinois and Iowa Department of Public Health. However, I aborted that option for confidentiality reasons.

I used SPSS statistical software to analyze data. I conducted a descriptive statistics analysis to generate the data summary. In addition, I applied statistical analyses to test the hypotheses. The variables that I considered in the descriptive statistics were age, gender, the number of year of service, and the frequency of HIV PrEP prescription. The statistical analysis section consisted of determining the suitable statistical test for each of the three research questions.

I projected to apply the logistic regression to analyze the research question 1: What is the association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad Cities? The eight levels associated with the independent variable (HIV PrEP awareness) included very much, much, quite a bite, a little, very little, none, don't know and no answer (Appendix A). I grouped these parameters in a dichotomous variable coded as unaware for the responses that fall under very little, none, don't

know and no answer and aware for the responses that fall under very much, much, quite a bite, a little. For the research question 2: What is the association between the number of years of service and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad Cities, I planned to use logistic regression analysis too. It offered the opportunity to group the predictor years of service into binary variables coded as fewer years of experience for physicians who have less than five years of experience and more years' experience for those who have more than five years of experience in medical field.

I projected to apply the ANOVA to the research question 3: What is the difference between provider type (i.e., family practitioners, pediatricians, internists, obstetricians/gynecologists, and infectious disease/HIV specialists) and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad Cities? In a study, the investigators use ANOVA when they want to determine whether specific groups have unlike effects (Barnes, & Writer, 2012). More specifically, ANOVA was suitable to determine whether belonging to each of the groups (i.e., family practitioners, pediatricians, internists, obstetricians/gynecologists, and infectious disease/HIV specialists) means higher or low HIV PrEP prescription frequency.

Table 4

Statistical Analysis Plan and Results Reporting Strategy of the Research Variables

Variables that I intended to collect	Source	Nature
Frequency of HIV PrEP prescription	Cross- Sectional Survey of Physicians Review of archived medical reports available at the local or State Department of Public Health	Continuous/Categorical (Ordinal)
HIV PrEP awareness	Cross- Sectional Survey of Physicians	Categorical (Nominal)
Number of year of service: Zero to five years Five to ten years 10 to 15 years 15 to 20 years 20 years and more	Cross- Sectional Survey of Physicians	Categorical (Ordinal)
Difference in provider type Family practitioners Pediatricians Internists Obstetricians/Gynecologists Infectious Disease/HIV specialists	Cross- Sectional Survey of Physicians Internet-based search and official list of physicians available at local public Health Department	Categorical (Nominal)

Statistical Methods

After the survey data have been collected, I entered them into Excel database. I created

an SPSS data file to run multiple logistic regression analysis. SPSS allowed me to investigate

the association between the independent variables (i.e., PrEP awareness level and the number

of years spent as a prescriber in the medical field). It was a useful tool to test the null

hypotheses one and two (i.e., 1. There is no association between HIV PrEP awareness and the

frequency of PrEP prescription among primary care providers in the Quad Cities; and 2. There

is no association between the number of years of service and the frequency of PrEP

prescription among primary care providers in the Quad Cities). For each variable of interest, I

projected not only to calculate unadjusted odds ratios and 95% confidence intervals for in

across-group comparisons purpose, but also I planned to include a p-value < 0.05 in the

multivariate model. I also looked at a combined model to determine whether all three

independent variables predict PrEP prescription.

I projected the logistic regression test for the research question1: What is the association

between HIV PrEP awareness and the frequency of PrEP prescription among primary care

providers and HIV specialists in the Quad Cities? The analysis consisted of collecting data by

using eight levels break down of the independent variable or predictor (i.e., awareness levels:

Very much, much, quite a bit, a little, very little, none, don't know, and no answer). I collected

data on multiple levels independent variables or predictors and one outcome variable (Green &

Salkin, 2011). There is one independent variable (X = HIV PrEP Awareness with eight

dummies) and one outcome (Y = Frequency of HIV PrEP prescription). Since I used non-

experimental methods, it is appropriate to call X and Y respectively as a predictor and the

criterion (Green & Salkin, 2011). This test is important to examine whether I can use HIV

PrEP awareness score to predict the frequency of HIV PrEP prescription among primary care providers and HIV specialists respectively.

I also planned to use the logistic regression to analyze the research question 2: What is the association between the number of year of service and PrEP prescription frequency among primary care providers and HIV specialists in the Quad Cities? In this question, the variable year of service was divided into five groups. I coded the groups in dichotomous variables, fewer years of experience and more years of experience. I represented the groups in the following format, 0 to 5 years of service for those fall under fewer years of experience in medical field and the remaining, 5 to 10 years of service, 10 to 15 years of service, 16 to 20 years of service, and 21 years and more fall under more years of experience in medical field.

First, I checked for the assumptions of logistic regression. An assumption is a condition that allows a researcher to aware of the effectiveness of what he or she attempts to do. In a study, the assumptions must be met to avoid statistical analysis biases (Field, 2012). The first assumption was whether the variable follow the normal distribution. The second assumption included additivity and linearity. For example, the dependent variable and dummy variables will not be estimated accurately when non-linear interactions occur in the terms of relationship (Osborne & Waters, 2002). Consequently, the true associations will be underestimated, and cause Type I and Type II errors. Therefore, it was important to examine the residual plots to detect an eventual nonlinearity (Osborne & Waters, 2002). The third assumption was the reliability of the variables' measurement (i.e., there is no measurement error). The fourth assumption was about the homoscedasticity or homogeneity of variance (i.e., one has the same variance of errors through all levels of the independent variable, Osborne & Waters, 2002).

I planned to apply the ANOVA to Question 3: What is the difference between provider type (family practitioners, pediatricians, internists, obstetricians/gynecologists and infectious disease/HIV specialists) and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad Cities? The five dummy variables that fall under the predictor (i.e., provider type) include

1. Family Practitioners (*X1*)

2. Pediatricians (*X2*)

3. Internists (*X3*)

4. Obstetricians/Gynecologists (X4), and

5. Infectious Disease/HIV specialists (*X5*).

I run the ANOVA *F* test to evaluate the magnitude of the difference between the group means on the frequency of PrEP prescription from each other group. I checked for the following assumptions: Normal distribution of the dependent variable for each dummy variable, same variances of the dependent variable for all dummy variables, and the independence of the cases and the scores on the test variable. The violation of the independence assumption could cause ANOVA *F* test to yield inaccurate *p*-values (Green, & Salkind, 2011). Later, I projected to run a post hoc test (Tukey's HSD) to determine which specific groups differ.

Since the outcome (i.e., the frequency of HIV PrEP prescription) is an ordinal variable that is associated with the three independent variables, I can use the nonparametric tests to analyze the research hypotheses. Field (2013) stated that researchers use the nonparametric tests for ordinal data in a study where fewer assumptions were made. He précised that the nonparametric tests do not assume specific distribution instead use the histogram as data

interpretation tool. In another hand, the parametric statistic tests involved interval and ratio data with normally predictable distribution (Field, 2013).

The two nonparametric tests that could be applied to this study are Wald-Wolfowitz runs and Mann-Whitney tests. Wald-Wolfowitz runs are suitable for the first hypothesis: There is no association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad Cities. It was convenient to look for runs of scores from each of the primary providers and HIV specialists' group within the ranked order (Field, 2013) respectively.

I planned to use Mann-Whitney tests for the second null hypothesis: There is no association between the number of years of service as a primary care provider and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad Cities. This test was appropriate when researchers want to look at, in the "differences in the ranked position of scores in different groups" (Field, 2013)

Mann-Whitney tests model could also be applied to analyze the third null hypothesis, $H0$: There is no difference in family practitioners, pediatricians, internists, obstetricians/gynecologists and infectious disease/HIV specialists and PrEP prescribing habits among primary care providers and HIV specialists in the Quad Cities. I run the different tests mentioned. The trustfulness and the confidence of the research results depended on the inquirer's ability to control and evaluate potential threats to validity (Gast &Ledford, 2014). I presented the statistical analysis plan on Table 5 and the summary of the statistical analysis and justifications on Table 6 respectively.

Table 5

Statistical Analysis Plan and Results Reporting Strategy

Statistical analysis steps	Research questions and variables	Nature of the questions	Statistical tests by using SPSS software	Results reporting strategies
Format research variables (i.e., describe demographic information, frequency distributions and missing values	Demographic information (i.e., age, gender, number of year of service and geographical situation: Illinois vs. Iowa; and the frequency of HIV PrEP prescription)	Expressed as percentages, proportion, ratios, modal values or as central tendency, variability and shape	Descriptive analysis	Tables and, or graphs (Note: Tables will contain the frequency and percentage of the categories)

(Table continues)

Statistical analysis steps	Research questions and variables	Nature of the questions	Statistical tests by using SPSS software	Results reporting strategies
Group & categorize data (i.e., use computer to place data in category of the research variable)	Question 1: What is the association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?	Relate more than 2 variables coupled with group comparison within 1 independent variable with dummy (8 levels break down of PrEP awareness (i.e.,Very much, much, quite a bit, a little, very little, none, don't know and no answer) and 1 dependent variable (the frequency of PrEP prescription). It expresses the degree of the relationship.	Logistic regression	Tables and, or, figures

(Table continues)

Statistical analysis steps	Research questions and variables	Nature of the questions	Statistical tests by using SPSS software	Results reporting strategies
Create and label table to report the results appropriately	Question 2: What is the association between the number of years of service as a primary care provider or HIV specialists and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?	The question relates 5 combinations of the predictor, years of service (i.e., Zero to five years, five to ten years, ten to 15 years, 15 to 20 years and 20 years and more) to one dependent variable (the frequency of PrEP prescription). It expresses relationship/prediction.	Logistic regression	Tables and, or, figures

(Table continues)

Statistical analysis steps	Research questions and variables	Nature of the questions	Statistical tests by using SPSS software	Results reporting strategies
	Question 3: What is the difference between provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?	It relates five categories (i.e., Family Practitioners, Pediatricians, Internists, Obstetricians/Gynecologists and infectious diseases physicians including HIV specialists) of independent variable (provider type) with one quantitative dependent variable (the frequency of PrEP prescription). It expresses group differences.	One-way ANOVA & Post Hoc test	Tables and, or, figures

Table 6

Summary of the Statistical Analysis and Justifications

Research Questions	Projected Statistical Analysis	Justifications
Research Question 1: What is the association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?	Logistic Regression Researchers performed this analysis on a binary dependent variable (DV) and binary independent variables (IV). It presents many advantages including (a) help to predict on DV from the ID data; (b) it is easier to calculate and interpret the odds ratio for a better understanding of the predictors.	The research question involves a binary (dichotomous) DV and dichotomous independent variables. Code for DV: Low frequency = 0; High frequency = 1 Code for IV: Unaware = 0; Aware = 1 Logistic regression analysis is a stable and powerful model. Not only it helps researchers to represent intervals or levels but also increases the probability of events.
Research Question 2: What is the association	Logistic Regression	The research question involves a binary DV and dichotomous

(Table continue)

Research Questions	Projected Statistical Analysis	Justifications
between the number of years of service as a primary care provider or HIV specialists and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?	Researchers performed this analysis on a dichotomous dependent variable (DV) and dichotomous independent variables (IV)	independent variables. Code for DV: Low frequency = 0; High frequency = 1 Code for IV: less (< 5) = 0; more (> 5) = 1
Research Question 3: What is the difference between provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?	Analysis Of Variance (ANOVA) Post hoc test Researchers used ANOVA when they deal with more than two groups.	The question involves five groups (i.e., family practitioners, pediatricians, internists, obstetricians/gynecologists and infectious disease/HIV specialists). There are more than two means to compare. Using multiple t-tests might be too complicated. I use ANOVA to avoid conducting multiple t-tests. Also, ANOVA will allow me to gather all the data into one number (F).

Threats to Validity

The extent to which a researcher measures, what he or she plans to measure effectively, is referred to as "validity" (Frankfort-Nachmias & Nachmias, 2008). Frankfort-Nachmias and Nachmias also mentioned that it is crucial, in quantitative inquiry, to provide steady evidence to support whether the variable measuring tools that one uses are reliable. It is also important to control and evaluate the study's internal, external and construct validity threats (Creswell 2009; Frankfort-Nachmias & Nachmias, 2008; Gast &Ledford, 2014).

Internal validity is about the causal effect attribution of the dependent variable on the independent variable (Frankfort-Nachmias & Nachmias, 2008). The threats to internal validity include any factor that can trigger researchers' ability to make sound inferences from the research data (Creswell, 2009). Some of the internal validity threats can arise from participants' selection methods, history, compensatory rivalry, testing, and instrumentation (Creswell, 2009). I limited the internal validity threats by selecting participants randomly and by reducing expectations of the HIV specialists versus primary care providers. It is also important to create equality between different subgroups involved in a quantitative study and to use the same instrument for each sub-group (Creswell, 2009). Researchers were also concerned about the effect of the variable on "other natural settings and on the large populations" (Frankfort-Nachmias & Nachmias, 2008) to ensure the study's external validity.

External validity stressed on the generalizability of research to the large population (Gast &Ledford, 2014). External validity threats can occur through improper inferences process that links data to participants, different settings and situations (Creswell, 2009). The external validity threats may include various interactions between (a) selection and treatment, (b) setting and treatment, and (c) history and treatment (Creswell 2009). I addressed the threats by restricting

claims among the subpopulation in which the generalization of the study results is limited and by engaging participants from different settings in the study (Creswell, 2009). In addition, I planned to replicate the same research to compare the results to the actual study in future. It is also indispensable to evaluate the compliance of the data collection instrument to "the concepts and the theoretical assumption" (Frankfort-Nachmias & Nachmias, 2008) of the study by controlling the threats to construct validity.

Construct validity allows researchers to prove the alignment of the study instruments to the theoretical framework (Frankfort-Nachmias & Nachmias, 2008). For instance, Frankfort-Nachmias and Nachmias cited Miltron Rokeach (1960) who developed a dogmatism questionnaire to assess the association between close-mindedness and ideological orientations. It is capital to establish convergent and discriminant validity of the study. Convergent validity consists of illustrating that the measures that were expected to be related were related effectively. Discriminant validity ensures that the measures that were expected to be different were not tied one to another as expected (Trochim, 2006c).

Ethical Procedures

Researchers' primary responsibilities are to be obedient to ethical standards and to behave properly as far as the research involves human beings (Rudestam & Newton, 2007). This study was strictly anonymous and confidential. For example, while sending e-mails, I protected participants' addresses by using Blind Carbon Copy. I also reminded participants to not put their returning address on the envelop containing their feedback letter. I included the invitation to participate in research letter coupled with implied consent statement, Wiley Global permissions to adapt PAPM algorithm for Figures 1 and Table 2 in Appendix B and Appendix C respectively, and the pilot test questionnaire in Appendix A for the IRB application.

I addressed potential ethical issues regarding the study process and recruitment materials by alerting my Chair as the issues arise. I was also obedient to the Walden University's research ethical standards. I had exclusive access to the data, which I stored in a secured location. For example, the printable documents were kept in a locked cabinet. I also used a password protected computer and back up on the password protected jump-drive. Data would be deleted according to the timeframe allowed by the school standards. Finally, I disclosed any conflict of interest (i.e., dissertation study grants, the work environment) and justified the use of any incentives to encourage participants (if it is applied) to ensure a better turnout of the survey.

Summary

In this chapter, I provided general information about the methodology of the study. The information was about the research design, the target population, the setting, research parameters, sample size, eligibility criteria, and instrumentation. I not only discussed the approaches to the analysis of the research variables but also discussed the statistical methods to test the research questions and hypotheses. Multiple logic regression analysis and Non-parametric statistics test if necessary were projected to be used to assess the extent of the association between independent variables and the outcome variable of interest. I further discussed the potential internal, external, and the constructs validity threats to the study. The chapter ended with an overview of the ethical procedures. In Chapters 4 and 5, I analyze the data collection process through the cross-sectional survey among primary care providers and HIV specialists, and discuss the findings of the study respectively.

Chapter 4: Results

Introduction

In this study, I aimed to understand the barriers to prescribing HIV PrEP among primary care providers and HIV specialists using the independent variables of PrEP awareness, the number of years of service, and provider's types. I also included gender, and geographic situation. These sociodemographic variables may predict the frequency of PrEP prescription (outcome variable) among primary care providers and HIV specialists. I described the research questions and hypotheses as follows:

Research Question 1: What is the association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*o1: There is no association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

*H*a1: There is an association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

Research Question 2: What is the association between the number of years of service as a primary care provider or HIV specialist and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*o2: There is no association between the numbers of years of service as a primary care provider and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

*H*a2: There is an association between the numbers of years of service as a primary care provider and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

Research Question 3: What is the difference between provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*o3: There is no difference in provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

*H*a3: There is a difference in provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

The results of the pilot study and their impacts on the main study are reported in the chapter. The results and findings of the actual study are reported in narrative, tabular and figure formats. The chapter ends with a descriptive summary of the study interpretation and outcomes.

Pilot Study

The pilot study covered 53 days (see Figure 1 for the timeline), and targeted 30 Physicians in the following specialties: seven family practitioners, four infectious disease/HIV specialists, seven internists, six obstetricians/gynecologists, and six pediatricians. There were 15 females and 15 males randomly selected. Geographically, the participants were equally distributed, 15 participants in the Quad-Cities Illinois and 15 participants in Quad-Cities Iowa. This pilot test aimed to ask physicians to read and complete the questionnaire and give me feedback regarding items and instructions that they found unclear to understand. The participants answered to the following feedback questions after they had completed the survey:

1. How long did it take you to complete this survey?

2. What is your interest in HIV PrEP issues?

3. What is your understanding of the survey questions?

4. Is the sequence of the questions encouraged or discouraged your desire to continue with the survey?

5. Have you hesitated to answer any questions because you need clarification on some points?

6. Was there anything objectionable in the survey?

7. Is there anything in the survey that is not relevant or appropriate for your culture?

8. Please, write down any wording that would have been clearer on the lines bellow.

There were nine respondents out of 30 potential participants corresponding to a 30% response rate. Over 77% (7 out of 9) respondents said that they had a greater interest in HIV PrEP issues, whereas 11.11% had an interest in PrEP issues. More than 66% of the respondents had a good understanding of the survey, and 22.22% had a fair understanding. More than 88% of the respondents (i.e., 8 out of 9 people) said that the sequence of questions had encouraged them to continue with the survey. All of the respondents (100%) did not hesitate answer, find anything objectionable or needed clarification on any wording remarks in the data collection instrument. The feedback and comments from the participants showed the following:

Survey Duration

It took a minimum of 1 minute and a maximum of 5 minutes to complete the survey. The average time was 2 minutes and 30 seconds. I projected 2 to 5 minutes to complete the questionnaire for the main study.

Interest in PrEP Issues

Up to 66.67% of the respondents had a greater interest in the PrEP issues, 11.11% had an

ordinary interest, and 11.11% had little interest.

Understanding of the Questions

Up to 77.78% of respondents had a good understanding of the questions, 22.22% had a fair

understanding, and 0% had a poor understanding.

Sequence of Questions

About 89% of respondents said that the sequence of the questions encouraged them to continue

the survey. The answers were *No* for each of the following Yes or No questions regarding (a)

participants' hesitation to answer, (b) points that need clarifications, (c) anything objectionable,

(d) anything not relevant/appropriate, and (e) any wording. The spaces provided for the

comments and remarks were left blank. I presented the results on Table 7. I also reported the

timeline of the pilot study on Figure 3 and the summary of the pilot test and its inferences on

Table 8 respectively.

9/29/2015

9/9/2015   Resume with

8/15/2015   9/2nd/2015   Request for   In-Person

Pilot Survey   Follow-up   a Change in   Distributions

Sent out via   Letter Sent   Procedures   of Survey

Survey Monkey   Out

8/14/2015   8/19/2015   9/24/2015   10/8/2015

IRB Notification   Pilot Survey   IRB approved   End of Data

of Approval to   Mailed to   the Request   Collection

Proceed to   19 Physicians   for Procedures

Final Study   change

Figure 3. Pilot study timeline.

Table 7

Data Report Showing Participants' Responses (n = 9)

1)		How much do you known about HIV Pre-Exposure Prophylaxis (PrEP)?					
Very much	Much	Quite a bit	A little	Very little	None	Don't know	No answer
0	1	2	3	0	3	0	0

2) How often do you prescribe HIV PrEP?							
Very often	Often	Quite a bit	A little	Very little	None	Don't know	No answer
0	1	0	0		8	0	0

3) How long have you been served as a Physician?					
0 to 5 years	6 to 10 years	11 to 15 years	16 to 20 years	21 to 25 years	26 years and more
0	3	1	3	1	1

(Table continues)

4) What is/are your specialty (ies)?

Family Practice	Infectious diseases	Internist	Ob/Gyn	Pediatrician	Other
2	2	1	2	2	0

5. A- Which of the following best describes your thoughts about prescribing PrEP?

(a) I have never thought about prescribing PrEP to my clients	7 answers (77.78%)
(b) I am undecided about prescribing PrEP to my clients	1 answer (11.11%)
(c) I have decided; I do not want to prescribe PrEP to my clients	0
(d) I have decided; I do want to prescribe PrEP to my clients	1 answer (11.11%)

5. B- What is the most accurate reason you may not prescribe or propose PrEP services to your clients who might need them?

(a) I have never been in a situation that required me to prescribe or propose HIV PrEP services to a client.	4 answers (44.44%)
(b) I don't know much about PrEP and its guidelines/protocol to prescribe or propose its services to my clients.	1 answer (11.11%)
(c) I think that only HIV specialists can prescribe HIV PrEP	0

(Table continues)

(d) I think that only HIV specialists can prescribe HIV PrEP	0
(e) Insurance companies don't want to cover HIV PrEP for my Clients	0
(f) Clients and or I have concerns about the HIV PrEP drugs' side effects	0
(g) My clients cannot afford HIV PrEP services because of the high cost	0
(h) I have no reason	4 answers (44.44%)

6.What is the age group range that do you belong to?

18 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65 to 74	75 or older
0	0	3 (33.33%)	5 (55.56%)	1 (11.11%)	0	0

7.What is your gender at birth?

Female	Male
3 (33.33%)	6 (66.67%)

8. In what zip code is your home located at?

Illinois	Iowa
5(55.56%)	3 (33.3%)

Table 8

Pilot Test Summary and Inferences (n = 9)

	Actual Numbers	Percentage	Remarks
Completed surveys	9 out of 30	30%	I will expect about 30% response rate for the actual study
Returned to Sender because the participants were no longer at the provided address or retired	6 out of 30	20%	I will expect about 20% of the surveys sent out to be returned to me for the actual study because the participants might no longer at the provided address
Some participants that did not respond	15	50%	I will expect about 50% of the participants that receive the survey effectively, will not fill and send it back to me during the actual study data collection process.
Females responded	3 out of 15	20%	I will expect more males to respond
Males Responded	6 out of 15	40%	to the survey than females. Statistically, about 2/3 of the respondents will be male.
Responses from Illinois	5 out of 15	33.33%	No zip code on one
Responses from Iowa	3 out of 15	20%	Completed survey

Results of the Pilot Study

I presented the summary and inferences of the pilot study on Table 7. The returned responses exceeded the minimum number of height responses that was needed to consider the pilot study valid. The respondents did not suggest any corrections to the data collection instrument. However, there were several issues that I faced during the pilot study:

- Difficulty finding the participants' emails addresses to send them the Survey Monkey directly. Consequently, none of the respondents sent their responses via the Internet

- Difficulty locating some physicians' offices to hand out the questionnaires

- Some participants have retired or moved to other locations outside the geographic study area

- Delay in time to return the completed surveys

- Low response during the first month of the data collection.

I requested a change in the data collection procedures to overcome the problems. The Institutional Review Board (IRB) allowed me to raise the number of the surveyed physicians from 19 to 30. IRB authorized me also to hand out the survey to the participants at their office via their receptionists to improve the response rate of the pilot study. Therefore, I resumed the pilot study data collection through an in-person distribution of the survey to eleven (11) additional physicians. IRB also authorized me to make a change to the sample population for the actual study. I increased it from 185 to 300 participants. I also use my car GPS system for direction purpose. Finally, the pilot study allowed me to make the following projections on the possible outcomes of the actual study:

1. I expected about 30% response rate for the actual study

2. I expected about 20% of the surveys sent out to be returned to sender because the participants might no longer be at the provided address

4. I expected about 50% of the participants who receive the survey, not fill it out and send it back to me during the main study data collection process.

5. There will be more males to respond to the survey than females. Statistically, about 2/3 of the respondents were expected to be males.

One recommendation for self-improvement regarding the data collection of the main study was to find the ways to have the email addresses of the participants to facilitate the Internet-based survey participation. Unfortunately, it did not work out because I must buy the email addresses buy from a third party, which may violate the participants' privacy and the research ethical rules.

Data Collection of the Main Study

I collected the data between October 24th, 2015 and January 24th, 2016 (i.e., 90 days). Three hundred surveys were mailed via US postal services. I also used In-person distribution approach to drop off the questionnaire at the Physicians' offices. Ninety-seven family practitioners, 44 pediatricians, 80 internists, 41 obstetricians/gynecologists, and 38 Infectious disease/HIV specialists were surveyed. One hundred responses were returned. The response rate was 33.33% that was slightly greater than the 30% response rate of the pilot study.

From the plan presented in Chapter 3, I noted four inconsistencies in data collection and analysis. The first inconsistency was the change in the procedures that I have requested during the pilot study to address low response issues that arose. For example, the IRB allowed me to increase the number of the participants from 19 to 30 for the pilot study, and from 185 to 300 for

the main study. I calculated the actual sample size using Raosoft sample size calculator. I chose

30% as the percentage of the response distribution based on the 30% response rate projection of

the pilot study. With 5% margin of error, 80% confidence level, and 1139 population size, the

recommended sample size was $n = 124$ (Raosoft, n. d.). Also based on the pilot study response

rate of 30%, it was estimated that about 450 physicians would need to be contacted to obtain at

least 144 responses. However, due to time and cost restraints the decision was made to survey

300 physicians in the hope that a 50% response rate (higher than the pilot study response rate)

could be obtained through follow-up with the potential participants. The study ended up with

33.33% response rate, resulting in a sample size of $n = 100$.

The IRB authorized me to use the in-person distribution approach to distribute the survey

in some physicians' offices via their receptionists. I used a car GPS system to locate the

physicians' offices. I prolonged the data collection period from two months to three, allowing me

to collect more survey responses to scale up the response rate above the 30%. Two issues

affected the response rate: a failure to send out the survey to the estimated 450 physicians and

lack of participants' email to encourage online participation through Survey Monkey.

The second discrepancy was that no participant had used the Survey Monkey link provided in the

invitation letter as planned. The third discrepancy was that I dropped the binary logistic for

which the sample did not obey the normality assumption and used Kendall's tau-b correlation

test for the analysis of the research questions one and two. The final discrepancy was the usage

of Fisher's exact test ($R \times C$) to analyze research question three instead of the ANOVA

announced in Chapter 3. The change was necessary because the dependent variable (i.e., the

frequency of PrEP prescription was a categorical that I changed into binary (high/low). It is not a

continious variable. Therefore, ANOVA was no longer the correct test for the research question

3. Since I have two categorical variables, either chi-square (2x2) or Fisher's exact test (*R x C)* is the appropriate test. Furthermore, I have more than two groups in the specialty category. I also observed low cell counts in the data. Therefore, Fisher's exact test is the most suitable statistical test.

Study Sample

The survey sample included 300 Physicians or 26% from the 1,139 total physician population in the Quad Cities area and distributed across five specialties. The participants were evenly distributed across gender (150 females and 150 males) and geographic (150 participants from Illinois and 150 from Iowa). The final sample size was $n = 100$ or 8.7% of the total sample population, corresponding to the number of participants who completed the survey. I presented the distribution of the participants on Table 9.

Table 9

Response Rate Distribution Across Specialties (n =100)

Subpopulations	Survey sample	Actual number of responses (n)	Response rate
Family practitioners	97	30	30.93%
Infectious disease /HIV specialists	38	11	28.95%
Internists	80	17	21.25%
Obstetricians/ gynecologists	41	18	43.90%
Pediatricians	44	19	43.18%
Total	300	100	33.33%
Male	150	53	35.33%
Female	150	47	31.33%

Descriptive Analyses

I used the IBM SPSS Statistics 21 for all statistical analysis. The key variables were coded and typed in the SPSS system. I conducted a series of descriptive statistics analyses. The first analysis was a frequency test for the respondents' gender, geographic distribution, age (by category), years of experience (by category), and their specialty. There were $N = 100$ valid responses and zero missing data.

I evaluated the zip code of respondents to determine their geographic location (i.e., Illinois versus Iowa). The five digits of the zip code of the Quad Cities Illinois start with 6, and that of the Quad Cities Iowa with 5. Table 4 reveals that slightly more participants lived in Iowa. The majority of participants were male. Many were 45 to 54 years old. The greatest number of them had 11 to 15 years of experience. Family Practitioners were more represented. The frequency distributions were presented on Table 10.

Table 10

Frequency distribution of demographic variables (n = 100)

Variables	Frequency	Percent
Gender of respondent		
Male	53	53%
Female	47	47%
Age range of respondent		
25-34	13	13%
35-44	21	21%

(Table continues)

Variables	Frequency	Percent
45-54	31	31%
55-64	28	28%
65-74	7	7%
Location of respondent		
Illinois	48	48%
Iowa	52	52%
Year of experience of respondent		
0-5 years	14	14%
6-10 years	16	16%
11-15 years	20	20%
16-20 years	14	14%
21-25 years	18	18%
26 and more years	18	18%
Specialty		
Family practitioners	30	30%
Infectious disease /HIV specialists	11	11%
Internists	17	17%
Obstetricians/gynecologists	19	19%
Pediatricians	17	17%

The demographic characteristics of participants were represented on figures 4 – 8.
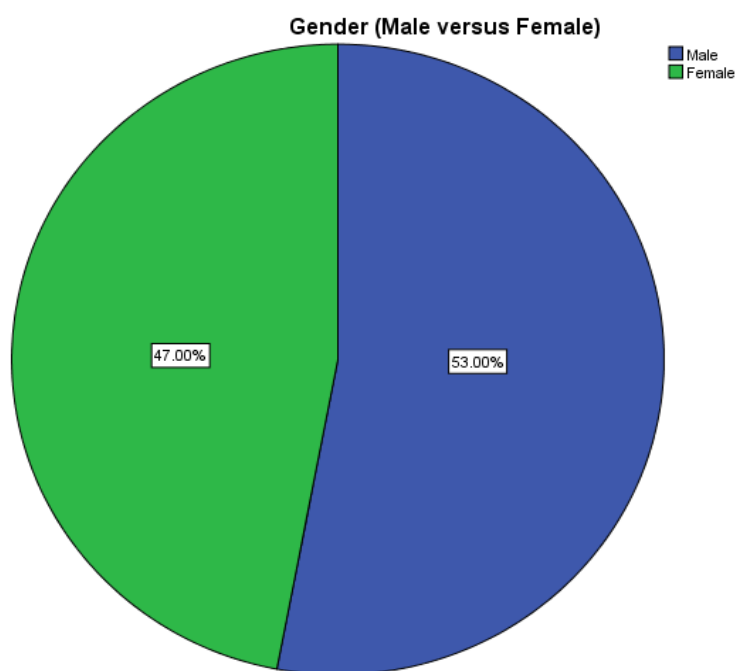

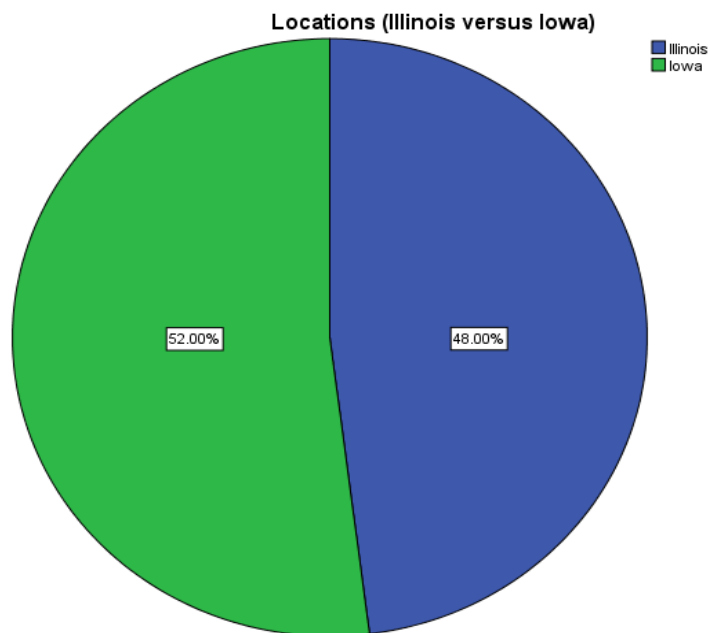*Figure 4.* Distribution of participants across gender.

Figure 5. Geographic distribution of participants.
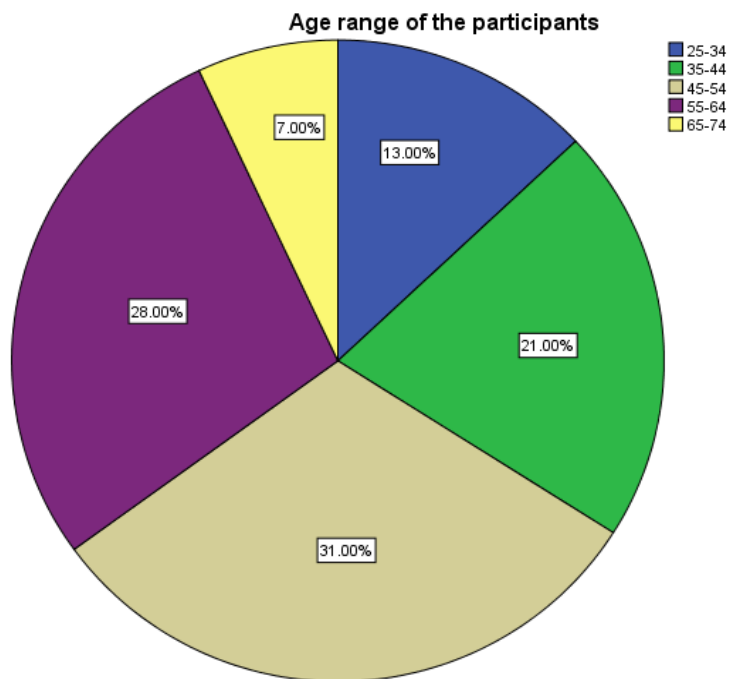
Figure 6. Age range distribution of participants.
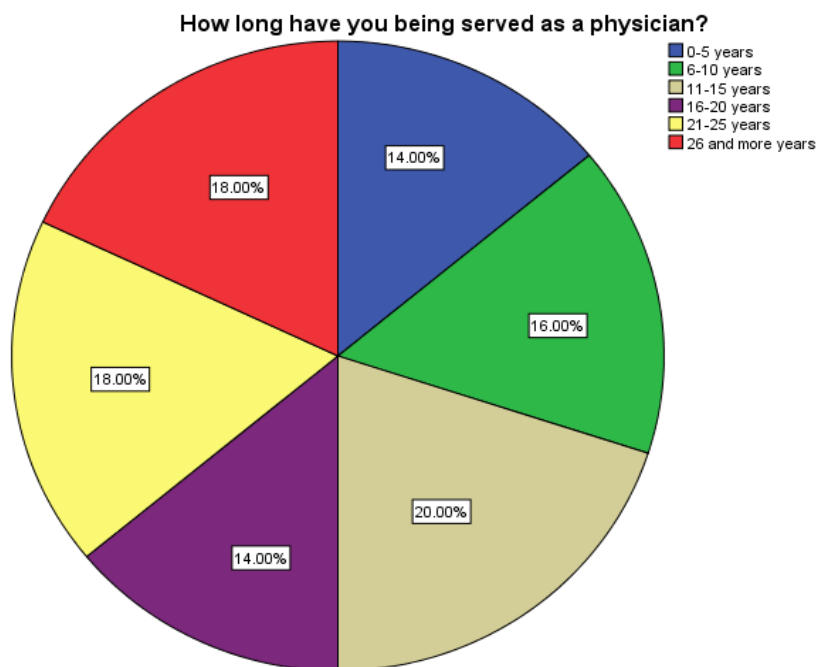
Figure 7. Distribution of participants across years of experience.
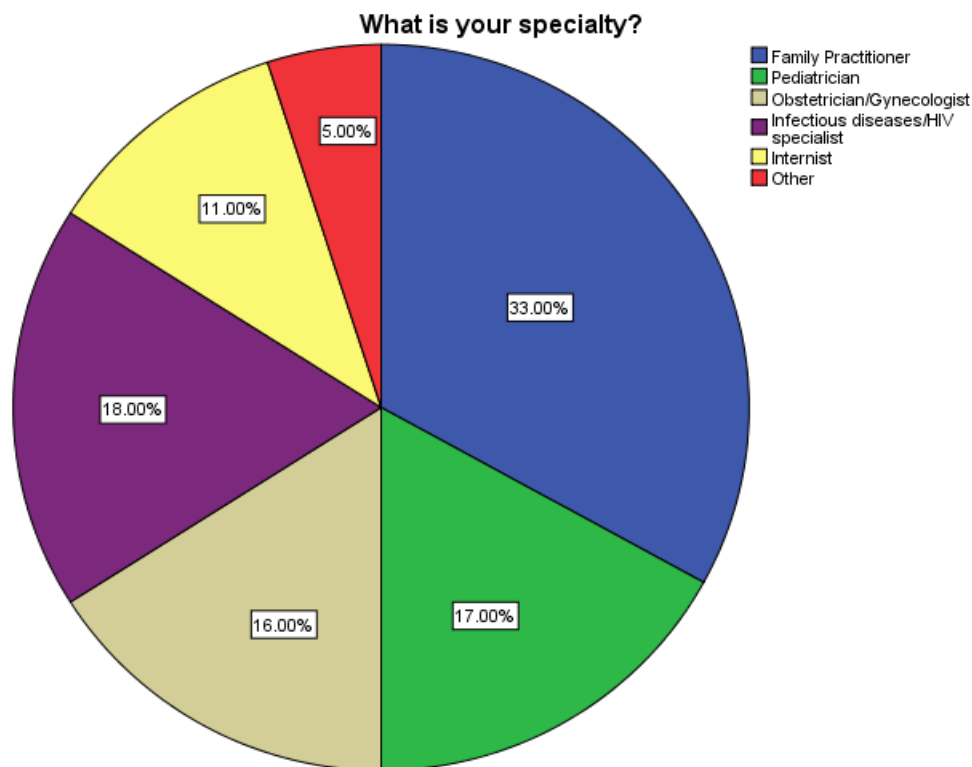
Figure 8. Distribution of participants across specialty.

Information on other survey responses was summarized in Table 5. The majority of respondents had very little awareness of PrEP. In addition, a higher number of them had never prescribed PrEP or thought about prescribing PrEP to their clients either. Furthermore, many participants declared that they don't know much about PrEP and its guidelines/protocol to prescribe or propose its services. See results on Table 11.

Note. I redefined the dependent variable, the frequency of PrEP prescription as Prescription of PrEP, and split it into a binary, Not prescribe PrEP coded *1* and Prescribe PrEP coded *0*.

Table 11

Frequency and Percent of Survey Responses (n=100)

How much do you know about PrEP?		
Response	Frequency	Percent (%)
Very much	2	2%
Much	1	1%
Quite a bite	10	10%
A little	32	32%
Very little	36	36%
None	18	18%
Don't know	1	1%
How often do you prescribe HIV PrEP?		
A little	3	3%
Very little	7	7%
None	89	89%
No answer	1	1%
Which of the following best describes your thoughts about prescribing PrEP? (Please circle one)		

(Table continues)

Response	Frequency	Percent (%)
I have never thought about prescribing PrEP to my clients	59	59%
I am undecided about prescribing PrEP to my clients	23	23%
I have decided; I do not want to prescribe PrEP to my clients	3	3%
I have decided; I do want to prescribe PrEP to my clients	13	13%
Other opinions	2	2%

What is the most accurate reason you may not prescribe or propose PrEP services to your clients who might need them? (Please check one)

I have never been in a situation that required me to prescribe or propose PrEP services to a client	34	34%

(Table continues)

Response	Frequency	Percent (%)
I don't know much about PrEP and its guidelines/protocol to prescribe or propose its services to my clients	53	53%
I think that only HIV specialists can prescribe HIV PrEP	2	2%
Insurance companies don't want to cover HIV PrEP for my client	1	1%
My clients cannot afford HIV PrEP services because of the high cost	1	1%
No reason	9	9%

I also presented these results in the pie chart format in figure 10.

How much do you know about PrEP?

Legend:
- Very much
- Much
- Quite a bite
- A little
- Very little
- None
- Don't know

1.00%
10.00%
18.00%
32.00%
36.00%
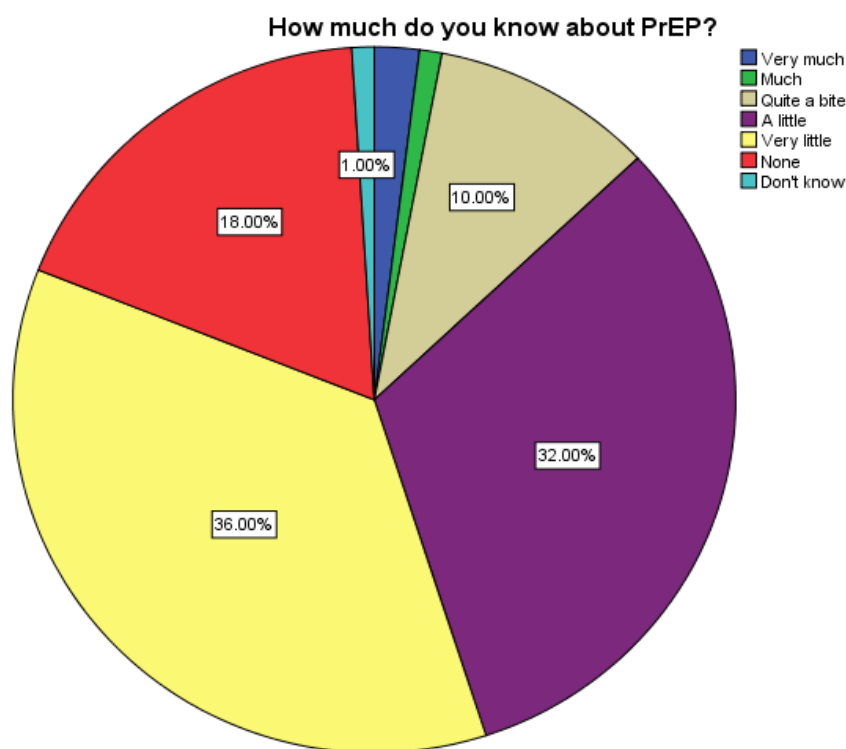
Figure 9. Level of PrEP awareness among participants.

Next, to be consistent with the research method that I proposed in chapter 3, I reset the response data for the questions regarding awareness and prescription of PrEP into binary variables. The two components of the independent variable, awareness about PrEP, were low awareness coded *1* and high awareness coded *2*. I defined low awareness as all answers that fall under (a little, very little, none, and don't know). The high awareness accounted for the answers that fall under (very much, much and quite a bit). The two components of the dependent variable, Prescription of PrEP were, not prescribe

PrEP coded *no*, and Prescribe PrEP coded *yes*. I considered the answers that fall under

(none, and don't know) for not prescribe PrEP. The answers that fall under very often,

often, quite a bit, a little, and very little were categorized as prescribe PrEP. The

frequency test was run for the two binary categorical variables.

The results were presented in the pie chart formats on Figures 10 and 11

Low Awareness Versus High Awareness About PrEP

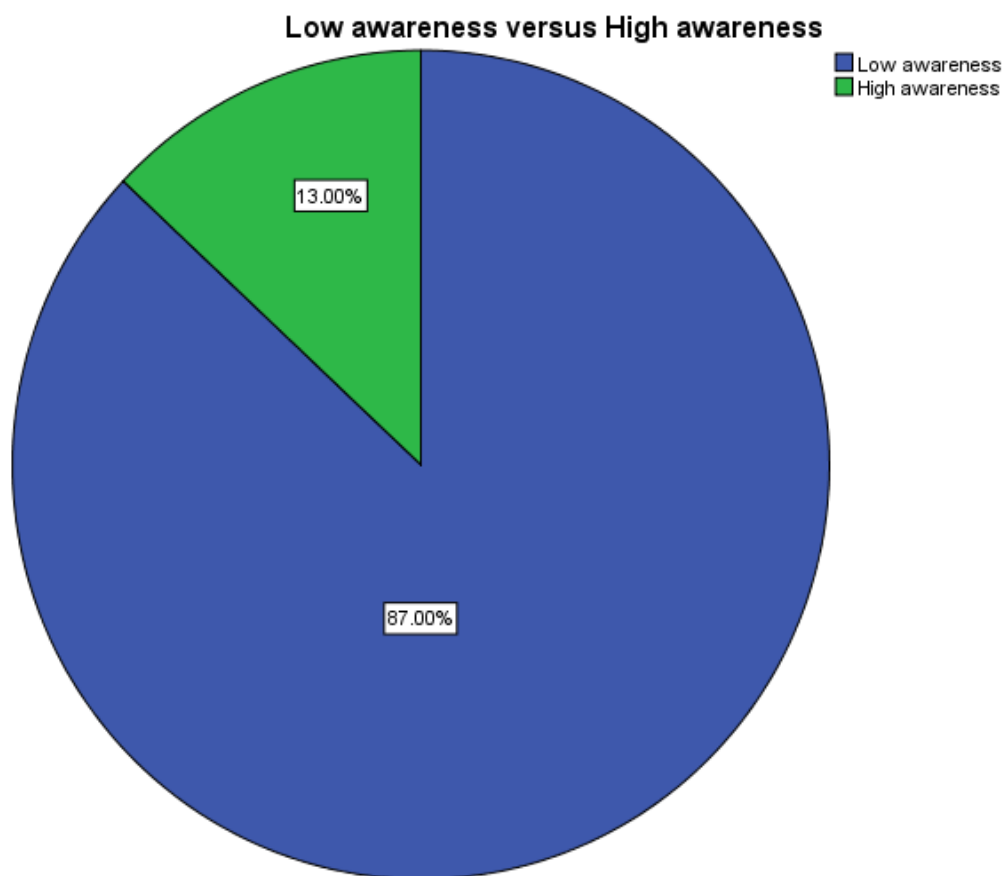*Figure 10.* Dichotomous distribution of the level of awareness about PrEP.

Eighty-seven percent of the respondents had low awareness about PrEP against 13% who

had a higher awareness about PrEP.

Prescribe Versus Not Prescribe PrEP

Only 10% of respondents had prescribed PrEP against 90% who did not prescribe it. See

results in Figure 11.
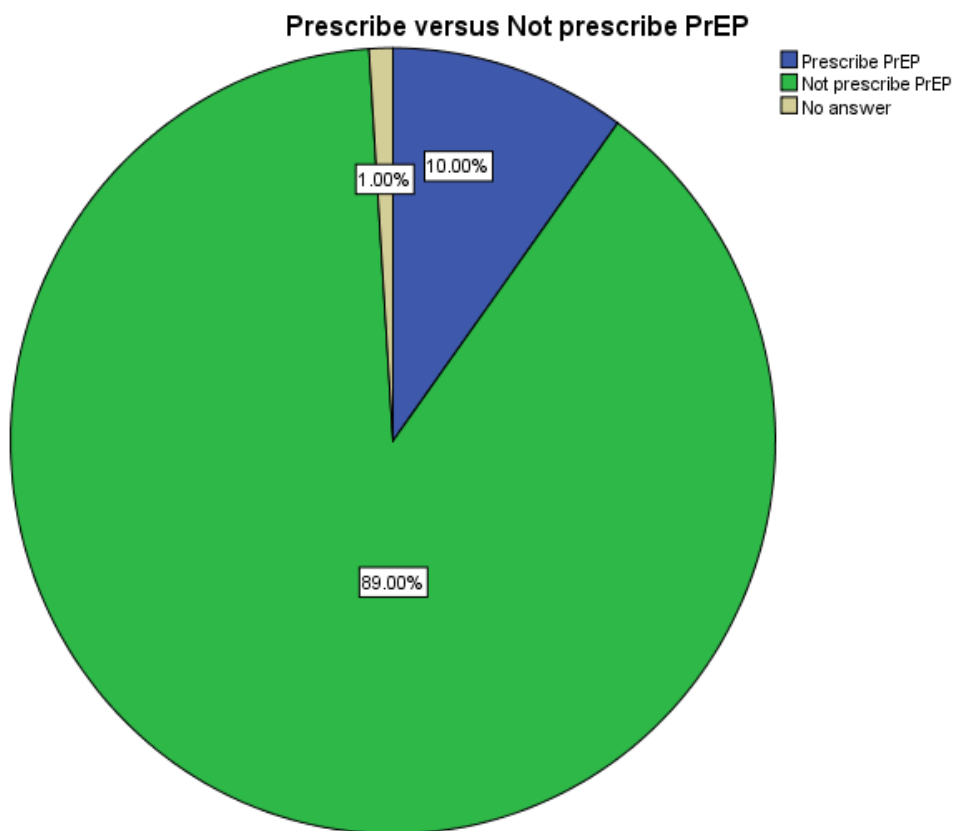
Figure 11. Dichotomous distribution of the frequency of PrEP prescription.

Cross Tabulation Test to Compare the Frequency of PrEP Across Independent

Variables

I run a series of cross-tabulation analyses to compare the mean of the frequency of

PrEP across provider types (specialties). Fisher's exact tests were performed for all the

other independent variables including awareness about PrEP, years of experience, and the

covariates, gender and geographic locations (Illinois vs. Iowa) because I had cell counts

that are less than 5 (Observed Values, n. d.). The results were presented in the Tables 12.

Table 12

Cross Tabulation Test of PrEP Prescription, Variables and Covariates (n=100)

Independent variables	Count for Prescribe versus Not prescribe PrEP		P-Values for each Variable
	Prescribe PrEP	Not prescribe PrEP	
Specialty			.181
Family Practitioner	3	30	
Pediatrician	1	16	
Obstetrician/Gynecologist	3	13	
Infectious diseases/HIV specialist	6	13	

Awareness			.017
Low awareness	9	78	
High awareness	5	8	
Years of experience			.002
0-5	0	14	
6-10	2	14	
11-15	0	20	
16-20	2	12	
21-25	2	16	
26 and more	8	10	
Gender			.361
Male	9	44	
Female	5	42	
Geographic location			.460
Illinois	8	40	
Iowa	6	46	

Two-sided Fisher's exact test revealed that the differences in the frequency of PrEP prescription across physicians' specialties were not statistically significant. The differences occurred more frequently than expected by chance ($P > 0.05$, Fisher's exact test). Inversely, there was statistically significant association between years of experience and the frequency of PrEP prescription ($P = .002$, two-sided Fisher's exact test). Pearson chi-square ($\chi 2$) test showed a significant association between awareness of PrEP and the frequency of PrEP prescription (p = .017). That between years of experience and the frequency of PrEP prescription was statistically significant too, confirming the result of Fisher's exact test performed earlier. Gender difference and geographic location covariates were not associated with the frequency of PrEP prescription. The results of the frequency of PrEP prescription across other covariates were presented in the Figures 12 – 17.
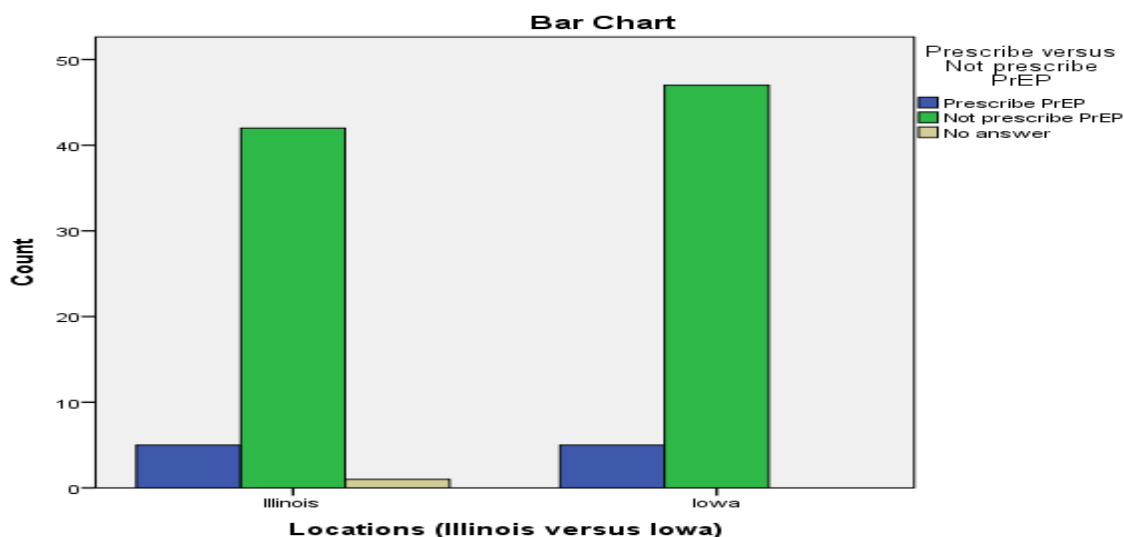

Figure 12. Frequency of PrEP across geographic locations (Illinois versus Iowa).
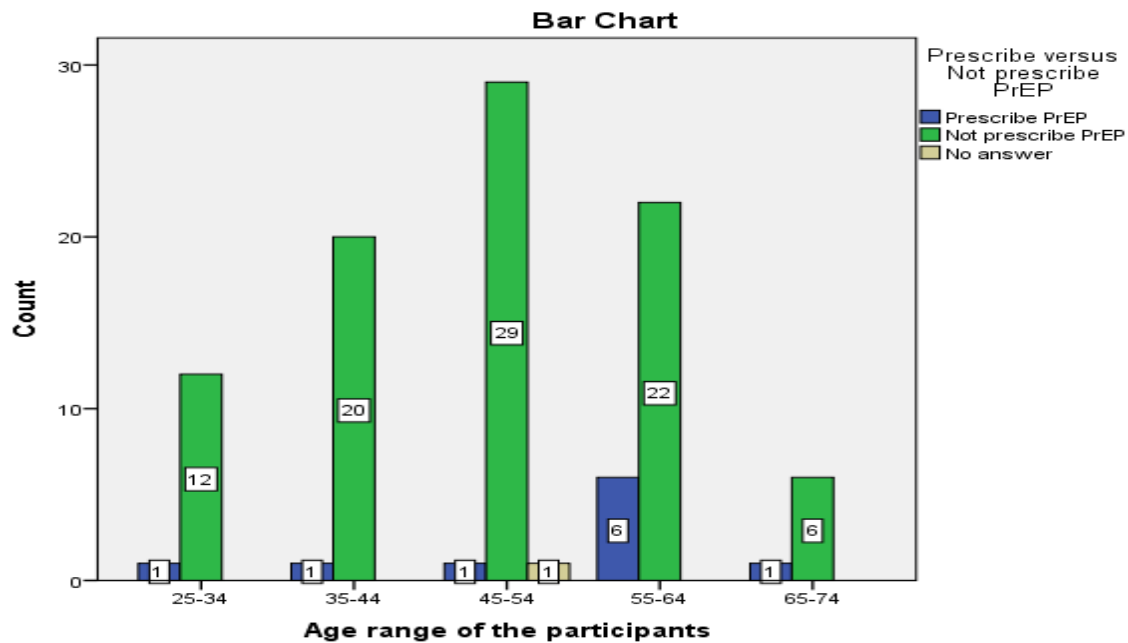
Figure 13. Frequency of PrEP across age ranges of the participants.
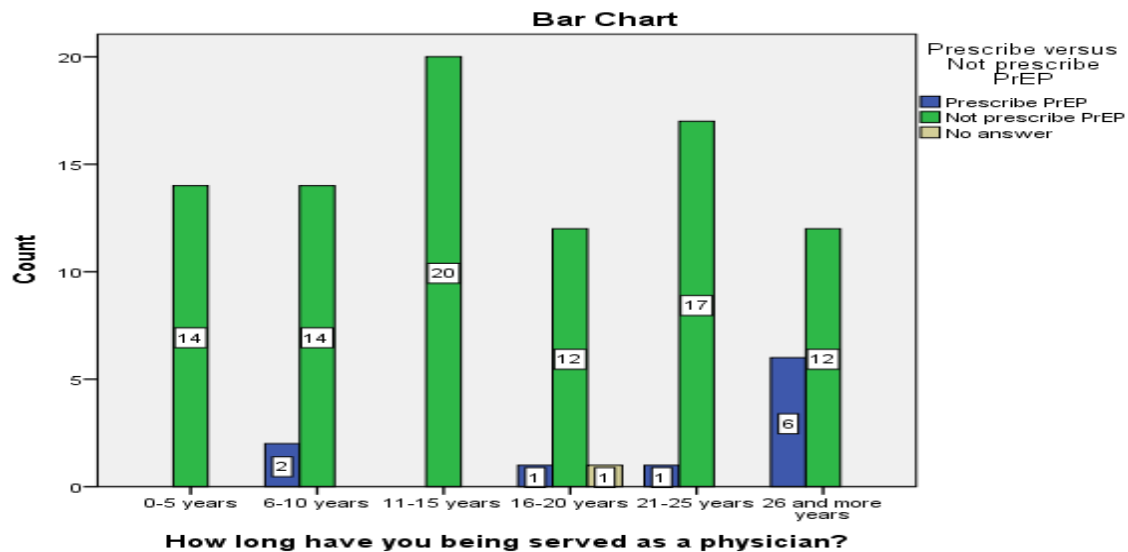

Figure 14. Frequency of PrEP by years of experience
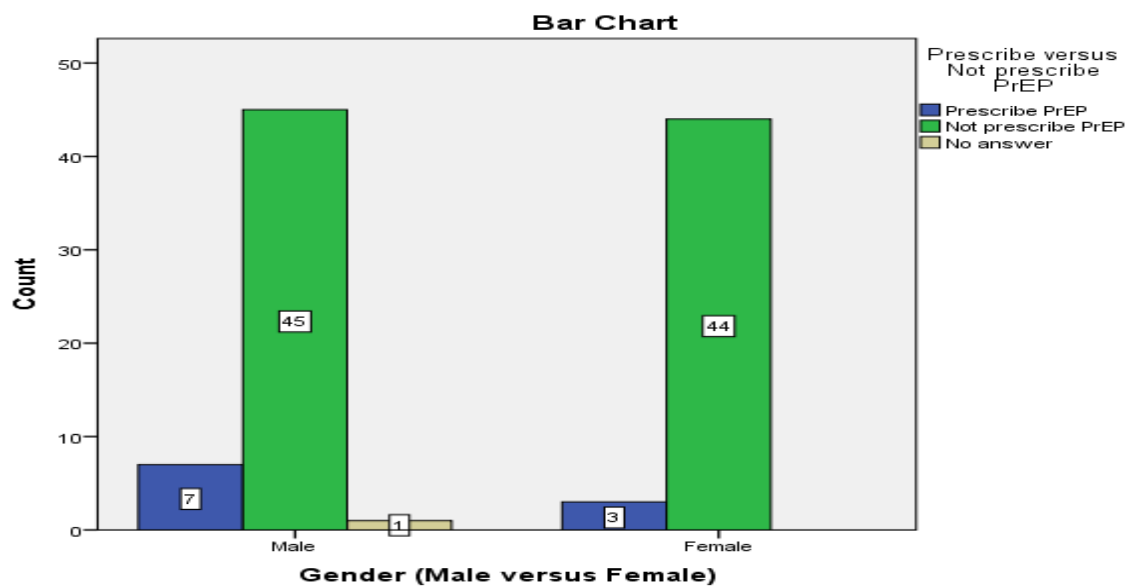
Figure 15. Frequency of PrEP prescription across gender (male versus female).
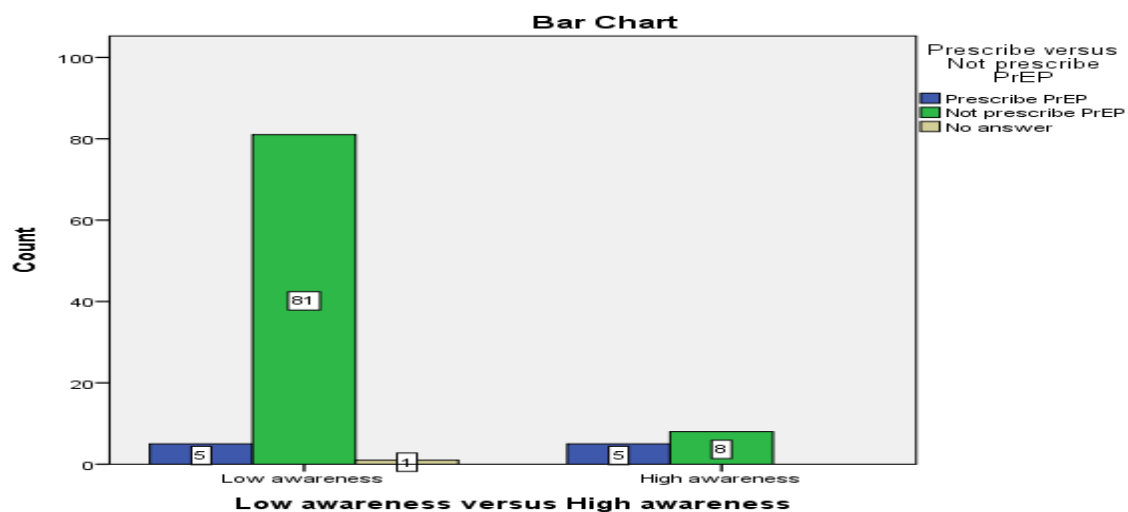
Figure 16. Frequency of PrEP by the level of PrEP awareness (low versus high

awareness).

Results by Research Question

I checked whether or not the assumptions for logistic regression analysis were met to ensure that the data were suitable for this test. The assumptions include:

1. Presence of dichotomous dependent variable,

2. Presence of one or more independent variables,

3. Ensure that the observations are independent,

4. Ensure that the sample size is greater than 10 cases per variable (rule of thumb),

5. Non multi-collinearity (Laerd Statistics, 2013)

6. Normality.

Observing the data set, I noticed that the first four assumptions were met for the following reasons. First, the dependent variable, the frequency of PrEP prescription was transformed into a dichotomous variable (i.e., prescribe PrEP, coded *yes* and not prescribe PrEP, and coded *no*. Second, I included in the study, one primary independent variable (awareness about PrEP) and many secondary independent variables or covariates (i.e., awareness of PrEP, years of experience, specialty, sex, age range, and location). Third, the responses provided for each question about the independent variables were independent of each other. Fourth, I observed more than ten (10) cases (i.e., 100 cases).

I ran a series of collinearity diagnoses to test for no multi-collinearity assumption. The results are presented in Tables 13 and 14.

Table 13

Collinearity Diagnosis for Multi-Collinearity (n = 100)

Model	Collinearity Statistics	
	Tolerance	*VIF*
Locations (Illinois versus Iowa)	.908	1.102
What is your specialty?	.997	1.004
Gender (Male versus Female)	.894	1.118
Prescribe versus Not prescribe PrEP	.985	1.015

Note. Tolerance > 0.10; *VIF* < 3

Table 14

Collinearity Diagnosis for Multi-Collinearity of Frequency of PrEP (n = 100)

Model	Collinearity Statistics	
	Tolerance	*VIF*
Low awareness versus High awareness	.787	1.271
Locations (Illinois versus Iowa)	.901	1.109
What is your specialty?	.818	1.223
Gender (Male versus Female)	.856	1.168

Note. Tolerance > 0.10; *VIF* < 3

For each collinearity analysis, the tolerance levels were very high (i.e., > 0.70), hence, greater than 0.10, the minimum tolerance level that indicates a presence of multi-collinearity. All *VIF* values were very low (i.e., around 1.1), hence less than *VIF* = 3, considered as the minimum *VIF* value to conclude for the existence of multicollinearity (Gaskin, 2011). Indeed, the assumption of no multicollinearity was met as well.

I also run Kolmogorov-Smirnov test to check the normality of the model. I used a stepwise (i.e., enter method) and incorporated all variables. The results showed *p*-values = 0.00 for each of the variables. The *p*-value was less than 0.05, indicating that the variables do not follow a normal distribution (Ghasemi & Zahediasl, 2012).

I transformed data using *1/x* and *x*-squared. Next, I run Kolmogorov-Smirnov to recheck the normality of the transformed data. The results were statistically significant, showing that the sample does not follow a normal distribution. Consequently, logistic regression model is not appropriate for the analysis.

Instead, I used Kendall's Tau-*b* test (a nonparametric test) to analyze the research question one and question two. I used it as an alternative to Spearman's rank-order correlation test whose monotonicity assumption was not met. Kendall's Tau-*b* model, not only measures the strength of association between binary variables, but also it indicates the direction of the relationship (Laerd Statistics, 2013). The assumptions of Kendall's Tau-*b* test were met; because, I can observe that the variables were continuous, and weighted on an ordinal scale. In addition, monotonicity is "not a strict assumption" for the model (Laerd Statistics, 2013). In a cancer study, Yao et al. (2007) used Kendall's Tau-*b* test to find statistically "significant association between *β1* integrin intensity score and fibronectin expression (Kendall's tau-*b* = 0.19; *P* = 0.03)" (Yao et al., 2007).

Research Question 1

What is the association between HIV PrEP awareness (independent variable) and the frequency of PrEP prescription (dependent variable) among primary care providers and HIV specialists in the Quad-Cities?

Ho1: There is no association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

Ha1: There is an association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

Research question one was tested using Kendall's tau-b correlation test to determine the association between 100 physicians' awareness of PrEP and the frequency of PrEP prescription among primary care providers and HIV specialists. There was a moderate, negative correlation between awareness of PrEP and the Frequency of PrEP prescription, which was statistically significant, ($\tau b = -.367, p < .001$). The negative value is an indication that the dependent variable and independent variable decrease collectively (What is Kendall's tau-b, 2016). Explicitly, the frequency of PrEP prescription decreases with the decrease of the physicians' awareness about PrEP. I presented the result in Table 15.

Table 15

Kendall's tau-b Correlation Test of Association Detween Awareness of PrEP and PrEP

Prescription (n = 100)

		Low awareness versus High awareness	Prescribe versus Not prescribe PrEP
Kendall's tau-*b*	Low awareness versus High awareness	Correlation Coefficient	1.000	-.367**
		Sig. (2-tailed)	.	.000
		N	100	100
	Prescribe versus Not prescribe PrEP	Correlation Coefficient	-.367**	1.000
		Sig. (2-tailed)	.000	.
		N	100	100

**. Correlation is significant at the 0.01 level (2-tailed).

I reject the null hypothesis. There is an association between HIV PrEP awareness and the

frequency of PrEP prescription among primary care providers and HIV specialists in the

Quad-Cities.

Research Question 2

What is the association between the number of years of service as a primary care provider or HIV specialist and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*o2**:** There is no association between the numbers of years of service as a primary care provider and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

*H*a2**:** There is an association between the numbers of years of service as a primary care provider and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

A Kendall's tau-*b* correlation test was run to determine the association between 100 physicians' years of experience and the frequency of PrEP prescription. The results presented in Table 16 showed a weak negative correlation between years of service and the Frequency of PrEP prescription, which was statistically significant ($\tau b = - .228$, $p = .010$). The negative value shows that the frequency of PrEP prescription decreases when the number of years of service as a primary care provider decreases.

Table 16

Kendall's tau-b Correlation test of Association Between Years of Experience and PrEP

Prescription

			Prescribe versus Not prescribe PrEP	How long have you been served as a physician?
Kendall 's tau-*b*	Prescribe versus Not prescribe PrEP	Correlation Coefficient	1.000	-.228[*]
		Sig. (2-tailed)	.	.010
		N	100	100
	How long have you been served as a physician?	Correlation Coefficient	-.228[*]	1.000
		Sig. (2-tailed)	.010	.
		N	100	100

*. Correlation is significant at the 0.05 level (2-tailed).

I rejected the null hypothesis. There is an association between the numbers of years of service as a primary care provider and the frequency of PrEP prescription.

Research Question 3

What is the difference between provider types and the frequency of PrEP

prescription among primary care providers and HIV specialists in the Quad-Cities?

*H*o3: There is no difference in provider types and the frequency of PrEP

prescription among primary care providers and HIV specialists in the Quad-Cities.

*H*a3: There is a difference in provider types and the frequency of PrEP

prescription among primary care providers and HIV specialists in the Quad-Cities.

Fisher's Exact test was used for research question 3 to examine whether there is a

difference in provider types and the frequency of PrEP prescription among primary care

providers and HIV specialists.

Checking for Fisher's Exact Assumptions

I have a small sample size $N = 100$. The participants to the survey are independent

of each other. I also have two categorical variables and more than two groups (5 groups)

in the specialty category. Therefore, Fisher's exact test assumptions were met.

For information, one-way Analysis of Variance (ANOVA) was projected to

analyze the research question three. However, the model did not fit because the

continuity assumption one was not met. The dependent variable (i.e., the frequency of

PrEP prescription) was not continuous. It was categorical that I changed it into binary

(high frequency/low frequency). I have more than two groups in the specialty category

and small cell counts in the categories. Therefore, I chose Fisher's exact test to analyze

the research question 3 over Kendall's tau-b correlation test that used to weight the

research questions one and two. The research questions 1 and 2 focus establishing the

association between the variables, and therefore align with Kendall's Tau-b that "is a

measure of association" (Non-parametric Measures, n. d.). On another hand, the research

question 3 is about determining the difference in PrEP prescription among five

specialties; therefore, fit into Fisher's exact model that determine the difference within

groups (Mehta & Patel, n. d.). Table 17 showed the cross-tabulation of the frequency of

PrEP prescription by specialty.

Table 17

Cross Tabulation of the Prescription of PrEP across Specialty (n = 100)

Specialty	Count and Percent (%)	Prescribe versus Not prescribe PrEP	
		Prescribe PrEP	Not prescribe PrEP
	Count	3	30
	% within specialty	9.1%	90.9%
Family Practitioner	% within Prescribe versus	21.4%	34.9%
	Not prescribe PrEP		
	Count	1	16
	% within specialty	5.9%	94.1%
Pediatrician	% within Prescribe versus	7.1%	18.6%
	Not prescribe PrEP		
	Count	3	13
Obstetrician/Gynecologist	% within specialty	18.8%	81.3%

(Table continues)

Specialty	Count and Percent (%)	Prescribe PrEP	Not Prescribe PrEP
	% within Prescribe versus Not prescribe PrEP	21.4%	15.1%
Infectious diseases/HIV Specialist	Count	4	14
	% within specialty	22.2%	77.8%
	% within Prescribe versus Not prescribe PrEP	28.6%	16.3%
Internist	Count	3	8
	% within specialty	27.3%	72.7%
	% within Prescribe versus Not prescribe PrEP	21.4%	9.3%
Total	Count	14	86
	% within specialty	14.0%	86.0%
	% within Prescribe versus Not prescribe PrEP	100.0%	100.0%

Note. Fisher's Exact Test showed *p* = .130.

I also presented the results in the bar chart in Figure 17.
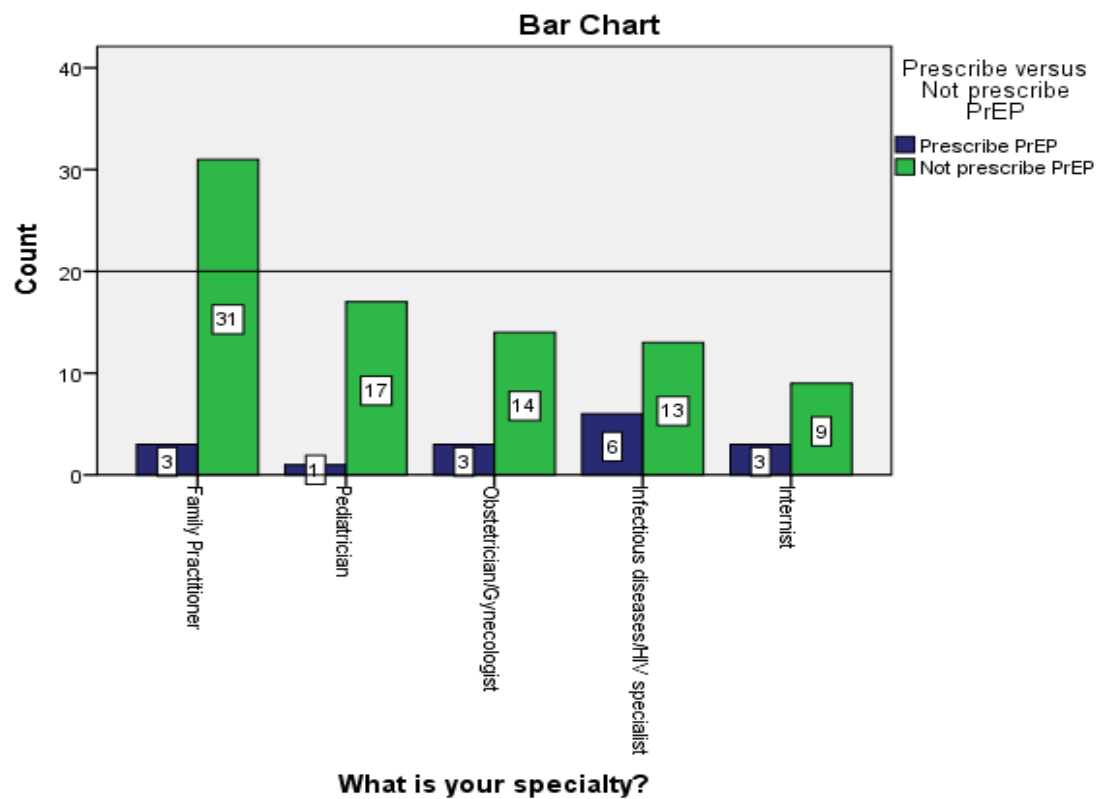
Figure 17. Differences in the frequency of PrEP prescription across specialty.

Based on Fisher's Exact test, there was no statistically significant difference at

0.05 significance level ($p = .130$). Therefore, I failed to reject the null hypothesis and

conclude that there is no difference in specialty and the frequency of PrEP prescription

among primary care providers and HIV specialists in the Quad-Cities. I summarized the

results of the three research questions in Table 18.

Table 18

Summary of the results of the PrEP study (n = 100)

Research Questions	Statistical tests	Results	Conclusions
RQ1: What is the association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?	Kendall's tau-b correlation test	There was a statistically significant association. ($\tau b = -.367, p < .001$).	I reject the null hypothesis. There is an association between HIV PrEP awareness and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities
RQ2: What is the association between the number of years of service as a primary care	Kendall's tau-*b* correlation test	There was a statistically significant association.	I reject the null hypothesis. There is an association between the numbers of years of

(Table continues)

Research Questions	Statistical tests	Results	Conclusions
provider or HIV specialists and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?		$(\tau b = -.228, p = .010)$	service as a primary care provider and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.
RQ3: What is the difference between provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities?	Fisher's Exact test	No statistically significant difference $P = 0.130$	Null hypothesis is not rejected. There is no difference in provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

Summary

The majority of the respondents had low awareness of PrEP. The frequency of not prescribing PrEP was very high. Ninety percent did not prescribe PrEP. About 60% have never thought about prescribing PrEP. The lack of awareness of PrEP and the lack of PrEP prescribing opportunities were the two primary reasons for physicians' reluctance to prescribing PrEP. For example, more than the half of the participants do not know much about PrEP guidelines/protocol in order to prescribe or propose its services to the patients. About one-third of them had never been in a situation that required prescribing PrEP. Physicians who had higher awareness about PrEP prescribed it often compared to those who know only little about. Based on the cross-tabulation analysis, the physicians with many years of professional experience often prescribed PrEP. For example, the highest frequency of PrEP prescription was found among the physicians that have 26 and more years of experience, and the lowest frequency of PrEP prescription was found among the physicians that have 0-5 years of experience. Furthermore, infectious disease / HIV specialists prescribed more often PrEP. Physicians aged between 55 and 64 years old and more, prescribed PrEP very often. Males more often prescribed PrEP compared to females. Geographically, the frequency of PrEP prescription was almost equally distributed across both Illinois and Iowa-Quad Cities areas.

Kendall's tau-*b* correlation analysis of the research question one showed a statistically significant association between awareness of PrEP and the frequency of PrEP

prescription (τb = - .367, p < .001). That of the research question two also revealed a statistically significant association between years of experience and the frequency of PrEP prescription (τb = - .228, p = .010). Regarding the research question three, Fisher's Exact test showed p = 0.130, meaning that there was no statistically significant difference in provider types and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities.

     In Chapter 5, I discuss the interpretation of the findings and conclusion of the results. I also discuss the limitations of the study, the implications for social change, and end the chapter by suggesting recommendations for future research.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

In this survey study, I aimed to explore the barriers to prescribing HIV PrEP and the need for education among care providers in the Quad Cities. The probability of contracting HIV is high among people who live in serodiscordant relationships. Securing a healthy sexual relationship was one of the top wishes of the serodiscordant sexual partners or couples (Heitz, 2015). PrEP was revealed 96% operative to decrease the risks of HIV infection in HIV-negative populations. However, the protocol of PrEP prescription is understood, causing under prescription among primary care providers and infectious diseases/HIV specialists (Carter, 2015). For these reasons, I proposed to test the hypothesis that awareness of PrEP, years of experience in the medical field, and provider types might be associated with the frequency of PrEP prescription among primary care providers and HIV specialists. To assess the level of PrEP awareness, and how often the care providers prescribe PrEP, I ran a series of frequency tests using SPSS. I used Kendall's tau-*b* correlation test and Fisher's exact test to analyze the research questions. The findings showed that lack of awareness of and missing the opportunity to prescribe PrEP were the two primary barriers to prescribing PrEP at the care providers' level. Kendall's tau-*b* correlation test revealed that there was a statistically significant association between awareness about PrEP and the frequency of PrEP prescription. The relationship between the years of experience and the occurrence of PrEP prescription was

also statistically significant. Fisher's exact tests showed non-significant differences between provider types and the frequency of PrEP prescription. In the following discussion, I describe the findings, compare them to those from the previous studies, and analyze them in the theoretical framework standpoint.

Interpretation of the Findings

I examined how HIV PrEP awareness, providers' years of service, and provider types could be used as predictors of the frequency of PrEP prescription. Many types of research have been conducted on the barriers of prescribing PrEP at the client or patient level. However, literacy on PrEP provision among primary care physicians and HIV specialists is lacking. The findings of the dissertation research revealed a relationship between awareness about PrEP and the frequency of PrEP prescription. I also found that the relationship between the years of experience and PrEP prescription were statistically significant. There is no statistically significant difference in provider type and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad Cities.

I discovered that the majority of respondents had low awareness about PrEP. Rosenthal et al. (2013) also found that the majority of physicians were unaware of the PrEP. Similar to Krakower and Mayer (2013), I found that PrEP was underprescribed among primary care providers and infectious diseases/HIV specialists. I also discovered that the frequency of PrEP prescription was high among those who have high awareness of PrEP. These findings are similar to those of other studies conducted by Young et al.,

(2013); Puro, et al., (2013); White et al., (2012). They found increased knowledge about PrEP associated with the rise in the frequency of PrEP prescription among primary care providers.

In light of the observations described above, primary care providers and HIV/AIDS specialists' disposition to prescribe PrEP depend on how much information and knowledge they have about PrEP. Moreover, providers' readiness to prescribe PrEP and patients' wiliness to adopt it should be the sine-qua-none conditions to promote PrEP regimen in the Quad Cities. However, I did not explore patients' attitudes towards, and need of PrEP services in this study.

The findings disconfirmed the assumption that the frequency of PrEP prescription is different as far as the physicians' specialty. Furthermore, the results did not support the hypothesis that there is a difference in provider types and the frequency of PrEP prescription among primary care providers and HIV specialists. In addition, while Hoberg and Raymond (2013) found that high cost of PrEP could dissuade its prescribers and users, this study revealed that excessive cost and coverage of PrEP issues were not the primary barriers of prescribing it. Finally, the findings were opposite of the findings of Puro et al. (2013) that demonstrated that only HIV/AIDS specialists had a privilege to prescribe PrEP. In fact, this study showed that even non-HIV/AIDS specialists (i.e., family practitioners, internists, obstetricians/gynecologists, and pediatricians), had prescribed PrEP.

This study adds to the body of public health knowledge through the discovery that lack of awareness about PrEP and lack of opportunity are the primary barriers to prescribing PrEP at the physicians' level. It provides insights that males are more likely to prescribe PrEP than females. It also shows equal distribution of the frequency of PrEP prescription across Illinois and Iowa.

Theoretical Framework

The principles of the PAPM as applied to this study include (a) identification of the seven stages of PAPM where physicians went through when prescribing PrEP and (b) definition of the factors that stimulate their movement from one stage to another. The results of the survey provided information on the physicians' attitudes corresponding to each stage of the constructs of PAPM.   I observed the following:

The majority of the respondents have never thought about prescribing PrEP (Stage 1: unaware).

1. Twenty-three percent of respondents were unresolved about prescribing PrEP (Stage 3: undecided).

2. Thirteen percent have decided that they want to prescribe PrEP (Stage 5: decided to act).

3. Three percent have declared "do not want to prescribe PrEP" (Stage 4: decided not to act.), and

    Two percent have no opinion of prescribing PrEP. Here are some possible interpretations:

Stage 1: **Unaware**

About one-fifth of the physicians had never heard of PrEP. Therefore, they would never prescribe PrEP. There is a need for basic information (education) on PrEP to allow them to move to the next stages.

Stage 2: Unengaged

About 70% of the participants learned very little or a little about PrEP. However, they were not yet engaged due to underprescribing PrEP. Targeted education is desirable to make PrEP and the need for action personally important to unengaged physicians.

Stage 3: Undecided

About a quarter of the surveyed physicians were undecided about prescribing PrEP, meaning that they were engaged with the issue and looking for how to proceed. Since they did not yet form an opinion about prescribing PrEP, they would be less resilient to persuasion (DiClemente, Crosby, & Kegler, 2002). Therefore, technical training is necessary for undecided physicians.

Stage 4: Decided Not to Act

Less than 5% of the surveyed physicians said that they do not want to prescribe PrEP. I assumed these people were aware of PrEP but have unexpressed reasons that challenge their decision to prescribe it. DiClemente et al. (2002) stated that those individuals might be difficult to persuade, and the precaution adoption process ends there.

On the other hand, some may hold off on deciding and stay undecided (Stage 3). Proactively identifying these barriers to PrEP education programs could help health educators to develop suitable strategies to overcome them.

Stage 5: Decided to Act

About 15% of the participants said that they plan to prescribe PrEP. I assumed that these individuals were conscious of the risks for not prescribing PrEP and the outcomes. Therefore, they decided to prescribe it. I used the data as baseline information to measure the percentage of physicians who are ready to prescribe PrEP in the Quad Cities area.

Stage 6: Acting

Ten percent of the surveyed physicians are prescribing PrEP. I also assumed that they might have some intrinsic and extrinsic motivations that I did not examine. Refreshment PrEP training might be needed to empower that target populations to continue prescribing PrEP

Stage 7: Maintenance

The study did not provide relevant data to quantify the number of physicians who have maintained their prescribing of PrEP over time. Further investigation of this aspect of PAPM is desirable.

Limitations of the Study

The physicians surveyed in this study did not represent a sample of all care providers that can prescribe PrEP in the United States. It included family practitioners, infectious disease/HIV specialists, internists, obstetricians/gynecologists, and pediatricians only. I might expand the sample to include other medical specialties such as physician assistants and certified nurse practitioners. Furthermore, the answers to the questions could be biased because of the self-reported survey (Yu & Tse, 2012). By aligning the survey questions strictly to the study's theoretical framework context, I missed the opportunity to include a question that will help me to quantify the need for PrEP education among physicians with exactitude. I wish I added the following "yes" or "no" question to the survey questions: Do you want to learn more about PrEP? By default, I determined the need for PrEP education based on inference to answer b of the following survey question, "What is the most accurate reason why you may not prescribe or propose PrEP services to your clients who might need them?" (Please check one). I assumed that every participant who selected answer b, "I don't know much about PrEP and its guidelines/protocol to prescribe or propose its services to my clients," has implicitly expressed, a need for PrEP education. Therefore, the data may be misreported. The results of the pilot test of the survey instrument provided evidence that supports the reliability of the data collection tools.

In Chapter 2 related to the literature review, I failed to report that the efficacy of the PrEP usage matches that of usage of condoms (Thompson, April 2014). Because the

usage of condoms only could not end HIV/AIDS pandemics, Thomson (2014) stated,

"We have already lost the battle in condom use … condoms fatigue" (p.19). Therefore, a

PrEP regimen that integrates steady and correct usage of condoms is recommended to

prevent HIV transmission.

The findings both confirmed and disconfirmed many results from the literature

review on the concepts and key variables. For example, this study revealed the need for

PrEP education and literacy improvement for physicians. Likewise, Krakower and Mayer

(2012) showed that PrEP education enhancement within care providers is desirable to

limit the higher HIV infection incidence rate in the United States. The findings also

indicated that the majority of physicians do not prescribe PrEP because they do not know

about its protocol. This confirms foundings from White et al. (2012) that 96% of

physicians believed that formal PrEP guidelines from the CDC would increase their

readiness to prescribe PrEP. Similar to results of the literature review, this study revealed

that PrEP was understood among primary care providers (Rosenthal et al., 2013).

Whereas the literature review demonstrated the effectiveness of PrEP

(Choopanya, et al., 2013; Paltiel et al., 2009), this study was limited to investigating the

variance in the frequency of PrEP prescription among physicians. The literature review

also found an association between stigma and PrEP prescription (Smith et al., 2012).

However, I did not include stigma in the key variables of this study.

In relation to inferences from the research data, the participants were randomly

selected as well as engaged from different hospitals to ensure the generalizability of the

study (Creswell, 2009). Therefore, the study can be generalized to other care providers nationally and worldwide. Furthermore, the pilot tested survey instrument could become a reference for future researchers.

Recommendations for Action and Future Study

This research established a statistically non-significant difference in provider types and the frequency of PrEP prescription among the physicians from the five specialties engaged in the study. Therefore, I would recommend a study that includes other specialties or groups, such as physician assistants and nurse practitioners that can prescribe PrEP. I would also suggest using the odds ratio analysis to determine whether the probabilities of prescribing PrEP are similar for primary care providers and HIV Specialists. The actual study includes very small sample size. I would propose a quantitative study involving a large sample size. To better understand the barriers to PrEP prescription, I would suggest qualitative research through interviews and focus group discussions targeting physicians from different settings. Further implementation research may be needed to understand and improve PrEP delivery at local and state levels. I would recommend using the results of this study to support or justify PrEP education and implementation grants projects. The findings can also inspire policies to regulate and update HIV/AIDS structural interventions. For example, it may be necessary to develop policies that support integrated PrEP implementation strategies. The strategies could consist of using HIV test to inform on PrEP, adding PrEP to risk assessment counseling

process, and integrating PrEP referrals into partner services, STD clinics, and social network strategies.

As a call for action to improve the frequency of PrEP prescription, I would recommend the following:

- Create a PrEP center in the Quad Cities area and wherever there is a need to better identification of, and response to, under-prescribing of PrEP gaps;

- Develop a comprehensive PrEP education curriculum that aligns to the precaution adoption process model for care providers nationwide;

- Include PrEP topics into the continued education online training modules for all physicians, physicians assistants, and nurse practitioners;

- Develop policies that support integrated PrEP implementation strategies. The strategies could consist of using HIV test to inform on PrEP, adding PrEP to risk assessment counseling process, integrating PrEP referrals into partner services, STD clinics, and social network strategies, and

- Educate and train providers including case managers, outreach staff, and testing counselors about PrEP guideline, PrEP protocols, its advantages and limits.

Finally, I would suggest taking PrEP information beyond care providers to the community as large trough community forums, community outreaches, seminaries, peer education, and webinars.

Implications for Social Change

This study is of public health interest. By empowering care providers to prescribe PrEP more often to vulnerable populations including sex workers, persons in a serodiscordant relationship and others, the study will bring positive changes to individuals and their families. The direct impacts could include peace of mind and elimination of fear of the HIV infection. PrEP will not only bring new dynamics (i.e., confidence, psychological supports, love, harmony, sexual freedom, etc.) in the family of serodiscordant individuals but will also prevent new infections. Next, providing PrEP to the professional sex workers and multiple sex partners will reduce HIV infection in the community. At the organizational level, the study could add value to the public health educators' efforts to advance the population health. It provides empirical data and a theoretical framework that HIV/AIDS prevention and treatment agencies/organizations can use for different purposes. Further, this study presents PAPM, as a potential evidence-based theoretical framework for the future PrEP interventions. The methodological approach could be a reference for many researchers, health educators, HIV/AIDS organizations and other public health professionals to advance research in the field.

Conclusion

Statistical analyses showed that there is an association between Prep awareness and frequency of PrEP prescription. However, if this study had identified an association

between awareness of PrEP and the frequency of PrEP prescription, may have been increased with the high PrEP awareness. I rejected the null hypothesis that "there is no association between the numbers of years of service as a primary care provider and the frequency of PrEP prescription among primary care providers and HIV specialists in the Quad-Cities" too. Therefore, the number of years of service as a primary care provider and the frequency of PrEP prescription were associated. The unknown was the maximum number of years of experience as a standard to predict the outcome of PrEP prescription among primary care providers and HIV specialists.

I found no difference in provider type and Prep prescription. Infectious diseases and HIV/AIDS specialists prescribed PrEP more often than other specialties. About one-third of HIV/AIDS frontline care providers have few opportunities to prescribe PrEP; whereas many other physicians are missing these chances in the United States (Carter, 2015). The majority of doctors including family practitioners, internists, obstetricians/gynecologists and pediatricians had low awareness about PrEP. They had differences of opinion and practice regarding PrEP prescription. Primary care physicians believed that it was HIV/AIDS specialists' responsibility to prescribe PrEP. Inversely, HIV/AIDS specialists thought that PrEP is a preventive approach and should be handled by primary care physicians.

In the absence of an HIV vaccine, PrEP could become an indispensable tool to prevent HIV infection. Therefore, it is urgent to scale up PrEP prescription across the United States and beyond by creating adequate infrastructures for PrEP provision and by

providing continued PrEP training to health care professionals. It is also important to provide physicians appropriate tools to detect persons at-risk for HIV infection, and encourage them to prescribe PrEP more often to these vulnerable persons. Ultimately, the results of this study indicate that physicians need education and training to fully understand the potential of PrEP to reduce HIV transmission in the Quad Cities area.

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Appendix A : Pilot Project Survey Questionnaire

PART 1 – DEMOGRAPHIC INFORMATION

The information that you provide is only for statistical drive. I will remain confidential and anonymous. Your participation will be highly appreciated.

1. Your area Zip Code is

    ………………………………………………………………….

2. Your Gender (Please, circle one)

    -   Male

    -   Female

3. What is your age? (circle that applied)

    -   18 to 24

    -   25 to 34

    -   35 to 44

    -   45 to 54

    -   55 to 64

    -   65 to 74

    -   75 or older

PART II – QUESTIONS ON HIV PrEP AWARENESS

1) Tell me the number that shows how much you know about HIV Pre-Exposure

    Prophylaxis (PrEP). (Please, circle that is applied to you.)

    1. Very much   5. Very little

    2. Much   6. None

3. Quite a bit   7. Don't know

4. A little   8. No answer

TART III – QUESTION ON HIV PrEP PRESCRIPTION FREQUENCY

2) Tell me the number that shows how often you prescribe HIV PrEP. (Circle that is applied to you.)

     1. Very often   5. Very little

     2. Often   6. None

     3. Quite a bit   7. Don't know

     4. A little   8. No answer

PART IV – QUESTION ON THE YEAR OF SERVICE AS A PRIMARY CARE PROVIDER OR A HIV SPECIALIST

3) How long have you being served as a primary care provider or a HIV specialist? (Circle the group that is applied to you.)

a) 0 to 5 years

b) 6 to 10 years

c) 11 to 15 years

d) 16 to 20 years

e) 21 years and more

PART V – QUESTION ON THE SPECIALTIES

4) Circle all that applied to you:

a) I am a family practitioner.

b) I am a pediatrician.

c) I am an internist.

d) I am an-obstetricians/gynecologists.

e) I am an infectious disease specialist

f) I am a HIV specialist

g) Other (please, precise) ………………………………………………………………….

PART VI – QUESTIONS ON HIV PrEP PRESCRIPTION ATTITUDE AND BARRIERS

5) Which of the following best describes your thoughts about prescribing PrEP? (Circle that is applied)
   a) I have never thought about prescribing PrEP to clients.

   b) I am undecided about prescribing PrEP to clients.

   c) I have decided I do not want to prescribe PrEP to clients.

   d) I have decided I do want to prescribe PrEP to clients.

6) Select the most accurate reason (only one) why you might not prescribe or propose HIV

   PrEP services to your clients who might need it from the following:

   a) I have never been in a situation that required me to prescribe or propose HIV PrEP

      services to a client.

   b) I don't know much about PrEP and its guidelines/protocol to prescribe or propose its

      services to my clients.

   c) I think that only HIV specialists can prescribe HIV PrEP.

   d) Insurance companies don't want to cover HIV PrEP for my clients.

   e) Clients and or I have concerns about the HIV PrEP drugs' side effects.

   f) My clients cannot afford HIV PrEP services because of the high cost.

   g) I have no reason.

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Mar 4

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