Syndemic Conditions and Medication Adherence in Older HIV-Positive Men who Have Sex with Men

by

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I dedicate my accomplishments in memory of my parents Ruth and Sigi Zepf, both of whom passed away in 2016.

Dedication

Because of the HIV epidemic I became a nurse in the first place, I dedicate this dissertation to all of the heroes who are HIV-positive and to those we have lost to AIDS. The fight against HIV—and against HIV-related stigmatization, trauma, discrimination, and racism—is as great today as it has ever been. I hope to make a difference in the health, quality of life, and overall well-being of people living with HIV (PLWH), of people who care for PLWH, and of people who, though currently uniformed and perhaps intolerant, may nevertheless someday come to understand, appreciate, and support the global endeavor to eradicate this disease.

Abstract

For people living with HIV, lack of adherence to medication regimen is a significant problem with serious deleterious outcomes. Reasons for non-adherence are co-concurring psychosocial health conditions—also known as syndemic conditions—such as symptoms of depression, post-traumatic stress disorder (PTSD), past physical or sexual abuse, intimate partner violence (IPV), stimulant use, and binge drinking. Majority of all new HIV infections in the United States are among men who have sex with men (MSM).

This dissertation reports on a secondary analysis of cross-sectional data from older MSM living with HIV receiving treatment at two outpatient HIV clinics in San Francisco. The sample included 281 MSM who were HIV positive and who were 50 years of age or older. The study period was December 2012–July 2016.

The participants' mean age was 57.89 years with a slight majority being Caucasian (54.8%). The majority (82.9%) of the participants had completed some college education; a minority of participants was working or retired (48.5%). The majority (68.7%) of the participants had incomes of $40,000 less. Over 70% of participants had one or more syndemic conditions. A large majority (84%) reported very good or excellent medication adherence.

In a bivariate linear regression model symptoms of depression ($p < .0001$), symptoms of PTSD ($p < .0001$), past physical or sexual abuse ($p = .009$), stimulant use ($p < .0001$), and binge drinking ($p = .015$) were significantly associated with lower medication adherence. In a multivariate linear regression model symptoms of depression ($p = .008$), symptoms of PTSD ($p = .002$), and binge drinking ($p < .0001$) remained significant associated with lower medication adherence. Experiencing two or more syndemic conditions was significantly associated with lower medication adherence than was experiencing no or one syndemic condition ($p < .0001$).

The present study's findings are important contributions to the body of literature on medication adherence because they suggest that in older MSM, syndemic conditions such as symptoms of depression, symptoms of PTSD, past physical and sexual abuse, IPV, stimulant use, and binge drinking may affect the outcome of medication adherence.

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CHAPTER 1:

The Study Problem

Introduction

Despite advances in HIV treatment, a sizable proportion of people living with HIV (PLWH) are not engaged in regular HIV care (Christopoulos et al., 2013; Mugavero, Amico, Horn, & Thompson, 2013). In the United States in 2011, only 37% of PLWH were prescribed the most effective medication regimen, antiretroviral therapy (ART; Centers for Disease Control and Prevention [CDC], 2014). More recently, the San Francisco Department of Public Health (SFDPH; 2016) has reported that in San Francisco, as many as 43% of men who have sex with men (MSM) and 42% of MSM who inject drugs have not been prescribed ART. Furthermore, of PLWH nationwide who are prescribed ART, 25% are non-adherent to their regimen (Hall et al., 2013), and 57% who use psychoactive substances are non-adherent (Low-Beer, Yip, O'Shaughnessy, Hogg, & Montaner, 2000). In addition, PLWH with co-occurring psychiatric or substance use diagnoses are less adherent to their ART regiments than are individuals diagnosed only with HIV with a mean slightly below 50 years old (Nahvi et al., 2012). Indeed, in addition to psychiatric conditions and substance use, a number of other synergistically interacting psychosocial health problems—known as *syndemic conditions*—have also been reported to adversely affect ART adherence. This dissertation describes a study that examined whether six such syndemic conditions—symptoms of depression, symptoms of posttraumatic stress syndrome (PTSD), past physical or sexual abuse, intimate partner violence (IPV), stimulant use, and binge drinking—are associated with PLWH adherence to ART medication regimens.

Background

Recent changes in MSM incidences of HIV and mortality. In the United States, represent 2%–4% of the male population (CDC, 2015; Purcell et al., 2012), but in 2010, 63% of all new HIV infections in the U.S. population as a whole were in this MSM subpopulation (CDC,

2013, 2015). Today, roughly one in four MSM (23%) in the United States are living with HIV/AIDS (CDC, 2010). Recent surveillance reports have also documented an alarming increase (34%) in the incidence of HIV among young MSM 13–29 years of age in 2010; this increase is most pronounced among young African American MSM, a group for whom HIV incidence increased by 48% (Prejean et al., 2011). The CDC (2015) has reported that from 2005 to 2014, new HIV diagnoses among young gay Black men increased 87% but declined by 2% since 2010. However, the highest death rate of MSM with AIDS is among people 65 years and older—and this death rate is increasing (CDC, 2015).

PLWH and MSM population statistics for San Francisco. Among the many cities broadly affected by the HIV epidemic worldwide, San Francisco has been a leader in developing and providing approaches to care and in research. The SFDPH estimates that between the early 1980s—when the city's first case of AIDS was detected—and 2013, nearly 20,000 residents died from the disease. Beginning in 1981, San Francisco's monthly incidences of new cases of HIV and deaths from AIDS rose dramatically and peaked in 1992. Although since that time the annual incidence has dropped substantially, the number of PLWH residing in the city is still high; in 2013, they numbered approximately 15,500 (Mugavero, Amico, Horn, & Thompson, 2013; SFDPH, 2016). Furthermore, recent changes in PLWH age demographics and mortality rate underscore the importance of continuing vigilance, both for health care providers and for the community as a whole. According to the SFDPH (2016), from 2009 to 2014 the proportion of newly infected PLWH increased markedly—from 9% to 17%—but then decreased in 2015 to 11%. During 2012–2015, the proportion of older adult PLWH (i.e., adults 50 years and older) increased from 52% to 60%, and notably, the death rate for this group also increased—from 62% to 78%. In contrast, during 2012–2015 the death rate of PLWH younger than 50 years of age

decreased. In 2012, older adult PLWH accounted for 66% of deaths, and in 2015, 77% of deaths. Among these older adult PLWH, 74% were MSM, and 13% were MSM who also inject drugs (SFDPH, 2016).

Non-adherence to antiretroviral therapy. Low-Beer et al. (2000) have reported that, in the United States, 38% of PLWH who are prescribed antiretroviral therapy (ART) are non-adherent; in their study, patients were said to be non-adherent if they were less than 95% regular in following their ART. Also, only 25% of PLWH are virally suppressed (CDC, 2015). In addition, PLWH with co-occurring psychiatric or substance use diagnoses are less adherent to their ART regiments than are PLWH who do not have these diagnoses (Nahvi, Litwin, Heo, Berg, Li & Arnsten, 2012). As with PLWH who use psychoactive substances mentioned above, MSM who use psychoactive substances are more likely to be non-adherent to ART (Carrico et al., 2010). Unfortunately, few HIV primary care providers identify and assess their patients for unhealthy substance use (Dawson-Rose, Cuca, et al., 2015; Dawson-Rose, Draughon, et al., 2015; Metsch et al., 2008). Furthermore, MSM who use psychoactive substances are more severely stigmatized and judged than are MSM who do not use substances (Carrico et al., 2010).

Many reasons have been proposed for non-adherence among MSM who use psychoactive substances, including inability to cope with HIV-positive status and with post-traumatic stress disorders that may have led to substance use (Carrico et al. 2010). Moreover, studies have revealed an association between substance use and behaviors that lead to the transmission of HIV (Carrico et al., 2011; Colfax et al., 2005). Substance use is associated with lower CD4 count and higher HIV-1 plasma viral load (HIV VL; Samet, Walley, & Bridden, 2007). In addition, only a few HIV outpatient clinics identify and address unhealthy substance use in their patients

(Dawson-Rose, Cuca et al. 2015; Dawson-Rose, Draughon et al., 2015; Das-Douglas, Colfax, Moss, Bangsberg, & Hahn, 2008).

Syndemics and syndemic conditions. In the 1990s, Merrill Singer first used the term *syndemic* to refer to the concurrent, synergistic interaction of two or more psychosocial health problems that may lead to or exacerbate health problems or diseases (Herrick, 2011; Singer 1994; Singer 2009; Singer & Clair, 2003). Among the syndemic conditions associated with increased HIV-infection are symptoms of depression, abuse, violence, substance use, incarceration, and stress (Herrick, 2011; Singer 1994; Singer 2009). For MSM, protracted social adversity and life trauma are believed to potentiate the development of these syndemic conditions, which are associated with faster rates of HIV seroconversion (Carrico, Nation, et al., 2015; Herrick, Lim, et al., 2013; Herrick, Stall, et al., 2013; Leserman, 2008; Leserman et al., 2007; Singer, 2009) and faster progression of HIV disease (Carrico, Gómez, et al., 2015; Freedman, Fainberg, Kipnis, Midthune, & Carroll, 2004; Leserman, 2008; Leserman et al., 2007). Moreover, in addition to affecting individuals, these syndemic conditions also fuel the HIV/AIDS epidemic as a whole (Mustanski, Garofalo, Herrick, & Donenberg, 2007; Stall, Paul, Barrett, Crosby, & Bein, 1999). As mentioned earlier, in the study described in this dissertation the associations of interest are those between medication adherence and the symptoms of six specific syndemic conditions: symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking.

For many MSM, multiple, concurrent syndemic conditions—such as symptoms of depression, sexual compulsivity, and trauma—trigger alcohol use and other types of substance use (Herrick, Lim, et al., 2013; Herrick, Stall, et al., 2013; Parsons, Rendina, Moody, Ventuneac, & Grov, 2015, Singer, 2009; Whetten, Reif, Toth, Jain, Leserman, & Pence, 2012). Substance

use has profound HIV-related adverse health consequences that result in substantial health-related disparities between MSM living with HIV and the general population (Finlayson et al., 2011; Murry et al., 2011; Santos, Coffin et al. 2014). Moreover, MSM who use psychoactive substances are more likely to be non-adherent to ART regimens (Carrico, Johnson, Colfax, & Moskowitz, 2010). Given these health issues, the prevalence of substance use among MSM is of great concern. For example, in 2009 and 2010, researchers conducting national HIV behavioral surveillance surveys estimated that 46% of MSM engaged in non-injectable substance use (Finlayson et al., 2011; see also Courtney & Ray, 2014). In 2015, the primary substances used by MSM in San Francisco were alkyl nitrites (also known as "poppers," i.e., DSM-V inhalants; 31.1%), cocaine (21.0%), and methamphetamine (8.5%); this methamphetamine use was slightly higher than in previous years; SFDPH, 2016). Fortunately, substance use trends for MSM are not uniformly negative. Following MSM's increasing cocaine use in previous years (peaking at 23.1% in 2014), cocaine use decreased slightly in 2015 (21.0%; SFDPH, 2016). Also, in a review of 12 studies, Carrico, Zepf, Meanley, Batchelder, and Stall (2016) reported that substance use interventions for MSM were successful in reducing both alcohol consumption and drug use—and also condomless anal intercourse. To my knowledge, no published study has investigated any alcohol or drug use in the older adult population of MSM living with HIV.

Statement of the Problem

Researchers have been investigating reasons for non-adherence as well as interventions for improving medication adherence (Saberi et al. 2015). However, data show that in the United States, inadequate medication adherence is still an issue to overcome (Saberi et al. 2015). Furthermore, syndemic conditions among MSM who are HIV positive are believed to be prevalent (Blashill et al. 2015; Friedman et al. 2015). However, little is known about medication

adherence among older MSM who are HIV positive, especially regarding the association of syndemic conditions and medication adherence.

Proposed Study

Need for the Study. To better understand non-adherence to ART in general, researchers and providers must gain a better understanding of associations between medication adherence and syndemic conditions that affect adherence.

Purpose of the study. The purpose of this study was to evaluate whether the aforementioned six syndemic conditions—symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking are associated with poorer medication adherence in a population of MSM over 50 years of age.

Impact. This study investigated syndemic conditions in relation to medication adherence among older MSM who were HIV positive. Prior to this study, abundant research has examined medication adherence by PLWH and MSM who use psychoactive substances who were HIV-positive, but the majority of these studies have focused on MSM who use psychoactive substances's challenges and barriers in attempting to engage in care. In addition, these earlier studies have not included syndemic conditions as a reason for MSM who use psychoactive substances's non-adherence to ART. In the investigation described in this dissertation, the use of syndemic theory has informed and enriched the design and execution of both the study and the resulting dissertation report—and thereby contributed to the body of research about medication adherence.

Innovation. The present study is highly innovative in that it examined the outcomes and associations of syndemic conditions related to medication adherence. Furthermore, this study is one of the first to research syndemic conditions that affect the older adult populations with HIV.

CHAPTER 2:

Review of the Literature and Conceptual Framework

Review of the Literature

Since the beginning of the HIV pandemic, MSM who are HIV positive have been exposed to psychological conditions such as stigma, violence, symptoms of depression, and trauma (Friedman et al., 2015; Herrick, Lim, et al., 2013; Herrick et al., 2011; Herrick, Stall, Goldhammer, Egan, & Mayer, 2014; Stall et al., 2003). These conditions frequently lead to adversity (Herrick, Lim, et al., 2013). As a result of the cumulative effects of these conditions over time, MSM who are HIV positive may use alcohol or other psychoactive substances to cope with their pain; for affected individuals, the likelihood of this use depends on many factors, including the type, number, and severity of adverse psychological conditions (Friedman et al., 2015). Research has shown that syndemic conditions result in poorer medication adherence, and this diminished adherence has in turn results in a detectable HIV VL. As a consequence, health outcomes have been poor, and the risk of transmitting HIV to others has been elevated. The present literature review discusses research that has examined (a) the effects of syndemic conditions on the psychological conditions of MSM who are HIV positive, (b) the measurement of medication adherence, and (c) the processes and factors by which the sydnemic conditions adversely affect medication adherence.

Syndemic Conditions

In this literature review's selected studies, a variety of syndemic conditions were used as a framework to examine psychological conditions. All of the studies used psychosocial syndemic conditions, and some studies used substance use. The other syndemic conditions that the studies used were

symptoms of depression (Friedman et al., 2015; Halkitis et al., 2014; Kuhns et al., 2016); *HIV stigma* (Halkitis et al., 2014; Kuhns et al., 2016); c*ondomless anal intercourse* (Friedman et al.,

2015; Mizuno et al., 2015); *symptoms of violence*, *symptoms of PTSD*, *symptoms of anxiety*, and *mood disorders* (Blashill et al., 2015); *sexual compulsivity* (Halkitis et al., 2014); *lack of social support* (Mizuno et al., 2015); *abuse* (Blashill et al., 2015; Mizuno et al., 2015); and either *substance use* or *poly-substance use* (Blashill et al., 2015; Friedman et al., 2015; Kuhns et al., 2016; Mizuno et al., 2015). For this dissertation, syndemic conditions are operationalized by symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking.

Symptoms of depression and medication adherence. Several studies examined relationships of psychological conditions and medication adherence, described as follows.

Associations with stigmatization. Gonzalez, Batchelder, Psaros, and Safren (2013) and Mitzel et al. (2015) found that symptoms of depression were associated with poorer medication adherence ($p = .001$). In addition, stigmatization was associated with an individual's having more symptoms of depression ($p = .001$). Although in the model stigmatization and symptoms of depression *in combination* were not associated with poorer medication adherence ($p = .11$), more symptoms of depression *by itself* (i.e, in which depression was an individual's sole condition concomitant with HIV-positive status) were associated associated with poorer medication adherence, which remained significant ($p = .005$).

Associations with physical activity. Blashill et al. (2013) reported that physical inactivity was associated with more symptoms of depression ($p < .0001$) and poorer medication adherence ($p < .0001$). In a multivariate regression model controlling for physical inactivity, having more symptoms of depression remained significantly associated with poorer medication adherence ($p < .0001$).

Associations with physical alcohol and substance use. Du Bois and McKirnan (2012) found that, over time, having fewer symptoms of depression resulted in higher medication adherence $p = .017$). In contrast, higher alcohol or other substance use was associated with lower medication adherence over time ($p < .0001$). However, symptoms of depression and substance use in combination in the model did not affect medication adherence. Many people who reported symptoms of depression also reported substance use (Edelman, Tetrault, & Fiellin, 2014; Skalski, Sikkema, Heckman, & Meade, 2013).

Associations with symptoms of depression and social support. In addition, Halkitis et al. (2014) found that having more symptoms of depression was associated with poorer medication adherence ($p = .05$). Woodward and Pantalone (2012) investigated whether symptoms of depression mediated an effect between social support and medication adherence. The authors found that symptoms of depression were significantly negatively associated with medication adherence ($p < .001$). More social support was associated with fewer symptoms of depression. Furthermore, symptoms of depression mediated the relationship between social support and medication adherence ($p < .05$; Woodward & Panalone, 2012).

Symptoms of PTSD. Halkitis et al. (2014) found that more symptoms of HIV-related stigmatization and PTSD were associated with poorer medication adherence ($p = .01$).

Past physical or sexual abuse. In comparison with heterosexual men, MSM were two-to-four times more likely to have experienced childhood sexual abuse (CSA; Paul, Catania, Pollack, & Stall, 2001; Schafer, Gupta, & Dillingham, 2013). Moreover, men and women who had experienced CSA were at higher risk of developing mental and physical problems. IPV was associated with substance use ($p = .044$; Duncan et al., 2016).

In comparison with MSM who were HIV negative, MSM who were HIV positive were four times more likely to report having experienced CSA, and CSA was significantly associated with depression (Phillips et al., 2014).

IPV. Schafer et al. (2012) found that symptoms of PTSD and IPV were associated with a detectable HIV VL (p = .005 and .035, respectively).

Substance use. Lopez-Patton et al. (2016) have reported that, in comparison with non-methamphetamine users, methamphetamine users‘ symptoms of depression were higher—independent of HIV status (i.e., HIV positive or HIV negative; $p < .001$). The investigators also found that methamphetamine users experienced more symptom of emotional, physical, and sexual abuse than did non-methamphetamine users ($p < .001$). On the other hand, CSA was not associated with symptoms of depression.

Rajasingham et al. (2012) found that crystal methamphetamine users were less like to be prescribed ART than were non-crystal methamphetamine users ($p < .05$). Furthermore, in comparison with non-stimulant users, stimulant users were seven times more likely to be non-adherent to medication regimens ($p < .001$). Edelman et al. (2014) and Green et al. (2010) reported that substance use was higher among PLWH than among participants who were HIV negative. Notably, in older PLWH, even low levels of alcohol use can interfere with activities of daily living (Edelman et al., 2014; Lin, Guerrieri, & Moore, 2011).

Measurements of adherence to medication regimen. Most studies included a self-report measurement such as the AIDS Control Trial Group (ACTG) Adherence Questionnaire (Friedman et al., 2015; Halkitis et al., 2014), the Visual Analog Scale (Kuhns et al., 2016). Mizuno et al. (2015) reported that 90% or more of the participants in their study adhered to their medication regimen; however, the investigators did not clearly identify the type of measurement

that they used. They reported that 90% or more were adherent. Blashill et al. (2015) used the Medication Event Monitoring System (MEMS) as their medication adherence measure. In addition to the MEMS, Friedman et al. (2015), Kuhns et al. (2016), and Mizuno et al. (2015) also used the HIV VL as a medication adherence measure.

Findings and Discussion

All studies generally found significant differences between the syndemic conditions and medication adherence or HIV VL. Blashill et al. (2015) found that the overall model was significant ($x^2[3]$, 11.26, $p = .01$). Individuals who had one or two syndemic conditions had a 4.1 times greater odds ($p = .08$) of being non-adherent than someone with no syndemic conditions; individuals who had three or four syndemic conditions had a 5.0 times greater odds ($p = .047$); and individuals who had five or more syndemic conditions had an 8.5 times greater likelihood. Friedman et al. (2015) found that the overall syndemic count was associated with medication adherence ($F = 37.75$, $p < .0001$), and a higher syndemic count accounted for higher HIV VL ($p < .0001$) and lower medication adherence ($p < .0001$). Halkitis et al. (2014) found that having more missed doses was associated with (a) higher level of HIV-related stigmatization ($p = .01$), (b) higher symptoms of depression ($p = .05$), and (c) higher sexual compulsivity ($p = .001$). Also, Kuhns et al. (2016) found that having three or four syndemic conditions accounted for poor medication adherence ($p = .022$ and .003). An individual's having four syndemic conditions was significant ($p = .008$) with regard to suppressed HIV VL. MSM (88%) reported higher medication adherence than did straight (68%) or questioning (40%) youth ($p = .001$; Kuhns et al., 2016). Stigmatization ($p = .001$) and anxiety ($p = .035$) were significant (Kuhns et al. 2016). Mizuno et al. (2015) found that an individual's having syndemic conditions was

associated with non-adherence ($p < .05$); Having 4–6 syndemic conditions was associated with non-adherence ($p < .05$) and detectable HIV VL ($p < .05$).

Having gained the knowledge supported by evidence that syndemic conditions affect medication adherence, the future direction of inquiry is to understand and treat those syndemic conditions.

Conceptual Framework: Theory of Syndemics

Introduced by Merrill Singer in the mid-1990s, the theory of syndemics refers to understanding the synergistic impact of two or more health conditions and accounts for diseases or disorders (Herrick, 2011; Singer, 1994). The term "syndemic" melds two root words: *synergy*, meaning two or more agents working together, and *demic,* which refer to people (Singer, 2009). *Syndemic* is defined by Singer as "co-occurrence of two or more diseases or health problems" (Singer & Clair, 2003, p. 425).

Singer was interested in gaining a greater understanding of how poverty and disparity could increase the likelihood that people would have health problems. According to Singer (2009), people living in poverty are exposed to stressors that can be caused by "social discrimination, food insufficiency and malnutrition, diverse infectious pathogens, toxic substances in the living and working environment, and climatic extremes owning to inadequacies of clothing and shelter" (p. xiii). Furthermore, when HIV/AIDS manifested in humans, Singer became interested in identifying links between stressors related to HIV-infection and the acquisition of HIV. As HIV/AIDS spread rapidly in the 1980s and 1990s and the true burden of HIV disease became evident, Singer began looking more deeply at the root causes of HIV and HIV acquisition among MSM. Singer began to conceptualize the disease burden and social discrimination linked to HIV among MSM as *syndemics* (Singer, 2009). Singer constructed the

theory of syndemics to account for the multiple risks and vulnerabilities among MSM (e.g. substance use, social discrimination, homophobia) as a way to describe the interplay of the underlying root causes that could be responsible for the great number of MSM impacted by the HIV epidemic. Singer, an openly gay man, recognized that MSM were at greater risk of acquiring HIV and that many MSM were using illegal substances. This recognition led Singer to develop a method of describing the context wherein for MSM these components (synergy and demics) coincided to increase HIV vulnerability (Singer, 2009).

Concepts and Relationships

In accordance with Singer's definition, the syndemic process involves three concepts: adversity, psychosocial health problems, and sexual risk of HIV and HIV infection (Figure 1).

Adversity. Singer (2009) defines *adversity* as "adverse health effects arising from connections among epidemic disease clustering, disease interaction, and health and social disparities (p. 18). Adversity incorporates the concepts of (a) *social adversity* (e.g., ethnic discrimination, homophobia, identity rejection and intolerance, and racism); (b) *violent victimization* (e.g., gay-related victimization and unwanted sexual experiences); (c) *family adversity* (e.g., negative family influence, family violence, and substance use in the home); and (d) *adverse situations* (e.g., financial hardship, homelessness, and stressful life events). For MSM, adversity may involve one or more these factors. For example a Black MSM may experience not only homophobia but also racism. At home, he may also experience violence and witness substance use (Herrick, 2011). Dyer et al. (2012) found that homophobia and racism in Black MSM with psychosocial health conditions increased their risk of HIV infection.

Psychosocial health problems. Exposure to adversity may result in psychosocial health problems. The term *psychosocial health problem* refers to social factors that influence mental

health (Singer, 2009). When Singer talks about psychosocial health problems, he is highlighting three health-related components: substance use, violence, and AIDS—also referred to as "SAVA." Notably, these three components are interactive. Singer (2009) explains *interactivity* as the relationship between any two of three components or between all three of the components, and he asserts that this interactivity worsens health outcomes. For example, the relationship between substance use and AIDS without violence may predict deleterious outcomes. Similarly, the relationship between (a) substance use and violence (without AIDS), and (b) violence and AIDS (without substance use) can have the same deleterious effects on outcomes. Others, such as Herrick (2011) and Herrick et al. (2011), have defined psychosocial health problems similarly. Klein (2011), on the other hand, conceives of substance use as having no connection with psychosocial functioning. In Klein's definition, (2011) psychosocial health problems are limited to low self-esteem and depression. Herrick (2011) and Herrick et al. (2011) have explained that adversity is directly associated with substance use, depression, anxiety, and victimization. There is a unidirectional relationship between adversity and psychosocial health problems that includes alcohol misuse or abuse, anxiety, depression, IPV, incarceration, stress, and substance use. The relationship is unidirectional because adversity may or may not lead to psychosocial health problems. Once psychosocial health problems manifest, the role of adversity in their manifestation is clearly apparent.

Sexual risk of HIV and HIV infection. Sexual risk behavior that can result in the acquisition or transmission of HIV is the direct outcome of psychosocial health problems. Singer (2009), Herrick (2011), and Herrick et al. (2011) have stated that psychosocial health problems can potentially lead to sexual risk of HIV and HIV infection. Anxiety, depression, IPV, incarceration, stress, unhealthy alcohol, and substance use may contribute to condomless

anal intercourse (CAI) and HIV infection. As Singer (2009) has pointed out, being exposed to two components of psychosocial health problems may be sufficient to elevate risk of HIV transmission. However, Klein (2011) found that an individual's having one component—for example using substances or being depressed—can lead to HIV risk behavior and HIV infection. Once psychosocial health problems manifest, the role of adversity in their manifestation is clearly apparent. Characteristics, sex-related preferences, and childhood maltreatment can directly lead to sexual risk behavior with or without using substances or being depressed. Those relationships between those concepts and indicators ultimately lead to HIV risk behavior and HIV infection.

Figure 1. Syndemic Process

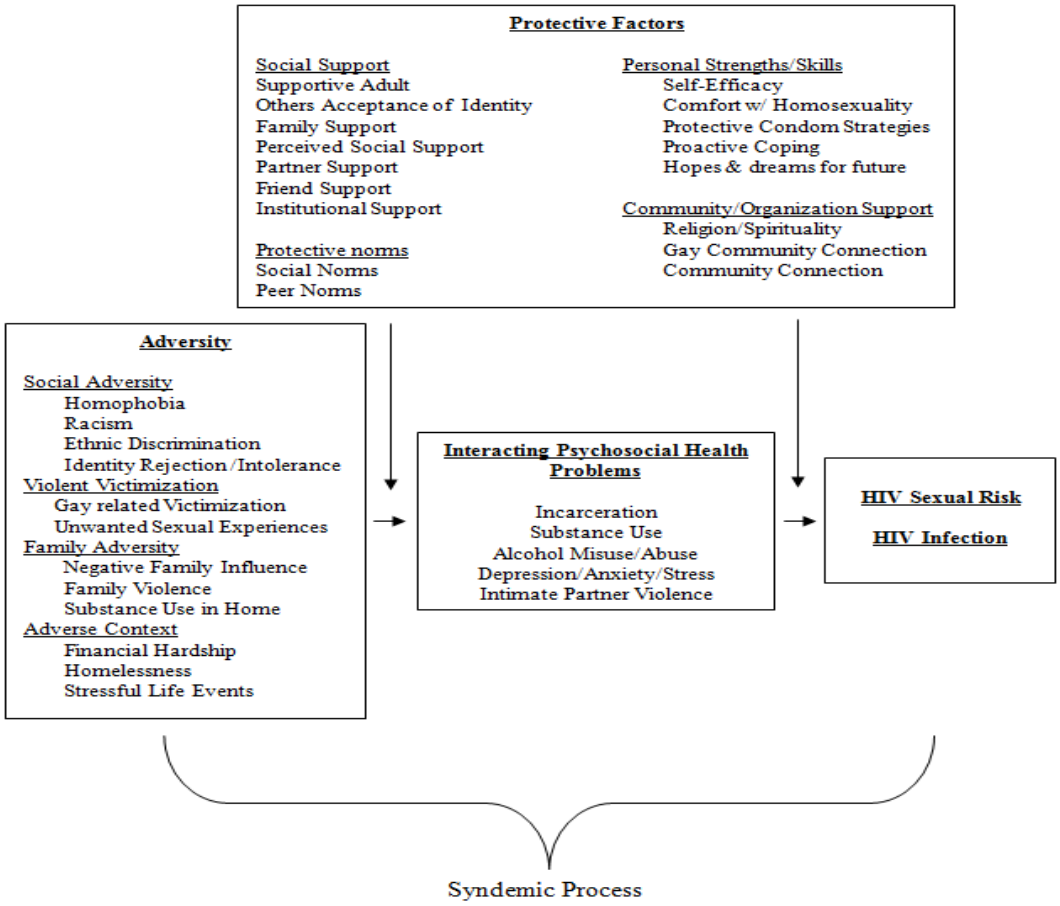

Figure 1. Theory of syndemics and resilience. Adapted from "Syndemic processes among young men who have sex with men (MSM): Pathways toward risk and resilience," by A. Herrick, 2011, p. 22.

Population

Researchers have found that in comparison with heterosexual men, a greater percentage of MSM have had mental illness during their lifetime, and that this mental illness is due to abuse, discrimination, victimization, and violence (Herrick, 2011; Singer, 2009). After comparing MSM with heterosexual men, Singer (2009) concluded that MSM are at higher risk of substance use, depression and other mental illnesses, loneliness, risk of HIV transmission, and suicide. Herrick (2011) and Singer (2009) have shown that MSM frequently suffer from childhood sexual abuse; sexual abuse as adolescents, young men, or adults; physical abuse; discrimination; and bullying. Those who were sexually abused as children frequently suffer from depression or even attempt suicide. In comparison with heterosexual children and adolescents, gay children and adolescents are more likely to attempt suicide. Herrick (2011) found that children who were sexually abused and who did not receive counseling were at risk of sexually abusing other children. Herrick and Singer further reported that adolescents, young men, and adult MSM are at higher risk of being sexually abused than are heterosexual adolescents, young men, and adult men. Openly gay men are more likely to be a target for sexual abuse than are gay men who do not disclose being gay (Herrick, 2011; Singer, 2009). Moreover, MSM who use drugs have an even higher risk of being sexually abused than do their counterparts who do not use drugs.

Having any two or more health conditions can adversely affect an individual's health and increase his vulnerability to other disorders (Herrick, 2011). MSM who are vulnerable to drug use have an elevated risk for HIV transmission and other sexually transmitted infections (STIs; Hirshfield, Remien, Humberstone, Walavalkar, & Chiasson, 2004; Stall et al., 2001). Mustanski

et al. (2007) found that young MSM who had experienced psychosocial health problems were significantly more likely to engage in CAI.

Because substance use, poor mental health, sex work, sexual orientation, and gender identity may result in HIV and violence, they are mediators for syndemics (DiStefano, Gill, Hubach, Cayetano, & Hilbert, 2014). However, DiStefano et al. (2014) have stated that the connection between violence and HIV prevention has not yet been established. In a qualitative study of HIV/AIDS and violence, DiStefano and Cayetano (2011) explained that HIV/AIDS and violence could be bidirectional. Because of abuse, discrimination, and violence, MSM were at higher risk of engaging in CAI and acquiring HIV/AIDS than were MSM who did not experience abuse, discrimination, and violence. MSM who were HIV positive were exposed to abuse, discrimination, and violence because of being gay and being HIV positive.

Singer (2009) found that MSM are at higher risk of substance abuse–violence–AIDS than are heterosexual men. Because, in comparison with gay men who are not openly gay, openly gay men are more likely to have a higher degree of exposure to more violence and bullying, they have a higher risk of using substances and engaging in CAI. DiStefano and Cayetano (2011) claimed that HIV and substance use were bidirectional: according to the researchers' findings, people who used drugs were at higher risk of acquiring HIV, and PLWH were at higher risk of using drugs. Herrick (2011) also found that MSM were at higher risk of using drugs due to bullying, CSA, discrimination, stigma, trauma, and violence. Furthermore, Russell, Eaton, and Petersen-Williams (2013) found that co-occurrence among PLWH is quite common. In particular, alcohol use and depression are problems in African countries. Russell et al. (2013) explored the relevance of substance abuse–violence–AIDS to syndemics theory. Klein (2011) showed that attitudes regarding condom use were more negative among MSM who also used

drugs than among MSM who did not use drugs ($p < .01$). The author also found that because CSA was related to lower self-esteem, the risk of drug use was higher for MSM than for heterosexual men ($p < .001$).

Conclusion

When working with marginally housed MSM—including MSM who are living with HIV and MSM who use psychoactive substances —the theory of syndemics can guide the study of how syndemic conditions may contribute to poor health outcomes in these groups. Currently in the body of research, these relationships are unexplored; more work must be done with this group to understand these relationships. As Singer (2009) has pointed out, MSM at risk of internalizing homophobia and who feel ashamed of being gay might experience violence or victimization, disassociate themselves from society, and develop psychosocial health problems such as drug use. Being gay, being victimized, and abusing drugs put those men at high risk of acquiring HIV/AIDS (Herrick, 2011; Herrick et al., 2011; Singer, 2009).

The theory of syndemics does suggest that MSM are vulnerable for substance use, CAI, and HIV infection because of their life experiences and the adversity they have faced. On the other hand, the theory of resilience shows that protective factors help otherwise vulnerable MSM to not engage in substance use, CAI and, as a result, to not become infected with HIV.

The research conducted by Herrick (2011) and by Herrick et al. (2011) and Singer's (2009) theory of syndemics have elucidated how syndemics may explain substance use. In contrast, the theory of resilience, which is also commonly used in the syndemic process, does not explain this phenomenon; rather, the theory of resilience explains only how substance use can be prevented. The theory of syndemics uses adversity to explain what many MSM may have

experienced in their lives and the factors and processes by which these experiences may lead to psychosocial health problems.

Herrick (2011) and Herrick et al. (2011) used helpful constructs and concepts. The theory of syndemics helps health care professionals to (a) understand how MSM use substances and the factors that increase MSM's vulnerability to HIV/AIDS, (b) develop interventions to decrease or eliminate substance use, (c) increase MSM self-respect and self-esteem, and (d) ultimately decrease MSM's risk of acquiring HIV/AIDS. Furthermore, the theory of syndemics provides a framework for the study of unique experiences, MSM health issues, and HIV infection.

Research Aims

The study described in this dissertation had four research aims:

Aim 1. Describe the prevalence of syndemic conditions and demographic characteristics of the older MSM population that is HIV positive in a clinic-based primary care setting.

Aim 2. Examine relationship between no or one syndemic condition and two or more syndemic conditions and demographic characteristics of the older MSM population that is HIV positive in a clinic-based primary care setting.

Aim 3. Examine whether syndemic conditions—specifically, symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking—were associated with medication adherence.

Aim 4. Examine whether higher *syndemic count* (the number of syndemic conditions experienced concomitantly) was associated with medication adherence.

Definition of Terms

The following abbreviations are used frequently in this dissertation:

AIDS	acquired immune deficiency syndrome
ART	antiretroviral therapy
CSA	childhood sexual abuse
HIV	human immunodeficiency virus
meth	methamphetamine
IVP	intimate partner violence
MSM	men who have sex with men
PLHIV	people living with HIV
PTSD	post-traumatic stress disorder
VL	viral load

CHAPTER 3:

Methodology

Research Design

This dissertation discusses a secondary analysis of the HIV Aging Project—also known as the "Silver Project."[1] As a cross-sectional study, the Silver Project was launched in 2012 after the leadership of the University of California–San Francisco (UCSF) 360: The Positive Care Center concluded that health care for PLWH should not focus exclusively on HIV care but rather, should be comprehensive. As a result of this far-reaching decision, screening tools and questionnaires were used thereafter to assess the physical, social, mental health, and cognitive function of PLWH. Concurrent with the decision that PLWH health care should be comprehensive, 360: The Positive Care Center (more commonly referred to as "360") partnered with the HIV outpatient clinic the Positive Health Program (PHP) at Zuckerberg San Francisco General Hospital (ZSFGH). A consequence of this partnership was that the present study was conducted at both the 360 at UCSF and the PHP at ZSFGH.

Description of Research Setting

The 360 is a primary and specialty outpatient clinic for both HIV-positive patients and HIV-negative patients who at risk of acquiring HIV. In addition to offering primary or specialty care, the clinic has implanted innovative programs such as the Men of Color Program (which cares for African American, Latino, and Asian men), the Shared Medical Appointments for Black Men program, the Pre-Exposure Prophylaxis (PrEP) program (which provides at-risk patients with counseling and medication to prevent seroconversion), and the Silver Project. The PHP is a city-funded, hospital-based outpatient HIV clinic that functions as a safety net in providing care for marginally insured, uninsured, and publicly insured PLWH (John et al., 2016).

[1] Details of the Silver Project have been published previously (John et al., 2016)

Sample

From 2012 to 2014, 438 participants participated in the Silver Project. To be eligible for participation in the project and accordingly with the present study, patients had to be HIV-positive and 50 years of age or older. No one who met those two criteria was excluded from the Silver Project. For the present study, participants who were not gay or bisexual were excluded from the study, and those for whom data were missing data (e.g., because of not answering all of the study's pertinent questionnaires) were excluded as contributors to the study's data set. The present study's sample (N = 281) was a subset of the total sample and had only MSM (n = 250; 89%) and bisexual men (n = 31; 11%); all participants had previously completed the measures that were analyzed in the study.

Human Subjects Assurance

The UCSF Committee on Human Research (CHR) approved the study. No adverse events were detected; in fact, during the course of the study, recognition of participants' depression, anxiety, abuse, and other deficits resulted in the clinic's providing participants with support that they may otherwise not have received. The study followed the study's protocol and CHR guidelines in respecting confidentiality. The participants received a $10 gift card for participating in the study.

Data Collection Methods

Instruments

Medication adherence. Medication adherence was measured using the Self-Rating Scale Item, Visual Analog Scale, and HIV VL. However, the HIV VL measures HIV suppression but in many studies is used as indicator of medication adherence (Saberi et al., 2014).

Self-Rating Scale Item. The Self-Rating Scale Item (SRSI) is widely used to determine medication adherence to ART (Feldman et al., 2013; Lu et al., 2008). This single-item scale assesses an individual's adherence to his or her ARV medication regimen for the preceding 30-day period. The SRSI can be administered quickly: the scale consists of a single question regarding respondents' ARV adherence with an ordinal outcome from "very poor" to "excellent" medication adherence. Notably, the SRSI does not ascertain reasons for non-adherence; hence, for people whose adherence is deficient, medication adherence counseling may be advisable (Feldman et al., 2013).

Validity and reliability of the SRSI. Comparisons with measures such as the Medication Event Monitoring System (MEMS), HIV VL, and CD4 count indicate that the SRSI is a valid measure (Feldman et al., 2013; Lu et al., 2008). For example, Lu et al. (2008) reported that the 30-day SRSI self-reports were closer in accuracy to the MEMS than were 3-day or 7-day self-reports; the correlation between SRSI scores and MEMS scores was .55. Also, unlike other studies, the correlations between SRSI and MEMS were higher than those of the visual analog scale (VAS) to MEMS (Feldman et al., 2013). Furthermore, in comparison with the VAS, the SRSI was a better predictor of undetectable HIV VL (Feldman et al., 2013).

Furthermore, Feldman et al. (2013) found that, in comparison with the VAS, the SRSI was a better predictor of undetectable HIV VL. In addition, unlike other studies, the SRSI was better correlated with MEMS than was the VAS with MEMS (Feldman et al., 2013). The SRSI has been widely used to determine medication adherence to ART (Feldman et al., 2013; Lu et al., 2008). The SRSI is a valid measure, having been compared with other measures such as HIV VL, CD4 count and MEMS (Feldman et al., 2013; Lu et al., 2008). Self-report of medication adherence has been strongly correlated with other screening instruments (Feldman et al., 2013;

Lu et al., 2008). The SRSI requires little time to administer; participants are simply asked one question regarding how they rate their medication adherence. On the other hand, 3- or 7-day self-reports seem to be less accurate than the 30-day self-report. Although the SRSI predicts medication adherence, it does not indicate reasons for non-adherence.

Visual Analog Scale. The VAS has been widely used to determine medication adherence to ART (Amico et al., 2006; Chesney et al., 2000; Holzemer et al., 2006). Fifty-seven studies have used the VAS to determine medication adherence in the HIV population with HIV. The VAS uses patients' visual self-report to assess the proportion of medication doses taken in the preceding 30 days. The VAS uses a single question, provides clear instructions, and is easy to complete. Completion of this scale requires that participants simply place a mark on a linear scale that ranges from 0% to 100%. In this study, the cutoff percentage for being considered adherent was 90% or more (Walsh, Mandalia, & Gazzard, 2002).

Validity and reliability of the VAS. The VAS is a valid measure that is comparable to other measures such as HIV VL, pill count, electronic cap monitoring, and biophysical medication screening (Holzemer et al., 2006). The scale was tested by Walsh et al. (2002) for antiretroviral adherence in the HIV-population. The VAS was found to be correlated with other objective measures of medication adherence, such as MEMS ($r = .63$; $p < .001$) and pill count ($r = .75$; $p = .001$ (Walsh et al., 2002).

HIV VL. The HIV VL is the most commonly used predictor of HIV progression and viral suppression and is widely used in resource-rich countries. Also, the HIV VL has been used as a predictor of disease progression and viral suppression (Bangsberg, Ragland, Monk, & Deeks, 2010). Although PLWH may not take their medications as recommended and may miss some doses, the HIV VL might still be undetectable, and PLWH could be suppressed.

Fortunately, to achieve an undetectable HIV VL, perfect medication adherence is no longer necessary (Saberi et al., 2015).

Findings from the Present Study

SRSI as the medication adherence outcome. Statistical agreement in medication adherence between the SRSI and the VAS was 90%, and agreement between SRSI and the HIV VL was 83%. In comparison, agreement between the VAS and the HIV VL was 82%. Furthermore, the sensitivity (true positive rate) between SRSI and VAS of this study was 93%, but the specificity (true negative rate) is only 58%. As a result, the highest agreement was between the two self-reports of medication adherence with a high sensitivity and low specificity prediction. With 10% of the SRSI and VAS scores, disagreement is due to outliers. For example, four participants' SRSI medication adherence rating was "excellent," but their VAS scores were less than or equal to 35%. In contrast, six participants' SRSI rating was "poor," but their VAS scores were 90%–100%.

SRSI–VAS correlation. Our data analysis found that the SRSI and VAS were only .419 correlated. Several participants reported low adherence in the VAS but high adherence in the SRSI. Conversely, other participants reported excellent adherence in the VAS and low adherence in the SRSI.

HIV VL. Only 48 participants had a *detectable HIV VL*—that is, their HIV VL exceeded UCSF lab standard of 39 copies of HIV per milliliter of blood plasma. Had we used the CDC parameters for *undetectable HIV VL*—that is, fewer than 200 copies—only 24 participants would have had a detectable HIV VL. Furthermore, Bangsberg et al. (2010 and Saberi et al. (2015) found that medication adherence could be lower than 90% and still show an undetectable HIV VL.

Syndemic conditions. In this study, we defined syndemic conditions as self-reported (a) symptoms of depression (measured by the PHQ-9); (b) symptoms of PTSD (measured by the Breslau instrument); (c) past physical or sexual abuse, (d) IPV (measured by the HITS instrument); (e) stimulant use; and (f) binge drinking.

Symptoms of depression. The PHQ-9 measure assesses and diagnoses levels of depression in primary care clinics (Spitzer, Kroenke, & Williams, 1999). The instrument has nine questions and uses a 4-point-Likert-scale (see the PHQ-9 questionnaire in Table 5). Possible total scores range from 0 to 27. *Not at all* is scored as 0, *several days* is scored 1, *more than half the days* is scored as 2, and *nearly every day* is scored as 3. Levels of depression are described as *minimal depression,* 0–4; *mild depression,* 5–9; *moderate depression,* 10–14; *moderately severe depression*, 15–19; and *severe depression*, 20–27 (Kroenke, Spitzer, & Williams, 2001). For the purpose of this study, the cutoff point was greater than or equal to 10—as recommended by Manea, Gilbody, and McMillan (2012)—which represents a symptom level consistent with at least moderate depression.

Spitzer et al. (1999) tested the PHQ-9 in eight primary care clinics that served a total of 3,000 patients. In that study, patients completed the PHQ-9 during a clinic visit before they saw their provider, who then determined whether they had a diagnosis of depression. Mental health professionals interviewed the participants by telephone. The diagnoses made by the primary care providers were validated against the diagnoses of mental health professionals. The overall accuracy was 85%, with 75% sensitivity and 90% specificity. Internal consistency was Cronbach's alpha of 0.88.

Symptoms of PTSD. The Breslau measure, which assesses post-traumatic stress disorder (PTSD) in primary care, was developed by Breslau, Davis, Andreski, and Peterson (1991). The

measure has seven questions; dichotomized response options are *yes* (score = 1) or *no* (score = 0; see the Breslau measure in Table 6). The lowest possible score is 0 (i.e., no PTSD symptoms); the highest score, 7, alerts primary care providers with that the respondent has a symptoms of PTSD. Scores of 4 and higher indicate likely PTSD (Breslau, Peterson, Kessler, & Schultz, 1999). Kimberling et al. (2006) test-retested the Breslau's 7-item screen for PTSD for use in primary care and found that (a) the test–retest reliability was $r = .84$ and (b) the test–retest reliability for individual items ranged from .05 to .81. The sensitivity ranged from .33 to .97, and the specificity ranged from .49 to .97. Internal consistency was a Cronbach's alpha of .92.

Past physical or sexual abuse. To ascertain information about participants' possible experience with abuse, the study queried participants about any sexual, physical, mental, emotional, or financial abuses that they might have experienced. The abuse questions are not validated measures; rather, they simply ask participants whether they had been abused in the past and are currently being abused (see Table 7). For the purpose of the present study—and in accordance with the theory of syndemics—only past physical or sexual abuse were considered as abuse (Blashill et al., 2015). Similarly Blashill et al. (2015) defined past physical or sexual abuse as CSA and current abuse as IPV. A participant's experiencing physical abuse, sexual abuse, or both types of abuse were indicated by a single score of 1. Internal consistency was Cronbach's alpha of .74.

IPV. The Hurt–Insult–Threaten–Scream (HITS) measure, which assesses IPV, was developed by Sherin, Sinacore, Li, Zitter, and Shakil (1998). The measure has 4 questions and uses a 5-point Likert scale that indicates with how often IPV has occurred in the preceding 12 months (see Table 8). *Never* is scored as 1, *rarely* is scored as 2, *sometimes* is scored as 3, *fairly often* is scored as 4, and *frequently* is scored as 5. The HITS measure's lowest possible score is

4; the highest score is 20. Shakil, Donald, Sinacore, and Krepcho (2005) validated the measure on male participants using a 5-point-Likert-scale HITS administered both to non-victims and to survivors of IPV. For recognizing victims of abuse, the HITS measure's sensitivity was 88%, and specificity was 97% (Shakil et al., 2005). Sherin et al. (1998) found that a cutoff point of 10.5 showed 96% agreement with correctly classified survivors of IPV. Shakil et al. (2005) found that a cutoff point score of greater than or equal to 11 showed a sensitivity of 88% and specificity of 97%. The present study used a cutoff point score of greater than or equal to 11. The HITS measure's internal consistency was Cronbach's alpha of 0.77.

Stimulant use. The study included three substance use-related questions pertaining to how often participants used methamphetamine, "crack" (i.e., cocaine that has been processed for smoking), or cocaine in the past 30 days (see table 9). Response options were *never, only a few times, 1–3 times per week, about once a week, once a day, 2 to 3 times a day, 4 to 9 times a day,* and *10 or more times a day*.

For this present study, stimulant use was determined by use of any stimulant (methamphetamine, cocaine, or crack cocaine) and any frequency of use in the prior 30 days. The variable "stimulant use" was dichotomized into *yes* for use of one or more stimulants at least "only a few times" (within the preceding 30 days) and *no* if a respondent "never" used any of the three stimulants.

Colfax et al. (2005) also used those three stimulants and same frequencies to assess stimulant use. However, the research inquired about stimulant use in the past 6 months—in comparison with this study's use period of 30 days.

Binge drinking. To assess alcohol use, the first alcohol question asked whether participants drink alcohol (see Table 10). If a participant responded with a *yes* to alcohol

drinking, a subsequent question asked the participant the number of days that the participant had had 5 or more standard drinks (per day) in the preceding 12 months. The National Institute on Alcohol Abuse and Alcoholism (2017) defines *binge drinking* as 5 or more standard drinks per day for men and 4 or more standard drinks per day for women. The alcohol question is a validated question for binge drinking but does not necessarily identify heavy drinking—because participants may drink five drinks per day every day, a consumption level that is viewed as a "heavy drinking" concern (Ewing, 1984; Frank, Graham, Zyzanski, & White, 1992; Taylor, El-Sabawi, & Cangin, 2016). If a respondent answered "yes" for 5 or more drinks in a day in the preceding 12 months, they were coded as binge drinkers.

Procedures

As stated in Chapter 1, this study was based on a secondary analysis of an existing study. However, because two HIV clinics participated in the parent study, the present study had to use two different datasets, which had to be merged. SPSS was used to analyze the data. Also, this study could use only variables that were used by both sites. As a result of these research design circumstances, careful and thorough cleaning of the data was important.

Data Analyses

In the present study's data analysis, the sample was described by using means and standard deviations of continuous variables and frequencies for categorical variables. Cronbach's alpha measures the internal consistency (reliability) of variables with multiple questions. A simple or multiple ordinal regression should be used if the dependent outcome variable was ordinal. However, an ordinal regression and a linear regression yielded the same results. Furthermore, a sample size of 281 would result in the same outcome. As a result, simple linear and multiple linear regressions were be used to analyze one or more independent

predictors predicting an ordinal variable. Logistic regression was appropriate for categorical variable outcomes. For continuous variables, the mean and standard deviation (*SD*) were calculated and a one-way analysis of variance (ANOVA) was used to ascertain differences among participants with no or one syndemic conditions and participants with two or more syndemic conditions. For categorical variables, a frequency table was used to describe the relationship between syndemic condition and demographic variables and participants with no or one syndemic conditions and participants with two or more syndemic conditions. A Cronbach's alpha of .05 was used to determine significance. The entire analysis was performed in SPSS Version 23.

Power Analysis

As mentioned, the present study was a secondary analysis of a sample size of 281 participants. The purpose of a power analysis is to calculate the sample size sufficient to determine the probability of finding significance. However, because of the study's use of an existing data set with a pre-determined sample size, alpha of 0.05, and power of 0.80, the effect size had to be calculated (Cohen, 1988). For a multiple linear regression model, the power is to detect a unique contribution of any of the six predictor (syndemic conditions) variables. The unique contribution is measures by R^2 change. A sample size of 281 provides adequate power (80%) at an alpha of .05 to detect even a small R^2 change of 2% if the other five variables in the model have explained 26% of the variance.

Internal and External Validity of Overall Study Design

To strengthen internal validity, the present study primarily used well-known validated measures. In particular, the clinic chose measures that were appropriate for primary care. Although the Silver Project has become a research study, the Project was originally intended to

serve as a clinical program to evaluate patients' physical, mental health, and cognitive and social function. With regard to the present study's external validity, the outcome of the program can be easily applied to a similar patient population. The clinic's patient population and those who participated in the Silver Project constituted a vulnerable population in reference to an older adult HIV population that was highly traumatized by abuse, discrimination, racism, and other syndemic conditions that might explain their substance use.

Study Fidelity

A clinical research nurse (CRN) who holds a master's degree in nursing leadership and is a doctoral candidate of the School of Nursing at UCSF oriented himself to the study by reading instructions, learning modules online, and consulting psychiatrists and geriatricians. The CRN also trained pre-medical students how to screen participants. The CRN regularly observed the pre-medical students and audited their screenings.

CHAPTER 4:

Results

Analysis of Research Aims

As stated in Chapter 2, the present study had four research aims, whose collective purpose was to evaluate whether selected syndemic conditions—symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking—are associated with poorer medication adherence in a population of MSM over 50 years of age. These aims are discussed as follows.

Aim 1. Describe the prevalence of syndemic conditions and demographic characteristics of the older HIV-positive MSM population in a clinic-based primary care setting.

We enrolled 438 participants who were HIV positive (age: 50 years of age and older) from two primary care clinics where they received care. For this study, data from 281 participants were used in data analysis because they were MSM, and they completed all of the questionnaires necessary for this study. The racially–ethnically diverse sample comprised Caucasian (54.8%, the majority), African American (18.5%), "other" (13.2%, which included mixed-race), Hispanic American (8.9%), and Asian American (4.6%) participants (see Table 1, column 2 for participant demographics). Participants ranged in age from 50 to 80 years old with a mean of 57.89 years (*SD* ±6.124). Eighty-nine percent identified themselves as gay, and 11% as bisexual. The mean of the duration of HIV-infection was 20.64 years (*SD* ±8.094). Most participants (83.0%) had some college education. A quarter (26.3%) of participants were employed (full- or part-time), a fifth (20.3%) were retired, 8.5% were unemployed, 0.7% were in school, 2.1% were engaged in other pursuits. Almost half of the participants (41.6%) were receiving disability financial support. The majority of participants' (68.7%) annual income was $ 40,000 or less, and nearly one quarter (24.9%) reported an annual income over $ 40,001. Some participants (8.2%) self-assessed their general health as being "excellent," 28.8% as being "very

good," 35.6% as being "good," 22.1% as being "fair," 4.6% as being "poor," and 0.7% did not know their health status. The majority (82.9%) of participants had an undetectable HIV VL—that is, fewer than 40 copies of HIV per milliliter of plasma. In self-reporting medication adherence, most participants (62.3%) reported "excellent," 21.7% reported "very good," 7.8% reported "good," 3.6% reported "fair," 2.5% reported "poor," and 2.1% reported "very poor."

All participants in the sample responded to the measures of syndemic conditions included in this study. We defined *syndemic prevalence* as symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking. Nearly one third (27.4%) of the sample indicated symptoms of depression (the PHQ-9 score was at least 10, i.e., "moderate" symptoms of depression). Fewer participants (13.5%) indicated symptoms of PTSD (the Breslau measure score was at least 4, i.e., having symptoms of PTSD). Over one third (34.9%) of the sample indicated past physical or sexual abuse (any past physical or sexual abuse counted as abuse). A minority of participants (5.0%) indicated having IPV (the HITS measure score was at least 11, i.e., likely to be experiencing IPV). Sixteen percent of the participants indicated stimulant use (stimulant use was defined as having used "meth," "cocaine," or "crack" at least a few times in the 30-day period preceding survey. Nearly one third (29.9%) of the sample indicated binge drinking (binge drinking was defined as having had 5 or more standard drinks in one day in the past 12 months. Even one episode of binge drinking was counted towards this syndemic condition).

Fewer than one third (29.5%) of participants indicated having no syndemic conditions, over one third (34.5%) indicated having one syndemic condition, 22.1% indicated having two syndemic conditions, 9.3% indicated having three syndemic conditions, 3.2% indicated having

four syndemic conditions, 1.1% indicated having five syndemic conditions, and .4% indicated having six syndemic conditions.

Aim 2. Examine the relationship between having no or one syndemic condition and two or more syndemic conditions and demographic characteristics of the older MSM population that was HIV positive in a clinic-based primary care setting.

Over half of the participants in this sample had no or one syndemic condition (n = 180; see Table 1, column 3) and participants with two or more syndemic conditions (n = 101; see Table 1, column 4). This categorization or separation is based on Singer (1994); Singer's (2009) definition of two or more syndemic conditions may lead to health problems. Significance was determined between participants with no or one syndemic conditions and participants with two or more syndemic conditions (see Table 1, column 5). The mean age of participants experiencing two or more syndemic conditions was younger with a mean age of 56.68 (*SD* ±5.006) compared with participants experiencing no or one syndemic condition of a mean age of 58.57 (*SD* ±6.587), and this difference was significant (p = .013). In addition, the age range varied. The age range of participants experiencing two or more syndemic conditions was from 50 to 73 years; in comparison, the age range of participants experiencing no or one syndemic condition was 50–80 years. The two groups did not significantly differ in racial composition (p = .200). For most of the racial–ethnic groups, the percentage of MSM participants having one or no syndemic condition was *greater* than the percentage having two or more syndemic conditions: Asian American participants, 84.6% vs. 15.4%; African American participants, 59.6% vs. 40.4%; and Caucasian participants, 65.6% vs. 34.4%. However, notably, the percentage of Hispanic American MSM having no or one syndemic condition was *slightly less* than the percentage having two or more syndemic conditions, 48% vs. 52%, respectively.

The two groups—those having one or no syndemic condition and those having two or more syndemic conditions—did not significantly differ in sexual orientation (p = .461). Among bisexual men, 41.9% had two or more syndemic conditions; in comparison, 35.2% of MSM had two or more syndemic conditions. The mean years of HIV infection of participants with no or one syndemic condition was not significantly different than that of participants with two or more syndemic conditions (p = .562). For participants with no or one syndemic condition, the mean number of years of HIV infection was 20.85 years, SD = ±7.942; for participants with two or more syndemic condition, the mean number of years was 20.24 years, SD = ±8.302.

The two groups did not significantly differ in years of education (p = .216). The majority of participants (65.7%) with no or one syndemic condition had at least some college; in comparison, 34.3% of participants with two or more syndemic conditions had at least some college.

The two groups differed significantly in employment rate (p = .008). The majority (74.9%) of participants who were employed full-time had no or one syndemic condition, in comparison, substantially fewer (25.9%) participants who were employed full-time had two or more syndemic conditions. Participants who were employed part-time had similar differences: the percentage of part-time participants (65.0%) with no or one syndemic condition was greater than the percentage of part-time participants (35.0%) with two or more syndemic conditions. Among retired participants, the percentage of participants (78.1%) with no or one syndemic condition was much larger than the percentage of participants (21.1%) with two or more syndemic conditions. The two groups also significantly differed in income (p = .016). Among participants whose annual income was $40,000 or less, 56.0% had no or one syndemic condition, and 44% had two or more syndemic conditions.

The two groups differed significantly in perceived general health as well ($p = .004$). The percentage of participants who perceived their health as "excellent" was larger for those with no or one syndemic condition than for those with two or more syndemic conditions (73.9% vs. 26.1%, respectively). The percentage of participants who perceived their health as "very good" was larger for those with no or one syndemic condition than for those with two or more syndemic conditions (70.4% vs. 29.0%, respectively). The percentage of participants who perceived their health as "good" was larger for those with no or one syndemic condition than for those with two or more syndemic conditions (71.0% vs. 29.0%, respectively). The percentage of participants who perceived their health as "fair" was somewhat smaller for those with no or one syndemic condition than for those with two or more syndemic conditions (48.4% vs. 51.6%, respectively). The percentage of participants who perceived their health as "fair" was smaller for those with no or one syndemic condition than for those with two or more syndemic conditions (30.8% vs. 69.2%, respectively).

The two groups did not differ significantly in HIV VL ($p = .564$). Among participants who had an undetectable HIV VL, the percentage having no or one syndemic condition was larger than the percentage having two or more syndemic conditions—64.8% vs. 35.2%, respectively.

Participants having no or one syndemic condition differed significantly from participants having two or more conditions with regard to symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking ($p < .0001$). Seventy-four percent of participants who experienced symptoms of depression also experienced other syndemic conditions—26.0% experienced symptoms of depression alone. As high as 92.1% of participants who experienced PTSD also experienced other syndemic conditions—7.9%

experienced PTSD alone. Over two third (69.4%) of participants who experienced past physical or sexual abuse, also had other syndemic conditions—30.6% experienced past physical and sexual abuse alone. All participants experiencing IPV, also experienced other syndemic conditions—0.0% experience IPV alone. Almost three quarters (73.3%) of participants self-reporting stimulant use, also experienced other syndemic conditions—26.7% self-reported stimulant use along. Over 60% (61.9%) of participants self-reporting binge drinking, also experienced other syndemic conditions—38.1% self-reported binge drinking alone.

Table 1.

Demographic Characteristics of older HIV-positive MSM

Demographics	Total MSM *n* = 281	≤ 1 Syndemic condition *n* = 180	≥ 2 Syndemic conditions *n* = 101	*p*-value
Age (mean, SD)	57.89 (±6.124)	58.57 (±6.587)	56.68 (±5.006)	**.013**
Range	50 to 80	50 to 80	50 to 73	
Race				.200
Caucasian	154 (54.8%)	101 (56.1%)	53 (52.5%)	
African American	52 (18.5%)	31 (17.2%)	21 (20.8%)	
Other (includes mixed-race)	37 (13.2%)	25 (13.9%)	12 (11.9%)	
Hispanic	25 (8.9%)	12 (6.7%)	13 (12.9%)	
Asian	13 (4.6%)	11 (6.1%)	2 (2.0%)	
Sexual Orientation				.461
Gay	250 (89.0%)	162 (90.0%)	88 (87.1%)	
Bisexual	31 (11.0%)	18 (10.0%)	13 (12.9%)	
Years of HIV-Infection				.562
Total Years (mean, SD)	20.64 (±8.094)	20.85 (±7.942)	20.24 (±8.392)	
Range	1 to 35	1 to 35	1 to 33	

Table 1. (continued)

Demographic Characteristics of older HIV-positive MSM

Demographics	Total MSM *n* = 281	≤ 1 Syndemic condition *n* = 180	≥ 2 Syndemic conditions *n* = 101	*p*-value
Education				.216
Less than high school	7 (2.5%)	4 (2.2%)	3 (3.0%)	
Some high school	10 (3.6%)	6 (3.3%)	4 (4.0%)	
High school diploma/GED	31 (11.0%)	17 (9.4%)	14 (13.9%)	
Some college	103 (36.7%)	59 (32.8%)	44 (43.6%)	
Bachelor's degree	57 (20.3%)	41 (22.8%)	16 (15.8%)	
Some graduate school	29 (10.3%)	19 (10.6%)	10 (9.9%)	
Graduate/professional degree	44 (15.7%)	34 (18.9%)	10 (9.9%)	
Education grouped				.216
≥ College	233 (82.9%)	153 (85.0%)	80 (79.2%)	
Employment				.008
Full time	54 (19.2%)	40 (22.2%)	14 (13.9%)	
Part time	20 (7.1%)	13 (7.2%)	7 (6.9%)	
Unemployed	24 (8.5%)	16 (8.9%)	8 (7.9%)	
Retired	57 (20.3%)	45 (25.0%)	12 (11.9%)	
In school	2 (0.7%)	2 (1.1%)	0 (0.0%)	
Receiving disability	117 (41.6%)	60 (33.3%)	57 (56.4%)	
Other	6 (2.1%)	4 (2.2%)	2 (2.12)	
Employment grouped				< .0001
Working, school, retired	133 (48.5%)	100 (58.8%)	33 (33.7%)	

Table 1. (continued)

Demographic Characteristics of older HIV-positive MSM

Demographics	Total MSM *n* = 281	≤ 1 Syndemic condition *n* = 180	≥ 2 Syndemic conditions *n* = 101	*p*-value
Income				.019
< $ 10,000	58 (21.6%)	33 (19.6%)	25 (25.0%)	
≤ $ 20,000	83 (31.0%)	43 (25.6%)	40 (40.0%)	
$20,001 - $40,000	43 (16.0%)	27 (16.1%)	16 (16.0%)	
$40,001 - $60,000	17 (6.3%)	14 (8.3%)	3 (3.0%)	
$60,001 - $80,000	14 (5.2%)	13 (7.7%)	1 (1.0%)	
$80,001 - $100,000	18 (6.7%)	13 (7.7%)	5 (5.0%)	
> $100,000	35 (13.1%)	25 (14.95)	10 (10.05)	
Income grouped				.001
≤ 40,000	184 (68.7%)	103 (61.3%)	81 (81.0%)	
General Health				0.004
Excellent	23 (8.2%)	17 (9.4%)	6 (5.9%)	
Very good	81 (28.8%)	57 (31.7%)	24 (23.8%)	
Good	100 (35.6%)	71 (39.4%)	29 (28.7%)	
Fair	62 (22.1%)	30 (16.7%)	32 (31.7%)	
Poor	13 (4.6%)	4 (2.2%)	9 (8.9%)	
Do not know	2 (0.7%)	1 (0.6%)	1 (1.0%)	
HIV VL				.564
Undetectable	233 (82.9%)	151 (83.9%)	82 (81.2%)	
Medication Adherence (SRSI)				< .0001
Very poor	6 (2.1%)	4 (2.2%)	2 (2.0%)	
Poor	7 (2.5%)	0 (0.0%)	7 (6.9%)	
Fair	10 (3.6%)	2 (1.1%)	8 (7.9%)	
Good	22 (7.8%)	9 (5.0%)	13 (12.9%)	
Very good	61 (21.7%)	34 (18.9%)	27 (26.7%)	
Excellent	175 (62.3%)	131 (72.8%)	44 (43.6%)	

Table 1. (continued)

Demographic Characteristics of older HIV-positive MSM

Demographics	Total MSM *n* = 281	≤ 1 Syndemic condition *n* = 180	≥ 2 Syndemic conditions *n* = 101	*p*-value
Syndemic conditions				
Symptoms of Depression	77 (27.4%)	20 (11.0%)	57 (56.4%)	< .0001
Symptoms of PTSD	38 (13.5%)	3 (1.7%)	35 (34.7%)	< .0001
Past physical or sexual abuse	98 (34.9%)	30 (16.7%)	68 (67.3%)	< .0001
IPV	14 (5.0%)	0 (0.0%)	14 (14.0%)	< .0001
Stimulant Use	45 (16.0%)	12 (6.7%)	33 (32.7%)	< .0001
Binge Drinking	84 (29.9%)	32 (17.8%)	52 (51.5%)	< .0001
Syndemic condition count				
0 Syndemic condition	83 (29.5%)			
1 Syndemic condition	97 (34.5%)			
2 Syndemic conditions	62 (22.1%)	Not Applicable	Not Applicable	Not Applicable
3 Syndemic conditions	26 (9.3%)			
4 Syndemic conditions	9 (3.2%)			
5 Syndemic conditions	3 (1.1%)			
6 Syndemic conditions	1 (0.4%)			

Aim 3. Examine whether syndemic conditions—specifically, symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking were associated with medication adherence.

For Aim 3, a simple linear regression model was used to determine the association of each syndemic condition with medication adherence. The change in medication adherence was measured by whether the participants experienced a syndemic condition. Furthermore, a multiple linear regression model is used to determine the association of all sydemic conditions together with medication adherence. Not experiencing a syndemic condition was used as the reference group (see Table 2).

Association between syndemic condition—symptoms of depression and medication adherence. A simple linear regression revealed that experiencing a syndemic condition of symptoms of depression was associated with medication adherence to a statistically significant degree $F(1,279) = 14.707$, $p < .0001$. A participant's experiencing a syndemic condition of symptoms of depression (a) accounted for 5.0% of the explained variability in medication adherence and (b) was associated with a medication adherence decrease of .574 relative to the medication adherence of participants who did not experience a syndemic condition of symptoms of depression.

Association between syndemic condition—symptoms of PTSD and medication adherence. A simple linear regression revealed that experiencing a syndemic condition of symptoms of PTSD was associated with medication adherence to a statistically significant degree $F(1,279) = 19.170$, $p < .0001$. A participant's experiencing a syndemic condition of symptoms of PTSD (a) accounted for 6.4% of the explained variability in medication adherence and (b) was

associated with a medication adherence decrease of .849 relative to the medication adherence of participants who did not experience a syndemic condition of symptoms of PTSD.

Association between syndemic condition—IPV and medication adherence. A simple linear regression revealed that experiencing a syndemic condition of IPV was associated with medication adherence to a statistically significant degree $F(1,282) = 0.862$, $p = .420$. A participant's experiencing a syndemic condition of IPV (a) accounted for 0.2% of the explained variability in medication adherence and (b) was associated with a medication adherence decrease of .254 relative to the medication adherence of participants who did not experience a syndemic condition of IPV.

Association between syndemic condition*—past physical or sexual abuse *and medication adherence. A simple linear regression revealed that experiencing a syndemic condition of past physical or sexual abuse was associated with medication adherence to a statistically significant degree $F(1,279) = 6.822$, $p = .009$. A participant's experiencing a syndemic condition of past physical or sexual abuse (a) accounted for 2.4% of the explained variability in medication adherence and (b) was associated with a medication adherence decrease of .371 relative to the medication adherence of participants who did not experience a syndemic condition of past physical or sexual abuse.

Association between syndemic condition—stimulant use and medication adherence. A simple linear regression revealed that experiencing a syndemic condition of using stimulants was associated with medication adherence to a statistically significant degree $F(1,279) = 22{,}274$, $p < .0001$. A participant's experiencing a syndemic condition of using stimulants (a) accounted for 7.4% of the explained variability in medication adherence and (b) was associated with a

medication adherence decrease of .849 relative to the medication adherence of participants who did not experience a syndemic condition of use stimulants.

Association between syndemic condition—binge drinking and medication adherence. A simple linear regression revealed that experiencing a syndemic condition of binge drinking was associated with medication adherence to a statistically significant degree $F(1,279) = 5.962$, $p = .015$. A participant's experiencing a syndemic condition of binge drink (a) accounted for 2.1% of the explained variability in medication adherence and (b) was associated with a medication adherence decrease of .362 relative to the medication adherence of participants who did not experience a syndemic condition of binge drinking.

Association between syndemic conditions—symptoms of depression, symptoms of PTSD, IPV, past physical or sexual abuse, stimulant use, binge drinking and medication adherence. A multiple linear regression revealed that experiencing syndemic conditions of symptoms of depression, symptoms of PTSD, IPV, past physical or sexual abuse, stimulant use, and binge drinking of the overall model was associated with medication adherence to a statistically significant degree $F(6,274) = 9.578$, $p < .0001$ and the overall model accounted for 17.3% of the explained variability in medication adherence.

Participants' medication adherence decreased by .391 for experiencing a syndemic condition of symptoms of depression relative to the medication adherence of participants who did not experience a syndemic condition of symptoms of depression; this decrease was significantly different ($p = .008$), with a unique contribution of 22.4%, controlling for syndemic conditions of symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking.

Participants' medication adherence decreased by .616 for experiencing a syndemic condition of symptoms of PTSD relative to the medication adherence of participants who did not experience a syndemic condition of symptoms of PTSD; this difference was statistically significant ($p = .002$) with a unique contribution of 25.4%, controlling for syndemic conditions of symptoms of depression, past physical or sexual abuse, IPV, stimulant use, and binge drinking.

Participants' medication adherence increased by .240 for experiencing a syndemic condition of IPV relative to the medication adherence of participants who did not experience a syndemic condition of IPV; this difference was not statistically significant ($p = .421$) with a unique contribution of 4.8%, controlling for syndemic conditions of symptoms of depression, symptoms of PTSD, past physical or sexual abuse, stimulant use, and binge drinking.

Participants' medication adherence decreased by .257 for experiencing a syndemic condition of past physical or sexual abuse relative to the medication adherence of participants who did not experience a syndemic condition of past physical or sexual abuse; this difference was not statistically significant ($p = .060$), with a unique contribution of 15.4%, controlling for syndemic conditions of symptoms of depression, symptoms of PTSD, IVP, stimulant use, and binge drinking.

Participants' medication adherence decreased by .739 for experiencing a syndemic condition of using stimulants relative to the medication adherence of participants who did not experience a syndemic condition of using stimulants, this difference was statistically significant ($p < .0001$), with a unique contribution of 27.2%, controlling for syndemic conditions of symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, and binge drinking.

Participants' medication adherence decreased by .240 for experiencing a syndemic condition of binge drinking relative to the medication adherence of participants who did not experience a syndemic condition of binge drinking this difference was not statistically significant ($p < .085$) with a unique contribution of 14.5%, controlling for syndemic conditions of symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, and stimulant use.

A syndemic condition of IPV was not significantly different when individually associated with medication adherence and remained insignificant in a multiple linear regression model. A syndemic condition of past physical or sexual abuse and binge drinking was significantly different when associated individually with medication adherence but became insignificant in a multiple linear regression model.

Table 2.

Association Between Syndemic Conditions—Symptoms of Depression, Symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, binge drinking and Outcome Variable: Medication Adherence

Syndemic conditions	Medication adherence change: increase +; decrease -	*p*-value	Medication adherence change: increase +; decrease -	Unique contribution	*p*-value
	Bivariate Regression		Multivariate Regression		
Symptoms of depression	- .574	*p < .0001*	- .391	22.4%	*p = .008*
Symptoms of PTSD	- .849	*p < .0001*	- .616	25.4%	*p = .002*
Past physical or sexual abuse	- .371	*p = .009*	- .257	15.4%	*p = .060*
IPV	- .254	*p = .420*	+ .240	4.8%	*p = .421*
Stimulant use	- .849	*p < .0001*	- .739	27.2%	*p < .0001*
Binge drinking	- .362	*p = .015*	- .240	14.5%	*p = .085*

All measurements controlling for the other variables within this model.

Aim 4. Examine whether higher syndemic count (the number of syndemic conditions experienced concomitantly) was associated with medication adherence.

For Aim 3, a simple linear regression model was used to determine the association between (a) syndemic condition count and medication adherence, (b) no or one syndemic condition and medication adherence, and (c) two or more syndemic conditions and medication adherence. Furthermore, two multiple linear regression model were used to determine the association between syndemic counts and medication adherence using (a) no syndemic condition as the reference group and (b) no and one syndemic condition as the reference group (Table 3). A Cronbach's alpha of .05 was used to determine significance.

Association between syndemic condition count and medication adherence. A simple linear regression revealed that the greater the number of syndemic conditions, the higher the association with medication adherence to a statistically significant degree $F(1,279) = 45.370$, $p < .0001$. A participant's having more syndemic conditions (a) accounted for 14.0% of the explained variability in medication adherence and (b) was associated with a medication adherence decrease of .367 for each additional syndemic condition.

Association between no syndemic condition and medication adherence. A simple linear regression revealed that having no syndemic condition was associated with medication adherence to a statistically significant degree $F(1,279) = 16.824$, $p < .0001$. A participant's having no syndemic condition (a) accounted for 5.7% of the explained variability in medication adherence and (b) was associated with a medication adherence increase of .599 relative to the medication adherence of participants who had at least one syndemic condition.

Association between no or one syndemic indicator and medication adherence. A simple linear regression revealed that having no or one syndemic condition was associated with

medication adherence to a statistically significant degree $F(1,279) = 26.702$, $p < .0001$. A participant's having no syndemic condition (a) accounted for 8.7% of the explained variability in medication adherence and (b) was associated with a medication adherence increase of .705 relative to the medication adherence of participants who had at least two syndemic conditions.

Association between one or more syndemic conditions and medication adherence. A simple linear regression revealed that having one or more syndemic condition was associated with medication adherence to a statistically non-significant degree $F(1,279) = 1.352$, $p = .246$. A participant's having one or more syndemic condition (a) accounted for .5% of the explained variability in medication adherence and (b) was associated with a medication adherence decrease of .167 relative to the medication adherence of participants with no syndemic condition.

Association between two or more syndemic conditions and medication adherence. A simple linear regression revealed that having two or more syndemic conditions was associated with medication adherence to a statistically significant degree $F(1,279) = 26.702$, $p < .0001$. A participant's having two or more syndemic conditions (a) accounted for 8.7% of the explained variability in medication adherence and (b) was associated with a medication adherence decrease of .705 relative to the medication adherence of participants who had no syndemic conditions.

Association between symptoms one, two, three, and four or more syndemic conditions and medication adherence. A multiple linear regression revealed that having one, two, three, four, or more syndemic conditions of the overall model was associated with medication adherence to a statistically significant degree $F(4,276) = 11.969$, $p < .0001$ and the overall model accounted for 14.7% of the explained variability in medication adherence.

Participants' medication adherence decreased by .312 for having one syndemic conditions relative to the medication adherence of participants who had no syndemic condition,

which was significantly different (p = .051), with a unique contribution of 6.9%, controlling for two, three, four, or more syndemic conditions.

Participants' medication adherence decreased by .541 for having two syndemic conditions relative to the medication adherence of participants who had no syndemic condition this difference was statistically significant (p = .003), with a unique contribution of 5.6%, controlling for one, three, four, or more syndemic conditions.

Participants' medication adherence decreased by 1.350 for having three syndemic conditions relative to the medication adherence of participants who had no syndemic condition this difference was statistically significant (p < .0001), with a unique contribution of 25.9%, controlling for one, two, four, or more syndemic conditions.

Participants' medication adherence increased by 1.504 for having four or more syndemic conditions than participants who had no syndemic condition; this difference was not statistically significant (p < .0001) with a unique contribution of 20.8%, controlling for one, two or three syndemic conditions.

Association between symptoms two, three, and four or more syndemic conditions and medication adherence. A multiple linear regression revealed that having two, three, four, or more syndemic conditions of the overall model was associated with medication adherence to a statistically significant degree $F(3,277) = 14.532$, $p < .0001$; the overall model accounted for 12.7% of the explained variability in medication adherence.

Participants' medication adherence decreased by .373 for having two syndemic conditions relative to the medication adherence of participants who had no or one syndemic condition this difference was statistically significant (p = .019), with a unique contribution of 5.6%, controlling for three, four, or more syndemic conditions.

Participants' medication adherence decreased by 1.182 for having three syndemic conditions relative to the medication adherence of participants who had no or one syndemic condition this difference was statistically significant ($p < .0001$), with a unique contribution of 25.9%, controlling for two, four, or more syndemic conditions.

Participants' medication adherence increased by 1.336 for having four or more syndemic conditions relative to the medication adherence of participants who had no or one syndemic condition; this difference was statistically significant ($p < .0001$) with a unique contribution of 20.8%, controlling for two or three syndemic conditions.

No syndemic condition versus no or one syndemic condition. There is a difference in levels of medication adherence depending on how many syndemic conditions one has. Medication adherence is higher in participants with no syndemic conditions than with any count of syndemic condition. The difference between two or more syndemic conditions and medication adherence is also significant. Combining no and one syndemic condition and comparing that category with two or more syndemic conditions resulted in significance of all syndemic condition counts.

Table 3.

Association Between Syndemic Counts and Outcome Variable: Medication Adherence

Syndemic conditions	Medication adherence change: increase +; decrease -	Unique Contribution	*p*-value
Multivariate Regression — Reference: no syndemic condition			
1 Syndemic condition	- .312	6.9%	*p = .051*
2 Syndemic conditions	- .541	5.6%	*p = .003*
3 Syndemic conditions	- 1.350	25.9%	*p < .0001*
≥ 4 Syndemic conditions	- 1.504	20.8%	*p < .0001*
Multivariate Regression — Reference: no or one syndemic condition			
2 Syndemic conditions	- .373	5.6%	*p = .019*
3 Syndemic conditions	- 1.182	25.9%	*p < .0001*
≥ 4 Syndemic conditions	- 1.336	20.8%	*p < .0001*

CHAPTER 5:

Discussion

The Meaning of Findings in Relation to Research Aims

This chapter discusses the findings pertaining to each aim of the present study; this discussion is based on my interpretation of the data.

Aims 1 and 2

The sample of 281 MSM living with HIV (age: 50 years and older) was categorized into two groups: participants experiencing no or one syndemic condition (who may not have health problems) and participants experiencing two or more syndemic conditions (who may have health problems).

Age. This study shows that even older MSM who are HIV positive experience syndemic conditions. However, the mean age of participants experiencing two or more syndemic conditions was slightly younger and this difference was significant (p = .013). To our knowledge, no prior study has examined an age difference among participants having syndemic conditions. However, what was established that some studies participants were generally younger than the current studies participants' age (Friedman et al., 2016; Martinez et al., 2016; Santos et al., 2014; Stall et al., 2003). This raises the question whether the experience influences syndemic conditions might diminish over time or when participants get older.

Race. In comparing participants having no or one syndemic condition with participants having two or more syndemic conditions, the present study found no significant difference in association with race–ethnicity. Although Friedman et al. (2015) has previously found that minority ethnicity was significantly associated with poorer medication adherence, we did not find that ethnic groups differed in their numbers of syndemic conditions, however, African Americans had more syndemic conditons than other ethnic groups.

Sexual orientation. In comparing participants having no or one syndemic condition with participants having two or more syndemic conditions, the present study found no significant difference in sexual orientation. Prior to our study, no published study has investigated associations between syndemic conditions and sexual orientation.

Years of HIV-infection. Most of the participants in our study sample had lived with HIV for many years. However, in comparing participants having no or one syndemic condition with participants having two or more syndemic conditions, the present study found no significant difference in years of HIV-infection. Prior to our study, no published study has investigated associations between syndemic conditions and years of HIV-infection.

Education. The majority of the participants in our study had at least some college education. However, in comparing participants having no or one syndemic condition with participants having two or more syndemic conditions, the present study found no significant difference in level of education. Friedman et al. (2015) and Martinez et al. (2016) also found that their studies' participants were highly educated (i.e., the majority had at least some college experience). These findings raise the question of whether being less educated is a protecting factor or being more resilient in responding to the effects of syndemic conditions.

Employment. The majority of participants in our study did not work. However, in comparing participants having no or one syndemic condition with participants having two or more syndemic conditions, the present study found a significant difference in level of employment. Among participants who were employed full-time, the percentage of participants with no or one syndemic condition was substantially greater than the percentage of participants with two or more syndemic conditions—74.1% vs. 25.9%, respectively. Furthermore, among participants who worked full- or part-time, the percentage of participants with no or one

syndemic conditions was somewhat greater than the percentage of participants with two or more syndemic conditions—29.4% vs. 20.8%, respectively. Prior to our study, no published study has investigated associations between syndemic conditions and employment status.

Income. The present study found that in terms of income, participants experiencing no or one syndemic condition differed significantly from participants experiencing two or more syndemic condition differed significantly. The percentage of participants with an annual income of $40,000 or less was greater for participants experiencing two or more syndemic conditions than for participants experiencing no or one syndemic condition—81.0% vs. 63.3%, respectively. We would think that because participants with more syndemic conditions because are not able to work as much, they would have less income. This finding showed that more participants experiencing no or one syndemic condition have full- or part-time employment but whose annual income is less than those participants experiencing two or more syndemic conditions. Friedman et al. (2016) also found that a lower income status was significantly associated with syndemic counts. Contrary to Stall et al. (2003), fewer than one half (44%) of their participants had an annual income below $40,000. It seems that in general, participants with syndemic conditions do not have a high annual income. In particular, the present study showed that the majority of participants had low income. This result raises the question whether people with a low annual income are more prone for syndemic conditions or whether people with syndemic conditions lose their employment and consequently have diminished annual income. Ordinarily, given that the participants in these studies had relatively high levels of education, one might assume that they would have better employment and career opportunities. However, exposure to syndemic conditions might significantly diminish their employment, career advancement, and income generation potentials.

General health. In comparing participants having no or one syndemic condition with participants having two or more syndemic conditions, the present study found significant difference in the perceptions of general health (p = .004). Among participants with no or one syndemic condition, 9.4% self-rated their health as "excellent," 31.7% as "very good," and 39.4% as "good." In comparison, among participants with two or more syndemic conditions, 5.9% self-rated their health as "excellent," 23.8% as "very good," and 28.7% as "good." Furthermore, among participants who self-reported "excellent" general health, the percentage with no or one syndemic condition was much larger than the percentage with two or more syndemic conditions—73.9% vs. 26.1%, respectively. Similarly, among participants who self-reported "very good" general health, the percentage with no or one syndemic condition was also much larger than the percentage with two or more syndemic conditions—70.4% vs. 29.6%, respectively. Also, among participants who self-reported "good" general health, the percentage with no or one syndemic condition was again much larger than the percentage with two or more syndemic conditions—71.0% vs. 29.0%, respectively.

HIV VL. The majority of participants in this study had an undetectable HIV VL. In comparing participants having no or one syndemic condition with participants having two or more syndemic conditions, the present study found no significant difference in HIV VL. Friedman et al. (2016) found a significant association between detectable HIV VL and syndemic counts. Although an undetectable HIV VL can be reached with a less than perfect medication adherence (Bangsberg et al. 2010; Saberi et al. 2015), many of this study's participants who had an undetectable HIV VL may not have had perfect adherence.

Aim 3

Syndemic conditions of symptoms of depression, symptoms of PTSD, past physical or sexual abuse, stimulant use, and binge drinking were individually and significantly associated with lower medication adherence; however, IPV was not. IPV may have not been significant because of the high cutoff point of the instrument used to ascertain the self-reported occurrence of IPV. If the cutoff point had been lower, more participants would have been associated with IPV and significance would have been determined.

Du Bois and McKirnan (2012), Halkitis et al. (2014), Gonzalez et al. (2013), and Mitzel et al. (2015) also found that symptoms of depression were associated with poorer medication adherence. However, their study population was not older MSM. It would be interesting to know whether older MSM would differ from older straight men in symptoms of depression. In addition, Stall et al. (2003) also found that symptoms of depression were significantly associated with childhood sexual abuse and IVP.

In finding that higher alcohol and substance use were associated with poorer medication adherence in older MSM who were HIV positive, the present study concurred with the earlier study conducted by Du Bois and McKirnan (2012).

Halkitis et al. (2014) also found that an individual's having more symptoms of PTSD was associated with the individual's having poorer medication adherence. However, their study population included older MSM who were HIV positive. The present study shows that symptoms of PTSD exist even in an older HIV-positive population.

Paul et al. (2001) and Schafer et al. (2013) found that in comparison with straight men, MSM were more likely to have experienced CSA. Furthermore, Phillips et al. (2014) found that, in comparison with MSM who were HIV negative, MSM who were HIV-positive were

more likely to have had CSA. This study shows that among older MSM who were HIV positive, past physical or sexual abuse was significantly associated with medication adherence and 56.4% of those with two or more syndemic conditions reported depression symptoms.

Although Schafer et al. (2012) found that symptoms of PTSD and IPV were associated with a detectable HIV VL, they did not find any significant association with medication adherence among older HIV-positive MSM.

Rajasingham et al (2012) found that study participants using methamphetamines were less likely to be adherent to ART. Their findings correspond with the present study's findings. Furthermore, the uniqueness of the present study is that substance use also occurs in older HIV-positive MSM not only in younger men or younger MSM; these findings underscore the importance of substance use screening for older MSM who are HIV-positive is crucial.

The application of a multilinear regression model found that associations between symptoms of depression, symptoms of PTSD, and stimulant use, on the one hand, and medication adherence, on the other hand, were statistically significant and that each of these symptoms made a unique contribution to medication adherence; however, past physical or sexual abuse, IPV, and binge drinking were not associated with medication adherence. Notably, previous studies had also found that depression (Mitzel et al., 2015) and PTSD (Halkitis et al., 2014) were associated with poorer medication adherence. The present study is the first to report that past physical or sexual abuse, stimulant use, and binge drinking are also associated with poorer medication adherence.

The present study revealed that in medication adherence, participants with no or one syndemic condition differed significantly from participants with two or more syndemic conditions. Among participants with no or one syndemic condition, 72.8% self-reported

"excellent" medication adherence; among participants with two or more syndemic conditions 43.6% self-reported "excellent" medication adherence. Also, among participants who self-reported "excellent" medication adherence, 74.9% had no or one syndemic condition, and 25.1% had two or more syndemic conditions. Among participants with no or one syndemic condition, 96.7% self-reported "excellent," "very good," or "good" medication adherence; among participants with two or more syndemic conditions, 83.2% self-reported "excellent," "very good," or "good" medication adherence. Similarly, among participants whose self-reported medication adherence was "very good," 55.7% had no or one syndemic condition and 44.3% had two or more syndemic conditions.

Aim 4

A participant's having no syndemic condition was significantly associated with higher medication adherence. Subsequently, the syndemic conditions that participants self-reported were associated with poorer medication adherence. Experiencing two and more syndemic conditions were significantly associated with poorer medication adherence. Experiencing just one syndemic condition was not significantly associated with poorer medication adherence. However, combining no or one syndemic condition and comparing that category with other syndemic counts of two or more syndemic condition resulted in significant poorer medication adherence. The larger the number of syndemic conditions that participants self-reported, the poorer was their medication adherence.

Blashill et al. (2015) has also reported that in their study, more syndemic conditions were associated with poorer medication adherence. The present study shows that even among older HIV-positive MSM syndemic conditions are present and contribute to poorer medication adherence. Santos et al. (2014) also found that having a larger number of syndemic conditions

was associated with greater likelihood of engagement in condomless anal sex and HIV-infection. Stall et al. (2003) found that psychosocial health problems were associated with engagement in HIV-risk behaviors. Friedman et al. (2015) found that syndemic conditions mediated HIV VL. All of these findings show that syndemic conditions are associated with worsened outcome.

Significance

The present study's findings are important contributions to the body of literature on medication adherence because they suggest that in older MSM, syndemic conditions—specifically, symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking—may affect medication adherence. However, it is important to also acknowledge that symptoms of depression, symptoms of PTSD, past physical or sexual abuse, and IPV may themselves contribute to substance use. Before implementing an intervention to improve medication adherence, we must understand the factors that contribute to non-adherence to medication, and we must identify or develop interventions for reducing or ameliorating syndemic conditions including those examined in the present study. We hope that by reducing symptoms of depression, symptoms of PTSD, past physical or sexual abuse, and IPV, may be able to reduce the psychoactive substance use and increase medication adherence.

Primary care providers may assume that patients who use substances are not adherent to ART. Few primary care providers know that substance use is not the primary barrier to medication adherence. The data from the present study show that many older HIV-positive MSM have experienced symptoms of depression, symptoms of PTSD, past physical or sexual abuse, and IPV. These syndemic conditions may lead to substance use.

Nurses who listen to and empathetically care for their patients build relationships of trust with their patients; on the basis of this trust, patients may be more likely to disclose their syndemic conditions. When we as nurses practice active listening with our patients, patients in turn are more likely to tell us what is wrong with them. Absent such disclosure, syndemic conditions may go undetected and untreated. Although achieving universal medication adherence may always remain a challenging goal, it is a goal whose benefits are clear and worthy of clinicians' efforts and commitment. Blaming a patient or blaming a patient's substance use is easy; ascertaining the basis of a patient's substance use is more difficult. Often, primary care providers may feel that if they ask patients about their substance use or about other syndemic conditions, providers will not know what to do with information that their patients might provide. Nurses, on the other hand, do not give up; rather, they thrive in finding opportunities to assist patients in a manner that is caring and not blaming. We know the more syndemic conditions a patient has, the more vulnerable patients are to substance use. One ramification of the association between syndemic conditions and substance use is that all primary care patients should be screened not only for substance use but also regarding symptoms of depression, symptoms of PTSD, past physical or sexual abuse, and IPV.

Study Limitations

Our study had several limitations. Multicollinearity between predictor variables is one concern. Some of the predictors are highly correlated; therefore, the outcome variable may not find valid results to individual predictors. Furthermore, in the present study, the number of predictor variables was limited due to correlation. The data set also included anxiety measures from the GAD-7 questionnaire. The drug questions were limited to stimulant use and did not include opioids and sedatives that might have increased the number of participants using drugs.

Furthermore, stimulant use was assessed for the preceding 30 days, not 6 months as Colfax et al. (2005) recommended. If our study had been conducted for 12 months, a higher number of participants might have self-reported stimulant use.

Our study assessed only binge drinking because assessment of this behavior only requires use of quick clinical screening tool; our study could not assess heavy drinking because this assessment was not done. Participants who self-reported no binge drinking might have self-disclosed heavy drinking by being asked the right question. The NIAAA (2017) recommends that participants be asked whether they drink 14 or more standard drinks per week. With that question, we would have been able to identify participants who engaged in heavy drinking—and not just participants who engaged in binge drinking.

When counting the syndemic conditions and attempting to ascertain associations between the syndemic conditions and medication adherence, information regarding which syndemic condition resulted in a higher syndemic count and poorer medication adherence was lost. Knowing how many syndemic conditions contributed to poorer medication adherence did not enable identification of what syndemic condition was actually the reason for poorer medication adherence.

Past physical or sexual abuse and IPV might have been misinterpreted by participants who self-reported both past physical and sexual abuse and IPV when in fact only one of those syndemic conditions occurred. In the questionnaire, past physical or sexual abuse was not defined as "childhood" abuse. However, to assess childhood abuse, Bashill et al. (2015) also used a questionnaire that enquired about past physical or sexual abuse questionnaire.

Given that our study's sample was older adult MSM who were HIV positive, we could not draw a comparison between subpopulations of young MSM who are HIV positive, MSM who are HIV negative, or straight men.

Implications for Nursing

Nurses are at the forefront of patient care and are the first to know when patients experience syndemic conditions such as symptoms depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking. Medication is an important factor in inhibiting HIV progression, and nurses are optimally positioned to effectively deliver this message to patients—in addition to giving patients medication adherence advice and counseling. However, nurses who care for people with syndemic conditions, including substance use vary in their degrees of comfort and qualification. Accordingly, for nurses who care for people with syndemic conditions, the provision of training and learning opportunities is crucial.

Future Research

In the future, researchers should investigate whether syndemic conditions are causal to substance use and to medication adherence. In addition, in order to substantially improve individuals' medication adherence, researchers must design and test the efficacy of medication adherence improvement interventions that concurrently reduce symptoms of depression, symptoms of PTSD, past physical or sexual abuse, IPV, stimulant use, and binge drinking. Also, future research should examine whether syndemic conditions are causally related to substance use and to medication adherence.

Conclusion

The HIV epidemic is not over yet. Given that medication adherence is a crucial component of PLWH health, providers must be aware that MSM receiving ART vary in their

ability to adhere to their regimens and, as the findings of the present study suggest, in their past and present exposure to the syndemic conditions that affect their adherence. Just as the advent of programs such as the Silver Project and the Positive Health Program represented an important extension of the continuum of HIV/AIDS care, the findings of this present study may suggest further extensions of the continuum of care—to include consideration of syndemic conditions that have affected MSM with HIV both earlier in their lives and in broader psychosocial contexts. The hope is that ultimately these findings will motivate nurses to assess the older MSM who are HIV positive—to screen for those syndemic conditions and to offer appropriate effective support. On the basis of this extended health care perspective, the end of the HIV pandemic may come more clearly into view.

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Table 4. List of Study Variables

Variable	Measure	Scale/Operational Definition
Age	Demographic Information	Continues variable
Gender	Demographic Information	1=male 2=female 3=male to female transgender 4=female to male transgender
Education	Demographic Information	1=less than high school 2=some high school 3=high school diploma or GED 4=some college 5=bachelor's degree 6=some graduate school 7=graduate or professional degree
Ethnicity	Demographic Information	1=African American 2=Asian 3=Caucasian 4=Hispanic 5=native American/Alaskan Native 6=Native Hawaiian/Pacific Islander 7=Other
Employment Status	Demographic Information	1=full time (at least 35 hours per week) 2=part time (less than 35 hours per week 3=unemployed 4=retired 5=in school 6=receiving disability 7=other
Household Income	Demographic Information	1=less than $10,000 2=$10,001 – $20,000 3=$20,001 – $40,000 4=$40,001 – $60,000 5=$60,001 – $80,000 6=$80,001 – $100,000 7=more than $100,000 8=prefer not to say
Year of HIV diagnosis	Demographic Information	Continues variable
General Health	Demographic Information	0=don't know 1=poor 2=fair 3=good 4=very good 5=excellent

Table 4. (continued)

Variable	Measure	Scale/Operational Definition
PHQ-9	Depression	0=not at all 1=several days 2=more than half the days 3=nearly every day
Breslau	PTSD	0=no 1=yes
Physical and Sexual Abuse	Abuse	sexual physical
HITS	IPV	1=never 2=rarely 3=sometimes 4=fairly often 5=frequently
Drink Alcohol	Substance Use	0=no 1=yes
5+ standard drinks in one day	Substance Use	Continues variable
Methamphetamine Cocaine Crack	Substance Use	0=never 1=only a few times 2=1 to 3 times per month 3=about once a week 4=2 to 5 times a week 5=about once a day 6=2 to 3 times a day, almost every day 7=4 to 9 times a day, almost every day 8=10 or more times a day, almost every day
Self-Rating Scale Item	Medication Adherence	1=very poor 2=poor 3=fair 4=good 5=very good 6=excellent 7=not taking HIV meds
HIV Viral Load	Viral Suppression	Continuous

Table 5. Patient Health Questionnaire (PHQ)-9—Depression

Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all 0	Several days 1	More than half the days 2	Nearly every day 3
Little interest or pleasure in doing things				
Feeling down, depressed, or hopeless				
Trouble falling or staying asleep, or sleeping too much				
Feeling tired or having little energy				
Poor appetite or overeating				
Feeling bad about yourself – or that you are a failure or have let yourself or your family down				
Trouble concentrating on things, such as reading the newspaper or watching television				
Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual				
Thoughts that you would be better off dead or of hurting yourself in some way				

Table 6. Breslau—PTSD

1) Have you experienced, witnessed, or been confronted with an even or events that involved actual or threatened death or serious injury, or a threat to the physical integrity of yourself or other?
2) Did your response involve intense fear, helplessness, or horror?

If both questions were answered with yes, the Breslau questionnaire below was used to measure PTSD

Questions	No = 0	Yes = 1
Did you avoid being reminded of this experience by staying away from certain places, people, or activities?		
Did you lose interest in activities that were once important or enjoyable?		
Did you begin to feel more isolated or distant from other people?		
Did you find it hard to have love or affection for other people?		
Did you begin to feel that there was no point in planning for the future?		
After this experience were you having more trouble than usual falling asleep or staying asleep?		
Did you become jumpy or get easily startled by ordinary noises or movements?		

Table 7. Abuse Questions

In the past, have you ever been
Sexually abused
Physically abused
Mentally abused
Emotionally abused
Financially abused
I have never been abused

Which of the following best describes your relationship with the abuser(s) that was in your life?
Family
Romantic Partner
Acquaintance
Stranger

Table 8. Hurt-Insult-Threaten-Scream (HITS) —IPV

Over the last 12 months, how often did your partner:	Never 1	Rarely 2	Sometimes 3	Fairly Often 4	Frequently 5
Physically hurt you					
Insult you or talk down to you					
Threaten you with physical harm					
Scream or curse at you					

Table 9. Stimulant Use Questions

	Never	Only a few times	1 to 3 times per month	About once a week	2 to 5 times a week	Once a day	2 to 3 times a day	4 to 9 times a day	10 or more times a day
Have you used any meth amphetamine during the past 30 days? If so, how often?									
Have you used any cocaine during the past 30 days? If so, how often?									
Have you used any crack during the past 30 days? If so, how often?									

Table 10. Alcohol Questions

	Yes	No
Do you sometimes drink wine, beer or other alcoholic beverages?		
How many times in the last year (12 months) have you had 5 or more standard drinks in one day?	Number of drinking days	

Table 11. Visual Analog Scale—Medication Adherence

How much of each of your HIV medications have you taken over the past 30 days?

0% 50% 100%

Scoring: 0% –100%
Range: 0% –100%

Table 11. Self-Rating Scale Item—Medication Adherence

Please rate your ability to take your HIV medications over the past 30 days Very Poor Poor Fair Good Very Good Excellent

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