Social Determinants of HIV Treatment Engagement among Postpartum Black Women Living with HIV (WLWH)

Emmanuela Nneamaka Ojukwu
University of Miami, eno5@miami.edu

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SOCIAL DETERMINANTS OF HIV TREATMENT ENGAGEMENT AMONG POSTPARTUM BLACK WOMEN LIVING WITH HIV (WLWH)

By

Emmanuela Nneamaka Ojukwu

A DISSERTATION

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SOCIAL DETERMINANTS OF HIV TREATMENT ENGAGEMENT AMONG POSTPARTUM BLACK WOMEN LIVING WITH HIV (WLWH)

Emmanuela Nneamaka Ojukwu

Approved:

Rosina Cianelli, Ph.D.  Natalia Villegas Rodriguez, Ph.D.
Associate Professor of Nursing  Associate Professor of Nursing

Karina Gattamorta, Ph.D.  Guillermo Prado, Ph.D.
Research Associate Professor  Dean of the Graduate School

Giovanna De Oliveira, Ph.D.
Assistant Professor of Nursing

Lunthita Duthely, Ed.D.
Research Assistant Professor
Prenatal Immunologic Clinic
University of Miami Health System
Department of Obstetrics, Gynecology and Reproductive Sciences
Engagement in postpartum Human immunodeficiency virus (HIV) treatment is critical to decreasing maternal morbidity and mortality, and poor infant health outcomes. HIV-related maternal morbidity is one of the leading causes of death among women of reproductive age, with as many as 8,500 HIV-infected women giving birth annually in the US. The risk of HIV-related maternal morbidity is greater for Black women who are disproportionately affected by the disease with an infection rate of 59% compared to 20% for Whites, and 21% for other minorities. Black women also have the highest rates of unintended pregnancies, HIV-related mortality, and being lost to follow-up (LTFU) for postpartum HIV treatment.

Studies demonstrate that social determinants of health (SDH) can influence the likelihood of engagement in HIV treatment for women living with HIV (WLWH). SDH are the conditions in which people are born, grow, live, work, and age. Poor social and economic situations negatively impact health throughout life, particularly for people living with HIV, and minorities are most likely to live in such conditions. To date, there has been a lack of research on the social determinants of engagement in HIV treatment among postpartum WLWH, particularly Black women who are significantly and disproportionately affected by HIV.
Therefore, the aim of this study was to investigate the social determinants of engagement in HIV treatment among postpartum Black WLWH, at the intrapersonal and interpersonal levels of the McLeroy social ecological model (SEM). The SEM is best suited to analyze the integrative-interactive synergy that exists between a person and her environment, and how such interactions influence health behaviors. The model postulates that patterned behavior is an outcome of interrelatedness among an individual’s intrapersonal attributes, interpersonal relationships, institutional factors, community factors, and societal factors. Postpartum engagement (PPE) was operationally defined as keeping at least 70% of scheduled postpartum visits in the first three months postpartum and having at least 500 Cluster of differentiation 4 glycoprotein (CD4) copies/mL and a viral load (VL) less than 200 copies/mL. Ongoing primary care engagement (PCE) was operationally defined as keeping as least 50% of scheduled postpartum visits in the first postpartum year and having at least 500 CD4 copies/mL and a VL less than 200 copies/mL.

This study was a retrospective, secondary data analysis of 143 Black postpartum WLWH who received immediate postpartum care at the University of Miami Prenatal Immunologic (PRIM) clinic and then transitioned into ongoing primary care at the Women’s Integrated Services for Health (WISH) clinic from May 2009 to May 2017. Data were retrieved manually and electronically from patients’ medical charts. Inclusion criteria for study participants were postpartum women age 18 years and older who self-identified as Black and had started prenatal care (PNC) at least one month prior to delivery of a live infant at PRIM before transitioning to WISH.
The researcher explored SEM variables at the intrapersonal and interpersonal levels. The variables investigated at the individual level were age, income, employment, education, health insurance, and maternal health status (HIV-related, obstetric, gynecologic, and psychosocial health status). HIV-related health status included the mode of HIV transmission, timing of HIV-diagnosis, and HIV biomarkers (VL count and CD4 count at baseline and delivery). The obstetric health status included the term at birth, type of delivery, and adequacy of PNC, including the gestational month at PNC entry and duration. The gynecologic health status included the women’s other medical comorbidities, while the psychosocial health status was measured by depressive symptoms and substance use. The variables investigated at the interpersonal level were relationship status, intimate partner violence/abuse, caregiver burden, HIV disclosure, and social support.

Data were analyzed using the IBM Statistical Package for the Social Sciences (SPSS). The analyses were conducted to examine the SDH that significantly affected two outcomes, independent of each other: postpartum HIV treatment engagement at three months (immediate postpartum engagement; PPE) and at 12 months (ongoing primary care engagement; PCE). The data analysis included descriptive statistics, chi-square, t-tests, and logistic regression.

Of the 143 women included in the study, the PPE rate was 32.9% and the PCE rate was 24.5%. Among women who attained PPE, more than half were unemployed (51.1%), had a high school diploma or more (71.7%), and had health insurance (78.1%). Among women who attained PCE, more than half were unemployed (68.6%), had a high school diploma or more (74.2%), and had health insurance (74.3%). The PPE logistic
regression analysis indicated that women had greater odds of engagement when their HIV VL was less than 200 copies/mL at baseline, they had delivered vaginally, and they had disclosed their HIV status to a family member, partner, or significant other. In contrast, women who were abused were less likely to engage in treatment. For PCE, women had greater odds of engagement when their HIV VL was less than 200 copies/mL and they had had term births. Conversely, women who had private health insurance were less likely to engage in treatment. Therefore, these findings indicated that the SDH significantly affecting PPE were maternal health status (HIV-related and obstetric health status), HIV disclosure. The SDH significantly affecting PCE were health insurance and maternal health status (HIV-related and obstetric health status).

This study is the first to provide evidence about HIV treatment disengagement among Black postpartum WLWH in Miami, FL—the city with the nation’s highest HIV rate. Because these results show that SDH may be contributing to this disparity, the researcher offers recommendations for future nursing research, teaching, practice, and policy. The results from this study also can be used to develop a measure to assess HIV treatment engagement for Black postpartum WLWH. Such a measure could help identify at-risk women, which would allow healthcare providers to intervene promptly. Building on this study’s findings, future researchers could use a sample of other minority groups to allow the results to be extrapolated to other minority women populations. In light of this study, nursing school curricula should be adjusted to offer course content on the disparities in HIV treatment engagement for pregnant and postpartum women, and the SDH that are linked to such outcomes. Practicing nurses should be empathetic and sensitive to their patients’ physical and cultural needs. Women whose treatment could be
hindered by their socioeconomic status should be referred to a social worker and educated about available Federal healthcare insurance plans (e.g., the Ryan White HIV/AIDS program). This study’s results also highlight the effect that HIV disclosure and abuse can have on engagement. Offering a nurse-facilitated disclosure intervention, such as the one discussed in this study, could help empower nurses to intervene when they see signs of abuse among their patients.
Dedication

This dissertation is dedicated to:

1. God Almighty, and my Lord Jesus Christ, without whom this journey could not have ever been possible.

2. My parents, Sir Martin Chukwunonye Ojukwu (KSM) and Lady Lydia Nkiruka Ojukwu (LSM), who from an early age, taught me the importance of education and relishing the boundless treasures that come with it. To my family, Chidubem Pius Njeze, Norah Ogochukwu Njeze, Usonwa Kodichukwu Njeze, Nwanneka Ogochukwu Njeze, Martin Chisom Ojukwu, Obunneme Stephen Ojukwu, and Prisca Chinazom Ojukwu, whose unwavering love and support helped me persevere through all strides of this journey.

3. To every woman living with HIV, particularly, the pregnant and new mothers, your life matters to your baby just as theirs matter to you. Please, take care of yourselves, and be present for them during this journey of your lives.

4. To all doctoral students working tirelessly- sleepless nights, migraines, acnes and all; fighting to build a great future for your different fields of study. Do not give up. It gets easier as you stride farther. One foot in front of the other, one paragraph beyond another, a strong supportive system of family, friends, teachers and you will be reaping the reward in not time. This is your personal journey and your story to tell. Embellish it with beautiful memories and novelty. It is not about “how far or how much” but “how well”. So, make it count. A good dissertation is a done dissertation. Do not relent. You have people rooting for you. I am one of them.
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List of Abbreviations

ACOG: American College of Obstetrics and
AIDS: Acquired Immune Deficiency Syndrome
APA: American Pregnancy Association
A-PNCU: Adequacy of prenatal care utilization
aOR: Adjusted odds ratio
aRR: Adjusted risk ratio
ART: Antiretroviral therapy
AZT: Zidovudine
BP: Before pregnancy
cART: Combination anti-retroviral therapy
CD4_BL: CD4 at baseline
CD4_Del: CD4 at delivery
CD4: Cluster of differentiation 4 glycoprotein
CDC: Centers for Disease Control and Prevention
C/S: Cesarean section
DP: During pregnancy
E: Employed
EGA: Estimated gestational age
FPL: Federal poverty level
Gest. Month PNC Entry: Gestational month of prenatal care entry
HCC: HIV care continuum
HHS: United States Department of Health and Human Services
HIV: Human immunodeficiency virus
HIV RNA: Human immunodeficiency virus ribonucleic acid
HRSA HAB: Human Resources and Services Administration HIV/AIDS Bureau
HSD: High school diploma
IDU: Intravenous drug use
IPV/A: Intimate partner violence/abuse
LTFU: Lost to follow-up
M: Medicaid
M+: Married/living with a partner
MLE: Maximum likelihood estimation
NDS: No depressive symptoms
NI: No insurance
ODPHP: Office of Disease Prevention and Health Promotion
OECD: Organization for Economic Cooperation and Development
P: Perinatal
PAHIV: Perinatally-acquired HIV
PCP: Pneumocystis jiroveci pneumonia
PCE: Ongoing primary care engagement
PLWH: People living with HIV
PMTCT: Prevention of mother-to-child transmission
PNC: Prenatal care
PNCU: Prenatal care utilization
PND: Prenatal depression
PNDS: Prenatal depressive symptoms

PN-PMTCT: Postnatal prevention of mother-to-child transmission

P/O: Private or other insurance

PPD: Postpartum depression

PPDS: Postpartum depressive symptoms

PPE: Immediate postpartum engagement

PRIM: University of Miami Prenatal Immunologic Clinic

PT: Preterm birth

PTSD: Post traumatic stress disorder

S: Single (separated/divorced)

S+: Single (in a relationship)

SC/M: Some college or more

SDH: Social determinants of health

SEM: Social ecological model

SPSS: Statistical Package for the Social Sciences

STI: Sexually transmitted infections

Sx: Sexual

TDF/3TC/EFV: Tenofovir/Lamivudine/Efavirenz

UE: Unemployed

UMHS-EHD: University of Miami Health System Electronic Health Database

UNAID: Joint United Nations Programme on HIV/AIDS

US: United States

V: Vaginal
VIF: Variance inflation factor

VL: Viral load

VL_BL: Viral load at baseline

VL_Del: Viral load at delivery

WHO: World Health Organization

WISH: Women’s Integrated Services for Health Clinic

WLWH: Women living with HIV
Chapter 1 – Introduction

HIV: A Growing Epidemic among Pregnant and Postpartum Women

Human Immunodeficiency Virus (HIV) is an epidemic that continues to plague many countries in the world. In the United States (US), as many as 38,739 people were newly infected with HIV in 2017 (Centers for Disease Control and Prevention [CDC], 2019a). Of these new infections, 19% were women (CDC, 2019a), most infected by heterosexual contact (86%) or injection drug use (IDU; 14%; CDC, 2019a). Women living with HIV (WLWH) who are of reproductive age are at risk for postpartum morbidity and mortality as well as viral transmission to their newborns. The most recent data on the percentage of WLWH giving birth in the US (from 2006) indicated that approximately 8,500 WLWH give birth annually (CDC, 2019b).

With the risk of HIV infection for women and the potential risk of perinatal infection to their newborns, it is critically important to develop strategies to prevent and reduce HIV’s negative consequences for mothers and their children, as well as the subsequent economic costs from the disease. The US Department of Health and Human Services (HHS; 2017) panel on treatment of pregnant women with HIV infection and prevention of perinatal transmission recommends several treatment strategies to manage HIV during the pregnancy and postpartum periods (HHS, 2017). By promoting optimal health for mothers and children since the early 1990s, these strategies have led to a 95% reduction in the rate of perinatal transmission in the US (CDC, 2019b).

For a pregnant WLWH, effective treatment involves three key strategies: taking antiretroviral therapy (ART) during pregnancy (to reduce the mother’s risk of developing opportunistic infections and the infant’s risk of viral transmission); receiving intravenous
ART administration during labor and delivery; and having elective cesarean section delivery (C/S) if indicated (for women at 38 weeks gestation with viral loads [VL] >1,000 copies/mL; HHS, 2017). These women also need other types of care and support such as obstetric, gynecologic, immunologic, physical and psychological health, nutrition, counseling, family planning strategies, and neonatal treatment services (HHS, 2017).

Similarly, the HHS (2017) recommends continuous use of combination anti-retroviral therapy (cART) in the postpartum period to ensure the health of mothers and their children. Other recommendations include receiving primary, gynecologic/obstetric, and HIV specialty care. Case management also is recommended to help the mother, infant, and other family members with basic needs such as housing, feeding, and transportation. Other supportive care services that can be helpful are mental healthcare, family planning services, substance abuse treatment, counseling on condom use and cART adherence (to prevent transmission for sero-discordant couples), and pediatric care for the infant (HHS, 2017).

Prenatal and perinatal strategies for the adequate treatment and management of HIV disease among pregnant WLWH seem to be successful, as evidenced by the rate adequate of treatment adherence during pregnancy (Meade et al., 2018; Vaz et al., 2007) and the reduction in perinatal transmission by 95% (CDC, 2019b). Despite these successes, a major problem remains—a high proportion of WLWH (37% to 74%) disengage from HIV treatment during the postpartum period (Kreitchmann et al., 2012; Mellins et al., 2008; Momplaisir, Storm, Nkwioreze, Jayeola, & Jemmott, 2018b; Rana, Gillani, Flanigan, Nash, & Beckwith, 2010; Siddiqui, Bell, Sangi-Haghpeykar, Minard, &
Levison, 2014; Watts et al., 2019). Women who disengage from postpartum HIV care can experience direct health consequences as well as indirect effects to the well-being of their children and families. Disengagement from postpartum HIV treatment can result in poor viral suppression that can lead to increased maternal morbidity and mortality rates (Lemly et al., 2007; Melekhin et al., 2010; Mellins et al., 2008; Vaz et al., 2007). Additionally, such women miss the chance to be identified to receive supportive care such as mental health, substance use, intimate partner violence, and case management services (HHS, 2017). Further, when these women experience negative health effects (secondary to poor viral suppression), their efforts to care for and contribute economically to their families can suffer. In this way, HIV prevention strategies can provide cost savings for the economy. For example, the annual cost of treating a person living with HIV (adjusted for age, sex, race/ethnicity, and transmission risk group) is $22,248–$54,540, versus $876–$7,536 in medical costs for uninfected persons (Schackman et al., 2015). These researchers also found that the cost savings from preventing one infection is estimated at $229,800 annually, and these savings increase to $338,400 when people living with HIV (PLWH) begin early treatment and remain in care (Schackman et al., 2015).

**HIV Treatment Engagement among WLWH**

There are ethnic- and gender-related disparities in HIV treatment engagement among different populations. Indeed, HIV treatment engagement is a significant problem for WLWH. In 2016, an estimated 258,000 women had HIV, representing 23% of all PLWH. Among those, an estimated 89% were aware of their infection (CDC, 2019a). Moreover, the CDC (2019a) found that for every 100 WLWH in 2015, only 65% had
received care and only 51% were retained in treatment and virally suppressed. Clearly, the minorities who are disproportionately affected by the disease need focused consideration. While Blacks/African Americans represent only 13% of the country’s total population, they comprised 43% of the total new HIV diagnoses in the country in 2017 (CDC, 2019c). In addition, Black women constitute 59% of all HIV diagnoses among women in 2017, compared to only 20% for Whites, 16% for Hispanics/Latinos, and 4% for other races (CDC, 2019a). Furthermore, the rate of heterosexual transmission of HIV among Black women was 91% in 2017, compared to 86% for all WLWH that same year (CDC, 2019a). In addition to ethnicity, certain age groups of women also are disproportionately affected by HIV. For example, young women of reproductive age (25–34 years) had the highest rate of new diagnoses in 2017 (CDC, 2019a). Such women also are found to have high rates of HIV treatment disengagement, particularly during the postpartum period (Siddiqui et al., 2014; Wang et al., 2011), and sometimes during pregnancy. Other factors associated with less than optimum HIV care engagement among women include time and resource constraints, employment, education level, intimate partner violence/abuse, and substance use (Blackstock, Blank, Fletcher, Verdecias, & Cunningham, 2015; Eastwood et al., 2015; Kempf et al., 2010; Moneyham et al., 2010; Quinlivan et al., 2013; Toth, Messer, & Quinlivan, 2013; Yehia et al., 2015). The factors surrounding the disproportionate rate of HIV infection and poor treatment retention among Black women are discussed in detail in chapter two.
Incidence and Prevalence of HIV Treatment Disengagement among Postpartum WLWH

Presently, there is no national estimate of the incidence of postpartum disengagement in HIV care among WLWH. This circumstance likely is due to inconsistencies in the measurement of this phenomena across different studies (Buchberg et al., 2015; Rana et al., 2010; Siddiqui et al., 2014). The measures of who is and who is not engaged in treatment depend on clinic standards and national recommendations. Unfortunately, clinic standards vary across states. Therefore, researchers examining the incidences of disengagement in postpartum HIV treatment have reported varied results.

A retrospective study of postpartum WLWH in Mississippi reported a 37% optimal follow-up rate (defined as two or more visits with a healthcare provider) among patients in the first 12 months postpartum (Rana et al., 2010). Among the 274 participants were 244 Blacks, 29 Whites, five Hispanics, and two Native Americans (Rana et al., 2010). The median participant age was 25 from a range of 18–42 years (Rana et al., 2010). Only 97 of the participants had obtained a high school education and 120 were not employed (Rana et al., 2010).

Another retrospective study of WLWH obtaining prenatal care (PNC) at two private clinics in Houston revealed that only 61% of the 213 participants were optimally retained in care, which was defined as at least one visit with a healthcare provider during the first 12 months postpartum (Siddiqui et al., 2014). Of these patients, 62% were Black, 34% Hispanic, and 4% White. The participant median age group was 20–29, 66% had Medicaid insurance, and 31% were on ART prior to pregnancy (Siddiqui et al., 2014).
Among international studies, a study in Switzerland had an incidence of HIV treatment disengagement that ranged from 14.5% of 580 participants in a 12-month postpartum period (Aebi-Popp et al., 2016). A study in Uganda showed a treatment disengagement rate of 62% among 289 participants in an eight-week postpartum period (Nassali et al., 2009). In a retrospective study of pregnant WLWH attending antenatal care institutions in Zambia, 507 of the 2,029 pregnant women who began care at the clinic were lost to follow-up (LTFU) by the sixth month postpartum (Bengtson et al., 2016). In Bengtson et al.’s (2016) study, *lost to follow-up* (LTFU) was defined as a person missing an HIV treatment appointment within 60 days of the last scheduled appointment. Sixty-six percent (66%) of the participants were 25 years and older, and 74% were either unemployed or housewives (Bengtson et al., 2016). Among the studies referenced above, the overall disengagement rate was higher among postpartum woman than pregnant women (Aebi-Popp et al., 2016; Bengtson et al., 2016; Nassali et al., 2009; Siddiqui et al., 2014). Additionally, greater disengagement is reported for young women than for older women (Siddiqui, et al., 2014), for Blacks/African Americans than for people of other racial backgrounds (Rana et al., 2010; Siddiqui et al., 2014), and for people with low socioeconomic status and/or less social support compared to those with more resources (Rana et al., 2010; Reece, Norman, Kwara, Flanigan, & Rana 2016; Siddiqui et al., 2014; Wang et al., 2011; Watson-Jones, Balira, Ross, Weiss, & Mabey, 2012).

**Consequences of HIV Treatment Disengagement among WLWH**

Women disengaged from HIV care during the postpartum period are susceptible to disease progression that exposes them to negative health outcomes (Katon, Russo, &
Gavin, 2014; Lathrop, Jamieson, & Danel, 2014; Newman, Cafardi, & Warshak, 2015; Ross, Sawatphanit, Mizuno, & Takeo, 2011). These health outcomes can negatively affect women’s physiological and psychological health.

**Physiological**

The physiological consequences of postpartum HIV care disengagement can be grouped into two categories. The first category is the negative effects of advanced HIV disease (secondary to treatment disengagement) on pregnancy and childbirth (Mikyas et al., 1997; Rich, Siegel, Jennings, Rydman, & Landay 1999; Watts et al., 2009). The second category is the negative effects of ART non-adherence on postpartum maternal health (Lathrop et al., 2014; Moran & Moodley, 2012).

During pregnancy, the placenta undergoes distinct phases of immune activation in the first and last trimesters (Mor & Cardenas, 2010). In the third trimester, an influx of immune cells into the myometrium initiates an inflammatory process that encourages cervix ripening, uterine contraction, and delivery (Mor & Cardenas, 2010). For the healthy mother, this immune activation process is subdued, and the maternal immune system returns to normal in the postpartum period (Mikyas et al., 1997; Rich et al., 1999). However, in HIV-infected women this immune activation is increased during pregnancy and remains elevated during the postpartum period in the absence of ART (Mikyas et al., 1997; Rich et al., 1999). For example, Watts et al. (2009) examined the laboratory values of inflammatory markers in postpartum HIV-infected women and found that certain T-lymphocytes were higher among women who had discontinued their medication. In another study, elevated lymphocyte levels were associated with HIV disease progression (Hazenberg et al., 2003). Taken together, these results show how pregnancy related
immunologic changes can adversely affect postpartum health, particularly for immunocompromised women who disengage from treatment.

The high incidence of ART non-adherence is a critical problem for both pregnant and postpartum WLWH, as it is a primary cause of morbidity and eventual mortality among them (Okawa et al., 2015; Vaz et al., 2007). ART adherence can be measured subjectively based on patient self-reporting (Okawa et al., 2015) or objectively by counting a patient’s pills (Vaz et al., 2007) or medication refills at the pharmacy. In Vaz et al.’s (2007) prospective study of 72 pregnant women receiving ART, adherence was 43.1% during pregnancy, a figure that declined to 20.6% postpartum. This study did not include information on the women’s ethnicity (Vaz et al., 2007). In another prospective study with 321 Black pregnant WLWH, ART adherence was 82.5% during pregnancy, 84.2% at one week postpartum, 81.5% at six weeks postpartum, and 70.5% at 24 weeks postpartum (Okawa et al., 2015). These authors documented a noticeable decline in the ART adherence from pregnancy to the postpartum period, with a .61 adherence probability at day 50 of the study’s enrollment period, .35 at 100 days, .18 days at 200 days, and .06 at 300 days (Okawa et al., 2015).

ART nonadherence is the primary cause for virologic failure (a term often used in the literature to identify incidences of poor viral suppression and increased viral rebound rates; Walsh, Pozniak, Nelson, Mandalia, & Gazzard, 2002), low-level viremia (Laprise, de Pokomandy, Baril, Dufresne, & Trottier, 2013), and the development of resistant viruses (Walsh et al., 2002). In terms of viral suppression, other researchers investigating the effects of HIV infection on maternal health and mortality found that postpartum WLWH who stopped therapy within two to six months after delivery had CD4
lymphocyte counts that had lowered by 12 cells per month (Moran & Moodley, 2012). Therefore, an estimated 72 cells would have been lost by the sixth month postpartum if the patient remained disengaged from treatment (Moran & Moodley, 2012). Women who were disengaged from treatment did not have a sufficient number of CD4 cells to maintain their immunity, thereby increasing their risk for developing opportunistic infections.

Another repercussion of ART non-adherence is the high incidence of HIV low-level viremia, which is when HIV-infected individuals suffer a persistent low but detectable level of the virus, often within the range of 50–200 RNA copies (Laprise et al., 2013). HIV low-level viremia can have negative repercussions for pregnant WLWH for whom vaginal births are recommended over C/S, due to reports of fewer complications compared to C/S (Calvert & Ronsmans, 2013a, 2013b; Kourtis et al., 2014; Moran & Moodley, 2012). However, for pregnant WLWH to undergo vaginal births, they need to have attained sufficient viral suppression (≤1,000 VL; HHS, 2015). Conversely, C/S are recommended for women who have not attained sufficient viral suppression (HHS, 2017). Unfortunately, insufficient viral suppression is common among women with poor treatment engagement and/or late HIV diagnosis (i.e., women diagnosed at or close to delivery). Therefore, women who are disengaged from treatment may be at risk for HIV low-level viremia, which can necessitate cesarean births, exposing them to more complications than those from vaginal births (Calvert & Ronsmans, 2013a, 2013b; Kourtis et al., 2014; Moran & Moodley, 2012).

Among postpartum WLWH, study results show that C/S significantly increases the risk of postpartum morbidity, complications (Calvert & Ronsmans, 2013a, 2013b;
Kourtis et al., 2014; Livingston et al., 2016; Read & Newell, 2005), hemorrhage, and death (Calvert & Ronsmans, 2013a; 2013b). These risks are greater for women who undergo emergency or non-elective C/S compared to elective C/S or vaginal births (Calvert & Ronsmans, 2013a; Livingston et al., 2016; Read & Newell, 2005). For example, results from Read and Newell’s (2005) Cochrane review of six studies (one randomized control trial and five observational studies) found that the risk of postpartum morbidity—including minor (e.g., febrile morbidity, and urinary tract infection) and major (e.g., endometritis, and thromboembolism health problems)—was greater for women who underwent C/S compared to vaginal births. They also found that the risk from elective C/S was between that of vaginal births and non-elective C/S (Read & Newell, 2005).

Due to their immunosuppression, C/S can be particularly harmful to the health of postpartum WLWH (Calvert & Ronsmans, 2013a, 2013b; Kourtis et al., 2014). Study results have demonstrated an increased rate of cesarean-associated complications among WLWH compared to women without HIV (Calvert & Ronsmans, 2013a, 2013b; Kourtis et al., 2014). In their study, Kourtis et al. (2014) compared the rates of cesarean-associated complications between postpartum WLWH and their uninfected counterparts. The authors found that the complication rates were notably higher for WLWH (117 per 1,000) births compared to women without HIV (only 67 per 1,000; Kourtis et al., 2014).

In another study, Livingston et al. (2016) investigated cesarean-related complications among a cohort of pregnant WLWH. These complications included surgery, delivery wound complication, infection, thromboembolic events, gastrointestinal complications, and hemorrhagic events. Of the 2,297 women included in the analysis, the
authors noted that 19% had at least one complication, mostly related to wound healing or other infections. Further, the complication rate was greatest among women who had emergency/non-elective C/S (28%), followed by women who had elective surgeries (23%). Vaginal births (13%) had the lowest complication rate. Other factors also are associated with an increased risk of postpartum morbidity among WLWH including advanced HIV disease (evidenced by lower CD4 cells and a high VL) and co-morbid conditions such as diabetes (Read & Newell, 2005). Due the complications associated with C/S for WLWH, the HHS (2017) recommends counseling pregnant WLWH about these risks while emphasizing the importance of adequate treatment engagement and viral suppression to maintain optimum postpartum health.

As the body’s immunity continues to fight HIV disease progression and poor treatment engagement during the pregnancy, delivery, and postpartum periods, opportunistic infections begin to occur. Regardless of gender, ethnicity, or parity, individuals who are not engaged in their HIV treatment are at risk for poor viral suppression and opportunistic infections. Pregnant and postpartum WLWH are particularly vulnerable to opportunistic infections of the respiratory, reproductive, and cardiovascular systems. Respiratory diseases like tuberculosis and pneumocystis jiroveci pneumonia (PJP), are two infections that co-occur with Acquired Immune Deficiency Syndrome (AIDS) among postpartum WLWH, with pneumonia the leading cause of HIV-related maternal death (Lathrop et al., 2014). Reproductive tract infections—including vaginal yeast overgrowth, urinary tract infections, and pelvic inflammatory disease (Watts et al., 2009)—also are common among these women. Research has established the susceptibility of WLWH to HPV and invasive cervical carcinoma (De
Vuyst, Lillo, Broutet, & Smith, 2008), as well as the positive effects of ART adherence in mitigating such outcomes (Minkoff et al., 2010). Furthermore, laceration of the abdominal wall from cesarean births and episiotomies from vaginal births can put women at risk for infection. For healthy women, infection often is a result of exogenous bacteria from improper hygiene of the affected skin surface (World Health Organization [WHO], 2017). However, an overpopulation of endogenous bacteria (normal flora) due to immunosuppression can cause infection for WLWH even with good hygiene (WHO, 2017).

Likewise, postpartum WLWH are particularly susceptible to puerperal sepsis. While maternal deaths from puerperal sepsis in the US have been reduced due to the availability of and advances in ART (United States Agency for International Development [USAID], 2013), puerperal sepsis still occurs (Calvert & Ronsmans, 2013a; Kourtis et al., 2006). This infection increases the mortality risk for patients not adequately engaged in treatment. In a meta-analysis of 44 studies from several US geographic regions, the results showed that pregnant WLWH has three times greater odds of puerperal sepsis compared to pregnant women without HIV. This risk increased to 5.81 for women who delivered via C/S (Calvert & Ronsmans, 2013a). This study’s results also showed that the risk of death related to pregnancy, delivery, and the postpartum period for WLWH was almost eight times that of women without HIV (Calvert & Ronsmans, 2013b). The authors estimated that 12% of HIV-related deaths occur during pregnancy and up to one year postpartum in geographic regions with an HIV prevalence rate of 2% among pregnant women (Calvert & Ronsmans, 2013b). This
mortality rate increases to 50% for regions with a prevalence rate of 15% (Calvert & Ronsmans, 2013b).

In another study, Kourtis et al. (2006) examined the rate of hospitalizations from postpartum complications among WLWH in the US from 1994–2003. Among 6,143 hospitalizations in 1994, 4.5% were due to major puerperal sepsis. The adjusted odds for hospitalization was 2.08 times greater for postpartum WLWH with sepsis compared to WLWH without sepsis. Although the odds declined in 2003 (2.27), the incidence of hospitalization from puerperal sepsis for WLWH remained high (3.1% of 6,235 WLWH; Kourtis et al., 2006). These hospitalizations resulted in huge annual care costs ranging from $43.5 million in 1994 to $86 million in 2003 (Kourtis et al., 2006). Furthermore, other researchers found that WLWH have a two to 10 times greater risk of dying during pregnancy and postpartum without proper treatment compared to their uninfected counterparts (Lathrop et al., 2014).

In addition to opportunistic infections, heart health also is affected by advanced HIV disease during the postpartum period. A recent case report indicated that postpartum WLWH may be at risk for pulmonary arterial hypertension (Newman et al., 2015), which can increase their susceptibility to heart attack. In one meta-analysis examining the risk of pregnancy complications caused by HIV, four of the nine study datasets showed a higher prevalence of preeclampsia among pregnant WLWH compared to uninfected women (Calvert & Ronsmans, 2013a). After analyzing the studies for eclampsia prevalence among infected versus uninfected women, the authors found the odds of developing eclampsia among pregnant WLWH ranged from 0.39 to 38.47 times that of women not living with the virus (Calvert & Ronsmans, 2013a).
The studies mentioned above provide evidence of adverse events—for patients and healthcare costs—that occur due to untreated HIV disease among pregnant and postpartum women. Clearly, efforts are need to engage women in treatment in order to prevent harmful outcomes.

**Psychological**

The psychological impacts of postpartum HIV treatment disengagement may be due to two causes. First, advanced HIV disease negatively effects maternal psychological and neurological health (Chibanda et al., 2010; Kranick & Nath, 2012; Ross, Sawatphanit, Mizuno, & Takeo, 2011). Second, disengagement results in missed opportunities for women to be screened and treated for common postpartum psychological disorders (e.g., postpartum depression [PPD], type of depression that occurs after giving birth; CDC, 2019d).

Several neurocognitive disorders are associated with advanced HIV disease due to poor ART adherence: asymptomatic neurocognitive hindrance, mild neurocognitive issue, and HIV-related dementia (Kranick & Nath, 2012). The intellectual weakness generally connected with HIV contamination in the central nervous system is subcortical dementia, which causes challenges in the speed of data handling and verbal familiarity (Kranick & Nath, 2012). While the use of ART has reduced the pervasiveness of the most extreme type dementia connected with HIV, milder HIV-related neurocognitive issues have remained common (Kranick & Nath, 2012). Having a low CD4 T-cell count puts patients at high risk for developing an HIV-related neurocognitive issue (Kranick & Nath, 2012). Therefore, it is important to ensure that WLWH continue their HIV
treatment in the postpartum period to prevent the development of the aforementioned neurocognitive disorders from an advanced disease (Kranick & Nath, 2012).

In addition to HIV-related dementia, depression is a common mental health comorbidity of HIV infection (Owe-Larsson, Sall, Salamon, & Allgulander, 2009), as well as a major health concern for postpartum women. Measured with the Edinburgh Postpartum Depression Scale (EPDS), the prevalence of PPD among WLWH varies across studies and countries, from an estimated 8.7% in Malta (Felice, Saliba, Grech, & Cox, 2004) to an estimated 73.7% in Taiwan (Affonso, De, Horowitz, & Mayberry, 2000).

There is limited information in the literature on the incidence of perinatal depression (a term used to refer to both prenatal depression [PND] and PPD; Kapetanovic et al., 2009). Most of the studies from developing countries reported high rates of antenatal and postnatal depression among their participants, including WLWH (Chibanda et al., 2010; Kwalombota, 2002; Manikkam & Burns, 2012). In one cross-sectional study conducted in Zimbabwe, the authors noted that although there was no correlation between HIV and PPD, more than half (54%) of the 31 HIV-infected women in their study had PPD (Chibanda et al., 2010). In a second mixed-method cross-sectional study conducted in Zambia, the researchers reported that 85% of their 45 participants (pregnant WLWH) reported experiencing major depressive episodes and suicidal ideation (Kwalombota, 2002). In addition, depression was correlated with HIV seropositivity and recent thoughts of self-harm in a cross-sectional study of 387 women attending an urban antenatal clinic in South Africa (Manikkam & Burns, 2012). Of their sample, 104 women were HIV positive, 204 were negative, and 73 had an unknown status. The authors noted
that 38.5% of the entire cohort suffered from depression, while 38.3% had thoughts of self-harm (Manikkam & Burns, 2012).

The prevalence of perinatal depression differs among middle-income and high-income countries (Kapetanovic et al., 2009). In a study conducted in Thailand, the prevalence of perinatal depression ranged from 44.7% (mild depression) to 29.4% (severe depression) among 85 postpartum WLWH (Ross et al., 2011). In one US study, prevalence of perinatal depression ranged from 53% of 51 pregnant WLWH, of whom 80% were Black. In one qualitative study of nine WLWH, of whom seven were Black, the authors found a strong theme of these women having extreme emotional distress antepartum after receiving their HIV diagnosis. Additionally, depressive symptoms were positively correlated with physical HIV symptoms in a cross-sectional study of 127 pregnant WLWH, (Ross, Sawatphanit & Zeller, 2009). Taken together, these results show that HIV progression without adequate treatment engagement, a precursor to increased physical symptoms, can lead to depressive symptoms among pregnant WLWH.

These depressive symptoms can progress to self-harm and suicidal thoughts. Reports of self-harm have been observed among pregnant (Wong et al., 2017) and postpartum WLWH (Kapetanovic et al., 2009). Literature findings indicate that women who are newly diagnosed are at risk for developing suicidal thoughts and attempts within the first weeks or months of their diagnosis (Cooperman & Simoni, 2005). Based on the cited studies, approximately 32%–37% of women are newly diagnosed with HIV in pregnancy (Rana et al., 2010; Siddiqui et al., 2014). Therefore, women newly diagnosed with HIV during pregnancy should be followed closely during pregnancy and in the postpartum period to promote treatment engagement and address emotional distress.
Despite the scarcity in research assessing the prevalence of perinatal depression among WLWH in the US, the literature has established that women with high-risk pregnancies caused by pre-pregnancy illness are at an increased risk for developing PPD (Katon et al., 2014). The co-occurrence of HIV infection with pregnancy may present as a high-risk pregnancy. Furthermore, the few above mentioned studies show a high prevalence of perinatal depression among pregnant and postpartum WLWH, along with the associated negative consequences on physical health. Therefore, it is critical that pregnant and postpartum WLWH remain engaged in treatment, so they do not miss the opportunity to be screened and treated for any existing or newly occurring psychological problems.

**Social Determinants of Health**

Studies have demonstrated that multiple social determinants of health (SDH)—such as age (Bengtson et al., 2016; Nassali et al., 2009; Phillips et al., 2014), education (Bengtson et al., 2016), and income (Siddiqui et al., 2014)—increase the likelihood of HIV treatment disengagement among pregnant and postpartum WLWH. SDH are the conditions in which people are born, grow, live, work, and age (WHO, 2017). Poor social and economic environments negatively impact health throughout life (WHO, 2003), particularly for PLWH (CDC, 2019a). While addressing the pitfalls in the healthcare sector is important to improving citizens’ health, broader approaches that address individual behaviors as well as social, economic, and environmental factors are equally important (Heiman & Artiga, 2015).

According to the HHS Office of Disease Prevention and Health Promotion (ODPHP; 2017), health begins where we live, learn, and work in our communities and
neighborhoods. Furthermore, Schroeder (2007) found that about 90% of premature deaths among the US populace can be attributed to an individuals’ behavior, genetics, and social and economic environments. Unfortunately, minorities have the highest incidence of living in poor social and economic environments (Fiscella, Franks, Gold, & Clancy, 2008; National Center for Education Statistics [NCES], 2007; Rodgers, 2008). Therefore, the importance of considering these factors while evaluating health promotion among minorities living with chronic illnesses cannot be overestimated. Other examples of SDH include transportation; residential segregation; language and literacy; access to media and technologies (cell phones, internet, and social media); social support; social norms and attitudes (discrimination, racism, and distrust of government); access to communal resources for healthy living (safe housing and local food markets); and access to resources that improve education, finances, and job opportunities (ODPHP, 2017).

**Statement of the Problem**

Minorities have the highest incidence of living in poor social and economic environments (Fiscella et al., 2008; NCES, 2007; Rodgers, 2008) that are detrimental to their health, often predisposing them to poor health outcomes and sub optimum well-being (CDC, 2019a). PLWH are especially vulnerable to multiple social, economic, and environmental setbacks (CDC, 2019a). These setbacks often include poverty (CDC, 2019b; Sharpe et al., 2012); racial segregation and geographic concentration of poor communities, which breeds dangerous activities like gangs, gun violence, drug dealings, and prostitution; stigma; inadequate knowledge; poor education; and high unemployment rates (Sharpe et al., 2012). Sharpe et al. (2012) reported that these setbacks are particularly common among Black women.
Furthermore, WLWH have additional social and relational events, which when coupled with HIV can impair their overall health and well-being. These events include pregnancy (CDC, 2019b), and diminished gender power within heterosexual relationships, which breeds partner violence, sexual abuse, and insufficient negotiating power to discuss condom-use (Sharpe et al., 2012). Study results indicate that having multiple negative SDH increases the likelihood of HIV treatment disengagement during pregnancy and postpartum (Bengtson et al., 2016; Nassali et al., 2009; Phillips et al., 2014). However, to date there has been a lack of research on such setbacks and social and relational events among minority women, particularly Black women, who—compared to women of other races—are at an increased risk for poor health outcomes due to their high incidence of HIV infection (CDC, 2019a), and treatment disengagement (Siddiqui et al., 2014).

**Purpose of the Study**

Due to the lack of research on the topic, the researcher investigated the SDH at the intrapersonal and interpersonal levels of McLeroy, Bibeau, and Glans’s (1988) SEM, which influence HIV treatment engagement among Black postpartum WLWH in South Florida. For this study, data from retrospective chart reviews of pregnant Black WLWH receiving care at the University of Miami Prenatal Immunologic (PRIM) clinic and the Women’s Integrated Services for Health (WISH) clinic were analyzed.

**Theoretical Framework**

This study was guided by McLeRoy et al.’s (1988) SEM. This model is best suited to analyze the integrative-interactive synergy between persons and their environments, which affect their health behavior choices. The SEM postulates that there are multiple,
interrelated factors influencing patterned health behavior, which can be grouped into the following five levels, from proximate to distal: individual (intrapersonal), microsystem (interpersonal), mesosystem (institutional), exosystem (community), and macrosystem (public policy; Bronfenbrenner, 1979; McLeroy et al., 1988; Figure 1).

Figure 1. Pictorial representation of the social ecological model. Adapted from “An Ecological Perspective on Health Promotion Programs,” by K. R. McLeroy, D. Bibeau, A. Steckler, and K. Glanz, 1988, Health Education Quarterly, 15, pp. 351–377.

Individual Level

While individual attributes such as culture, race, ethnicity, and genetics are non-modifiable, attributes such as knowledge, attitudes, self-concept, and knowledge base are modifiable and capable of influencing behavior (McLeroy et al., 1988). Taken together, these intrapersonal attributes make up the first level of the SEM known as the *individual level*. While the individual level focuses on the attributes of the self, the other levels focus on the attributes of other entities within the environment (animate or inanimate) that can influence behaviors.
**Microsystem level.** The second level of influence on behavior change in the SEM is referred to as the *interpersonal or relationship level* (McLeroy et al., 1988). In the microsystem level, an individual’s behavior often is a reflection of her relationships with persons or objects in her immediate environment (Bronfenbrenner, 1979). Such interrelations involve face-to-face social interactions with family members, peers, healthcare providers, work colleagues, and others (McLeroy et al., 1988).

**Mesosystem level.** In the *mesosystem or institutional level*, social structures—organizations such as schools, churches, and health institutions (Bronfenbrenner, 1979)—and their inherent rules and regulations are capable of influencing health behaviors (McLeroy et al., 1988).

**Exosystem level.** Interactions among the organizations within a given community are found in the *exosystem or community level* (McLeroy et al., 1988).

**Macrosystem level.** The final ecological environment influencing patterned behavior is the *macrosystem or public policy level*. This underlying foundation or blueprint unifies the distinct microsystem, mesosystem, and exosystem in their different settings (Bronfenbrenner, 1979; McLeroy et al., 1988). In concrete terms, the macrosystem is made up of the policies and laws governing the operations of structures in the exosystem and their interactions with one another (Bronfenbrenner, 1979). In health promotion, the macrosystem includes the local, state, and national health policies governing different healthcare institutions, in both the public and private sectors (Bronfenbrenner, 1979). Such health system policies significantly impact communities, which affect the organizations within those communities, then the individuals within those organizations, and eventually the individual’s behavior. (McLeroy et al., 1988).
Application of Theoretical Framework to this Study

When adapted to healthcare and nursing, the SEM highlights the fact that a person’s health behaviors, whether prevention or treatment-seeking actions, are a result of their internal environments (their attitudes and sociodemographic characteristics) and external environments (the activities of persons and things around them). External environmental influences can come from their immediate environment (family members) or their extended environment (society, country, geographic location, and the associated healthcare policies). Due to this fact, nurses must be considerate of such influences, aiming to control/curb the negative ones while encouraging the positive ones. Because this model excellently instills the four meta-paradigms of the nursing discipline (person, health, environment, and nursing), it can be quite useful for addressing issues regarding SDH and health behaviors in nursing practice.

For this study, the researcher considered that engagement in health promoting behaviors can be subject to both internal and external socioecological factors. Human behaviors are subject to inevitable change—from personal attributes, family influences, peer pressure, media exposure, and federal laws—that can be either helpful or harmful in nature. Prior to the development of ecological models for investigating human behavior, most health promotion theories were focused on individual-oriented behaviors (McLeroy et al., 1988). A major problem with this approach was not only its “victim-blaming ideology,” but also its legitimization of “the retrenchment from rights and entitlements” (McLeroy et al., 1988, p. 352). In other words, these models blamed human behavior itself, ignoring the detrimental influences of the environment on such behaviors (McLeroy et al., 1988). In contrast, the SEM has the major advantage of considering
these external, social, and environmental factors, and their influence on health behaviors (McLeroy et al., 1988). This human-environment interaction is a two-way transactional process in which humans are equally capable of influencing their environment in ways that can promote or harm their health (McLeroy et al., 1988). To help answer this study’s research question, the researcher focused on the SEM’s first two levels: the intrapersonal and interpersonal levels. The factors within each level were selected based on their associations with HIV treatment engagement among pregnant and postpartum women as documented in the literature. Each one of these factors were evaluated and statistically analyzed (Figure 2).
Significance of the Study

This study’s findings hold significance for promoting mother-infant health, improving clinical nursing practice, and contributing to knowledge and education related to the domain of inquiry. HIV-related maternal morbidity is one of the leading causes of deaths among women of reproductive age (15–49 years; WHO, 2011a). This is an important consideration with the number of WLWH giving birth—approximately 5,000 in 2017 (CDC, 2019b). The risk of HIV-related maternal morbidity likely is greater for Black women who are disproportionately affected by the disease, with at an infection rate of 59% compared to 20% for Whites, 16% for Hispanic/Latina, and 4% for other races (CDC, 2019c). Black women also have the highest rates of unintended pregnancies (Finer & Zolna, 2014), HIV-related mortality (CDC, 2015), and postpartum HIV treatment disengagement (Siddiqui et al., 2014). This chapter documents the physiological and psychological benefits for postpartum woman who engage in HIV treatment. These benefits derive from proper HIV management and the prevention of maternal morbidity, mortality, and transient poor infant health outcomes (Melekhin et al., 2010; Mellins et al., 2008; Vaz et al., 2007).

In clinical practice, findings from this study can help clinicians identify women who are at risk of being disengaged from HIV treatment, so that early interventions can be implemented to keep them engaged. Indeed, every healthcare provider caring for pregnant and postpartum WLWH has a role to play, as a multidisciplinary approach is needed to address this public health problem. However, the importance of nursing professionals’ role in reducing disengagement among these women cannot be overemphasized. Because nurses spend so much of their time in direct patient care
(Kakushi & Evora, 2014), they are best positioned to promptly identify women who may be at risk for treatment disengagement and intervene accordingly.

This study’s results also contribute scientific knowledge by adding to the literature on the issue of HIV treatment engagement among Black postpartum WLWH, and the development of interventions to address it. While many studies have been conducted on HIV treatment engagement for pregnant WLWH, there are limited studies on postpartum WLWH. Moreover, the majority of available studies were conducted in developing countries, with only a small number conducted in the US. Furthermore, to date no study conducted in the US has focused exclusively on a Black population or been guided by a social ecological framework to examine the social determinants of HIV treatment engagement. This study’s was designed to fill these significance research gaps, by identifying the various social determinants of HIV treatment engagement unique to Black postpartum women from a social-ecological standpoint. The factors identified by this study can be used to develop culturally-sensitive interventions aimed at improving maternal outcomes for this vulnerable population. Further, by educating patients on this study’s findings, nurses can increase HIV-related knowledge of this at-risk women. Finally, the information gained from this study can be added to nursing schools curricula to educate future nursing professionals to be aware of at-risk women and intervene accordingly while in practice.

**Summary**

In conclusion, this chapter discussed the various physiologic, psychologic, financial, and economic factors contributing to HIV treatment disengagement among postpartum WLWH. The physiological consequences primarily are a result of HIV
disease progression coupled with reproductive changes occurring during pregnancy and childbirth as well as opportunistic infections resulting from immunosuppression. Likewise, the psychological consequences result from opportunistic infections affecting the mother’s mental health as well as the untreated PPD that can occur when there is a lack of interaction with the healthcare system. In addition, the financial burden caused by these consequences can be daunting on the mother as well as the economy. There is an old adage that is apt in this situation: an ounce of prevention is worth a pound of cure. In other words, emphasizing the prevention of HIV treatment disengagement among postpartum women could save a myriad of physiological, psychological, and financial costs for women and the economy. Because this study’s results can inform the development of interventions aimed at engaging and retaining postpartum WLWH in HIV treatment, they hold great promise for improving the health of WLWH and their infants, as well as Florida’s economy.
Chapter 2 – Literature Review

This chapter discusses the literature on HIV treatment engagement, the documented disparities therein, and the associated factors for pregnant and postpartum WLWH. Because evidence shows the detrimental consequences prenatal HIV infection can have on both mother and child—up to and including death (Zash et al., 2017)—this review includes studies on pregnant women with HIV. Also, adequate engagement during pregnancy may transition into adequate engagement during the postpartum period, which can benefit mothers and infants. Furthermore, the risk of perinatal HIV infection is higher if prenatal HIV treatment is interrupted at any time during pregnancy, labor, or delivery (CDC, 2019b). Because engagement during pregnancy can influence postpartum engagement, it is worthy of consideration for this study.

This chapter begins with a detailed overview of HIV treatment engagement, how engagement is measured, and the related racial and gender disparities. The chapter concludes with a review of the social determinants of HIV treatment engagement among pregnant and postpartum WLWH. This review is guided by McLeroy et al.’s (1988) SEM, as an understanding of this model’s factors is critical to developing interventions to mitigate health concerns for such women.

HIV Treatment Engagement

The concept of engagement overarches all steps in the HIV care continuum (HCC; Gardner, McLees, Steiner, Del Rio, & Burman 2011). This concept also is complex and often difficult to operationalize (Mugavero, Amico, Horn, & Thompson, 2013; Mugavero, Davila, Nevin, & Giordano, 2010; Mugavero et al., 2012), partly because retention measures must occur over a long period (Mugavero et al., 2010;
Mugavero et al., 2012) and account for what is considered appropriate or the gold standard for engagement (Mugavero et al., 2012; Yehia et al., 2012). Due to a lack of consensus about what constitutes the gold standard for engagement (Mugavero et al., 2012; Yehia et al., 2012), the concept of retention often is used as a proxy to measure engagement (Mugavero et al., 2010; Mugavero et al., 2013), with both terms being used interchangeably. Of the several definitions of HIV treatment engagement and retention found in the literature, the most frequently used include the proportion of missed visits, visit adherence, visit constancy, gap in care, and measures by the CDC (2019e), HHS (2012), and the Human Resources and Services Administration HIV/AIDS Bureau (HRSA HAB; 2017).

While the category of missed visits records the number of appointment no-shows a patient accrues within each measurement period (Mugavero et al., 2010; Mugavero et al., 2012; Mugavero et al., 2013), visit adherence is the proportion of kept visits versus the total number of scheduled visits (Mugavero et al., 2010; Mugavero et al., 2012; Mugavero et al., 2013). Other measures, such as visit constancy and gap in care, measure time intervals between care. While visit constancy measures the percentage of time intervals with at least one kept visit (i.e., the number of four-month intervals in a year in which patients attended at least one visit; Mugavero et al., 2010; Mugavero et al., 2012; Mugavero et al., 2013; Yehia et al., 2012), gap in care measures the gaps or time intervals between sequential kept visits (Mugavero et al., 2010; Mugavero et al., 2012; Mugavero et al., 2013; Yehia et al., 2012).

Using these key concepts, several definitions of HIV treatment engagement have emerged in the literature. The CDC (2019e) defines retention as “the percentage of
persons with diagnosed HIV who had two or more VL or CD4+ tests performed at least three months apart” (p. 4). The HHS (2012) defines retention as at least one kept visit in a six-month period of a 24-month measuring period, with ≥60 days between the first visit in the prior six-month period and the last visit in the subsequent six-month period. The HRSA HAB (2017) defines retention as attending two or more visits within a 12-month measuring period, with an interval of 90 days or more between subsequent visits (as cited in Mugavero et al., 2012; Mugavero et al., 2013). The HRSA HAB (2017) measure, which has since been updated and is now known as HIV medical visit frequency, refers to patients with at least one visit in each six-month period of a 24-month measuring period, with subsequent medical visits separated by at least 60 days (HRSA HAB, 2017). Among these measures, there is a consensus about the need to have at least two HIV medical care visits in a 12-month measuring period, with an interval of ≥60 days between each kept visit. Due to this consensus, this definition was used to measure engagement in this study.

**Disparities in HIV Treatment Engagement**

The rates of HIV disease incidence, linkage to and receipt of care, and treatment adherence and engagement are not equally shared among all genders and races (Blank et al., 2015). In fact, several studies have highlighted the gender and racial disparities in HIV treatment disengagement (Abdulrahman et al., 2017; Beer & Skarbinski, 2014; Byrd, Bush, & Gardner, 2017; Horberg et al., 2015; Mugavero et al., 2009a).

**Women**

Women living with HIV experience suboptimal outcomes in treatment engagement and viral suppression (CDC, 2017a). The CDC (2019a) found that one in four persons living with HIV is female. In addition, while women make up about 50.8%
of the US population, they constituted 19% of the total new HIV diagnoses (39,513) in 2015 (CDC, 2019a), and 251,653 cumulative AIDS diagnoses from 2011–2016 (CDC, 2017b). Globally, HIV is rated the leading cause of death among women of reproductive age (15–49 years; Joint United Nations Programme on HIV/AIDS [UNAID], 2017).

There were 126,525 cumulative HIV-related deaths among US women from 2011–2016 (CDC, 2017b). In fact, Hodder et al. (2010) referred to HIV as a hidden epidemic among women because, unlike other epidemics, its harmful effects often are overlooked by the at-risk population, and it remains understudied by the scientific population. These figures may be viewed as a call to action for the scientific community to develop more effective prevention and management strategies for WLWH.

While the CDC (2017a) reported more favorable percentages of diagnosis (88%), care receipt (64%), and treatment retention (50%) for women than for men (diagnosis=84%; receipt=61%; and retention=48%) in 2014, women’s percentage of viral suppression (48%) was lower than that of men (49%). A plausible explanation for the lower percentage of viral suppression for women despite their supposedly better percentage of retention is that a sizable proportion of women (about one-fourth) are diagnosed with AIDS instead of HIV at the time of their initial diagnoses (CDC, 2018b). Being diagnosed with AIDS instead of HIV may be a strong motivator to remain in care. Therefore, suboptimal retention (50%, CDC, 2017a) in care after a late diagnosis may potentiate poor viral suppression. In addition, women often are found to underutilize HIV care services, including primary care visits, a choice that eventually leads them to the emergency department as the disease worsens (Sohler & Cunningham, 2009). A study of 414 severely marginalized PLWH in New York city found that women were significantly
more likely to report underutilization of HIV care services (including primary care services) and overutilization of emergency care services (Sohler & Cunningham, 2009). This finding supports the idea that HIV treatment engagement is suboptimal among women.

More studies have examined the decreased likelihood of HIV treatment engagement of women compared to men (Abdulrahmeen et al., 2017; Beer & Skarbinski, 2014; Byrd et al., 2017; Horberg et al., 2015; Mugavero et al., 2009a). This lack of treatment engagement included a lower likelihood of filling (Byrd et al., 2017; Horberg et al., 2015) and adhering to ART prescriptions (Beer & Skarbinski, 2014), avoiding care gaps (Byrd et al., 2017), and attending medical appointments (Abdulrahmeen et al., 2017). In their cross-sectional study—designed to estimate the percentage of PLWH adherent to ART in the US, related factors, and association with viral suppression—Beer and Skarbinski (2014) analyzed data from 3,606 adults in a national HIV surveillance system. The authors noted that, among other factors (younger age, depression, alcohol and stimulant use, patient beliefs, longer time since HIV diagnosis, experiencing medication side effects, and more than once-daily ART dosing), females were less likely to report ART adherence (adjusted prevalence ratio \(aPR=0.96, CI [0.93, 0.99]\)). For this study, ART adherence was measured as the number of missed doses in recent days. Results also showed that being dose-, schedule- and instruction-adherent were significantly associated with a VL of <200 (Beer & Skarbinski, 2014).

A second cross-sectional study examined the predictive sociodemographic, economic, psychosocial, and patient-related factors for missed outpatient visits among 224 patients living with HIV who were enrolled in a parent randomized controlled trial
for a year in Selangor, Malaysia (Abdulrahmeen et al., 2017). For this study, missed outpatient appointments was measured dichotomously as either a *regular attendee* (never missed a visit) or a *defaulter* (missed at least one visit). Although males constituted a majority of their sample (n=197), the authors found that women had a greater prevalence of missed outpatient appointments (n=10, 37.0%) than did males (n=32, 16.2%), $\chi^2 (1, N=197) = 6.739, p = .009$. The results of their multivariate logistic regression showed that males were three times more likely (OR=3.033; 95% CI [1.273–7.225]; $p = .012$) to attend appointments than were females. Other predictive factors for attending appointments were urban or semi-urban compared to rural residence, having a homosexual or heterosexual compared to bisexual orientation, and having a bachelor degree (not statistically significant). The authors concluded that factors such as stigma and discrimination, which are particularly salient among WLWH, contributed to their higher odds of missing appointments (Abdulrahmeen et al., 2017).

In addition to missing medical appointments, Byrd et al. (2017) and Horberg et al. (2015) found that women are less likely than men to fill ART prescriptions. In Byrd et al.’s (2017) cross-sectional study, the authors examined a billing claims database of 22,089 PLWH in Atlanta, GA, to determine the proportion of patients who continued to fill ART prescription despite having a gap in care. They found that women more likely to have longer care gaps (measured as no outpatient visit claim with a physician, nurse practitioner, or physician assistant in more than six months) at a median of 50 days [IQR: 23–93] than were men (42 days [19–83]). They also concluded that women had a higher likelihood of never filling ART during care gaps compared to men (OR=1.6; 95% CI [1.52–1.83]; Byrd et al. (2017).
Horberg et al. (2015) estimated HIV treatment cascade performance over time at Kaiser Permanente, a large national integrated care system providing HIV care to PLWH in eight US States and Washington DC. The authors evaluated differences by demographic subgroups such as age, sex, and race/ethnicity. First, the researchers created a cascade of PLWH ≥13 years of age from 2010–2012. In this group, they found that women had lower percentages of filling ART prescriptions (filled ≥3 months of combination ART; 82%) and attaining viral suppression (Human immunodeficiency virus ribonucleic acid [HIV RNA] <200 copies/mL last measured in year; 81%) than men (ART=89%; VS=86%) in 2012. This finding was noteworthy especially considering the fact that the women had better treatment retention percentages (≥2 medical visits ≥60 days apart) than did the men in the study (Horberg et al., 2015).

In another study, Mugavero et al. (2009b) retrospectively analyzed data from 543 participants receiving care in a university-affiliated outpatient clinic in Alabama from 2000–2005. The researchers assessed the effect missed visits in the first year of care had on resulting mortality while considering other baseline sociodemographic, psychosocial, and clinical factors. The authors observed a higher incidence of missed appointments in the first year of treatment among women. Using cox proportional hazards analysis, they determined that the missed visits measure was independently associated with a greater risk of death (hazards ratio [HR]=2.90, 95%CI=1.28–6.56). While the mortality rate for persons missing appointments in their first year of treatment was 2.3 per 100 person-years, it was only 1.0 per 100 person-years for those who never missed appointments (P=0.02; Mugavero et al., 2009b).
Minority Women

Women of color are of particular concern among WLWH, as they are disproportionately affected by the disease and experience more debilitating outcomes compared to their White counterparts (CDC, 2018b, 2019c; KFF, 2014). These women account for the marked disparity in HIV incidence and treatment outcomes among WLWH in the US (CDC, 2018b, 2019c; KFF, 2014). Furthermore, among women of color, Black women bear the brunt of HIV crisis including having the highest rates of infection, poor care access, and mortality (CDC, 2018b, 2019c; KFF, 2014). According to the CDC (2018b), Black women are six times more likely to acquire HIV than Hispanics, and 17 times more likely than Whites. In addition, while Black people constituted only 13% of the US population, Black women accounted for 59% of the total new infections among women in 2017 (CDC, 2019c). Compare those figures to those of Hispanics and Whites who made up 16% and 63% of the population but accounted for only 16% and 20% of total new infections, respectively (CDC, 2019c). Further, Black women accounted for 61.2% of HIV-related deaths among women (CDC, 2018b) in 2015, compared to only 13.1% among Hispanics and 19% among Whites (CDC, 2018b). HIV is currently rated the seventh leading cause of death for Black females of reproductive age (20–34 years), and the fourth leading cause of death for those aged 35–44 (Heron, 2017). This figure strongly contrasts to the same statistics for white females in the same age groups for whom HIV is not included as one of the top 10 leading causes of death (Heron, 2017).

There are several the commonly cited reasons for the poor rates of HIV treatment engagement among women of color, especially Black women. First among these are
socioeconomic factors such as income/poverty, education/poor health literacy, and employment/health insurance coverages (Blackstock et al., 2015; Eastwood et al., 2015; Kempf et al., 2010; Moneyham et al., 2010; Quinlivan et al., 2013; Toth et al., 2013; Yehia et al., 2015). Structural factors also come into play including family/child-care issues, inability to take time off work or school, poor access to high-quality care, inability to see specialist physicians, stigma, fear of disclosure, and unstable housing (Blackstock et al., 2015; Eastwood et al., 2015; Kempf et al., 2010; Messer et al., 2013; Moneyham et al., 2010; Quinlivan et al., 2013; Toth et al., 2013; Waldrop-Valverde et al., 2014; Yehia et al., 2015). Moreover, the psychosocial factors of mistrust of providers/patient-provider relationships, substance abuse, clinical depression symptoms, and mental illness also influence HIV treatment among Black women (Blackstock et al., 2015; Messer et al., 2013; Moneyham et al., 2010; Quinlivan et al., 2013; Yehia et al., 2015). Also relevant to this issue are gender roles within heterosexual relationships such as conservative cultural practices, emotional and financial dependence on a partner, insubordination to males, spousal infidelity, and rape (Quinlivan et al., 2013; Remien et al., 2009). Furthermore, environmental issues have been documented including transportation issues and residency in high-risk environments and geographic locations (Blackstock et al., 2015; Eastwood et al., 2015; Kempf et al., 2010; Moneyham et al., 2010; Surratt, Kurtz, Levi-Minzi, & Chen, 2015; Yehia et al., 2015). Finally, physical factors have been reported to influence HIV treatment disparities among Black women, including pregnancy and symptomology (being too sick; Messer et al., 2013; Yehia et al., 2015).
**Pregnant and Postpartum Women**

WLWH generally do not seek treatment until they experience symptoms or become pregnant (Aziz & Smith, 2011; Messer et al., 2013). Research has shown that pregnant women are more treatment adherent than are their non-pregnant counterparts (Vaz et al., 2007; Meade et al., 2018). Given the CDC recommendation to test every pregnant woman for HIV except those who opt-out (Branson et al., 2006), women unaware of their HIV status who become pregnant have an opportunity to be tested and treated for HIV. Furthermore, pregnancy and motherhood often stimulate women’s treatment-seeking tendencies as a way to assuage the fear and guilt associated with having a sero-positive infant and stay healthy to care for their children (Boehme et al., 2014; Buchberg et al., 2015). Unfortunately, these care-seeking tendencies often are short-lived, becoming absent once symptoms improve (Mellins et al., 2008) and the child is born (Siddiqui et al., 2014). Therefore, the choice to remain in care during the postpartum period may depend on women’s self-care practices during pregnancy as well as their willingness to retain these practices postpartum (Siddiqui et al., 2014). For example, the qualities of autonomy, competency, relatedness, and self-determination have been cited as important elements of sustaining long-term HIV treatment engagement among minority WLWH.

There are several possible reasons for treatment disengagement among postpartum WLWH. The woman’s transition back to primary care services from the prevention of mother-to-child transmission of HIV (PMTCT) care services, which may be offered at a different clinic, can introduce a care gap that encourages disengagement (Psaros, Remmert, Bangsbeg, Safren, & Smit, 2015). Additionally, caring for a newborn...
can be time-consuming and exhausting for the new mom, causing her to prioritize her child’s care over her own (Psaros et al., 2015). Women also may lack motivation to remain in treatment after giving birth to a healthy infant (Psaros et al., 2015). Moreover, it is common for these women to experience a lack of financial, familial, and spousal support that discourages treatment engagement (Psaros et al., 2015). Finally, stigma may hinder women from seeking or continuing treatment (Psaros et al., 2015).

The importance of HIV treatment engagement during the pregnancy and postpartum periods cannot be overstated, as doing so is critical to maintaining optimal maternal health, and reducing the risk of viral transmission to fetuses and newborns (CDC, 2019b; HHS, 2017). Providing care for WLWH, particularly during and after pregnancy, requires a rigorous, multidisciplinary approach. This approach includes primary, gynecologic/obstetric, and HIV specialty care; pediatric infant care; family planning to meet psychosocial, contraceptive, and substance-use treatment needs; and support and case management services (HHS, 2017). Such services are crucial to decreasing HIV transmission rates and promoting community health (Momplaisir et al., 2018b).

The primary goal of HIV treatment for the pregnant and postpartum woman is sustaining maternal health and PMTCT. Such treatment must include the following types of care: obstetric, gynecologic, immunologic, physical, psychological, nutrition, counseling, family planning strategies, and neonatal treatment (HHS, 2017). To sustain the health of WLWH during pregnancy, the HHS (2017) emphasizes giving women who initiated ART before pregnancy proper treatment for ART-resistant viruses; performing HIV RNA sensitivity testing for ART-naïve women; determining possible interactions
between ART, contraceptives, and other medications; and gauging ART toxicity in the developing fetus. For PMTCT, the emphasis is on prenatal treatment (for women with CD4 count ≤350 cells/mm³) or antepartum and intrapartum prophylaxis (for women with CD4 count >350 cells/mm³; HHS, 2017; WHO, 2010). Therefore, the guidelines for PMTCT in the US involve the following strategies: administering cART antepartum (with at least one nucleoside/nucleotide reverse transcriptase inhibitor agent to ensure transplacental passage of the ART); confirming viral suppression before delivery; providing intravenous zidovudine (AZT) intrapartum; avoiding C/S (except when indicated for women with an unsuppressed VL); discouraging breastfeeding; and ensuring neonatal use of ART (HHS, 2017).

Globally, the WHO (2012) now recommends the Option B+ approach for PMTCT, an update from their Option B and Option A approaches (WHO, 2010). Options A and B both recommended starting triple ART (often tenofovir, lamivudine, and efavirenz [TDF/3TC/EFV]) as soon as the diagnosis is made and continuing the therapy for life for women with a CD4 count ≤350 cells/mm³ (WHO, 2012). In contrast, Option B+ involves starting triple ART as soon as diagnosis and continuing treatment for life regardless of CD4 count (WHO, 2012). Treatment modalities that continue for life (WHO, 2012) are complex and can become overwhelming for women who struggle to remain in care.

A number of studies have examined the incidence and consequences of HIV treatment disengagement among pregnant and postpartum women. While most developing countries still struggle with engaging pregnant WLWH in care (Boateng, Kwapong, & Agyei-Baffour, 2013; Kohler et al., 2014; Nassali et al., 2009), retention in
the postpartum period is more problematic in the US (Adams, Brady, Michael, Yehia, & Momplaisir, 2015; Buchberg et al., 2015; Rana et al., 2010). Regardless of geographic setting, research has shown that treatment engagement is generally higher during the antepartum than the postpartum period (Clouse et al., 2013; Myer, Zulliger, Bekker, & Abrams, 2012; Panditrao, Darak, Kulkarni, Kulkarni, & Parchure, 2011). Regardless, the rates for women in both periods remain below the levels recommended for viral suppression (Nachega et al., 2014). For example, one meta-analysis of 51 studies with 20,153 women found suboptimal levels of ART among both pregnant and postpartum women (Nachega et al., 2014). The cumulative analysis of all the studies indicated that only 73.5% of pregnant women had adequate (≥80%) ART adherence. Additionally, among those with adequate adherence, higher rates were noted before delivery (75.7%) than after (53.0%). This finding was statistically significant (p < .05). Moreover, among postpartum WLWH, Black women had a greater likelihood of disengaging in HIV treatment (Siddiqui et al., 2014).

Research has shown that the first three months postpartum are critical to ensuring long-term retention in postpartum care (Adams et al., 2015). Furthermore, several studies highlighted the significant losses that occur within the first three months postpartum (Buchberg et al., 2015; Meade et al., 2018; Myer et al., 2012; Nassali et al., 2009). In a mixed-method study conducted in Texas, Buchberg et al. (2015) found that 10 of 35 women were lost to their postpartum obstetric appointment within three months. By the sixth month, this number increased to 15 women who were lost to their scheduled HIV primary care appointment (Buchberg et al., 2015). A second retrospective cohort study of 22 women in Atlanta with perinatally-acquired HIV (PAHIV) found that as many as 59%
of the women were LTFU within the first three months postpartum (Meade et al., 2018). While these studies may not possess adequate statistical power given their small sample sizes, they still contribute valuable information to the literature on HIV treatment engagement among postpartum women.

In a third retrospective study with a larger sample size, Myer et al. (2012) analyzed records of 490 patients receiving ART services at a community clinic in South Africa. These researchers found that there was a steady decline in retention of the 382 pregnant women (median gestation age=27 weeks) who initiated ART, with retention rates of 84.7% at four months, 79.6% at eight months, and 75% at 12 months (Myer et al., 2012). Results from a cross-sectional study conducted in Uganda showed that as many as 62% of 289 women were LTFU by the end of the second postpartum month (Nassali et al., 2009). These studies highlight the importance of offering interventions to engage women in treatment within the first 90 days after delivery. As noted by Adams et al. (2015), women who are engaged within the first 90 days postpartum are more likely than their disengaged counterparts to continue long-term follow-up postpartum and be virally suppressed. The likelihood of retention in care (adjusted odds ratio [AOR], 11.38; 95% CI: 7.74–16.68) and viral suppression (AOR, 2.60 [95% CI, 1.82–3.73]) at one year postpartum was greater for women who engaged in care within 90 days of delivery. This trend continues into the second year postpartum for both retention (AOR, 6.19 [95% CI, 4.04–9.50]) and viral suppression (AOR, 1.40 [95% CI, 1.01–1.95]; Adams et al., 2015).

Another important factor for promoting long-term postpartum engagement in HIV treatment is ensuring a smooth transition to primary HIV care postnatally (Phillips et al., 2014). Such transitions are important for maternal health and prevention of vertical HIV
transmission in future pregnancies (Adams et al., 2015). Transition often is difficult to achieve among women who were ART-naïve before pregnancy (i.e., newly diagnosed women who started ART during pregnancy and had no prior treatment or HIV specialty care provider). This difficulty likely is due to the fact that ART-naïve women must continue treatment upon discharge from perinatal care, and may feel that have been left to navigate their treatment options by themselves, which could be tiresome and encourage treatment disengagement. Therefore, excellent care coordination, which is essential to ensuring long-term treatment retention and viral suppression, should include primary care and HIV specialty care providers, case management, mental health and drug abuse treatment services, intimate partner violence support services, and public assistance programs (HHS, 2017).

**Social Determinants of Treatment Engagement among Postpartum WLWH**

Successful HIV treatment coordination for postpartum women requires identification of and strategies to address all the medical and social challenges these women face. Several SDH influence HIV treatment engagement among pregnant and postpartum WLWH. This study focused on factors associated with HIV treatment engagement among pregnant and postpartum women at the individual and interpersonal levels of the SEM.

From the literature review, the researcher identified seven factors that influence HIV treatment engagement among pregnant and postpartum women at the individual (intrapersonal) level: age, income, employment, education, health insurance, adequacy of PNC utilization, and maternal health status. The four associated factors at the relationship
(interpersonal) level were relationship status, caregiver burden, abuse, and HIV disclosure.

**Individual Level Factors**

**Age.** Study results have shown associations between age and HIV treatment disengagement in pregnant and postpartum women. Many of the studies on this topic were conducted in developing countries. In Clouse et al.’s (2013) prospective cohort study conducted in South Africa, the authors found that women older than 30 years were less likely to be disengaged (measured as not returning to the clinic within a minimum of one month after the last scheduled postpartum visit; adjusted Hazards Ratio [aHR] 0.49; 95%CI: 0.30–0.81). In a study conducted in Ghana, the authors examined the influence of inadequate knowledge and perceptions of ART and PMTCT program adherence among pregnant women (Boateng, 2013). To do this, they performed a cross-sectional analysis of data from 229 patients who had been on ART for at least six months who were recruited from three ART centers in the city. They found that women with inadequate knowledge were more likely to default (consistently missed two or more ART appointments within the previous two months), and that inadequate knowledge was common among women younger than 44 years (Boateng, 2013).

In the literature, younger maternal age has been linked to increased odds of HIV treatment disengagement in the postpartum period (Aebi-Popp et al., 2016; Bengtson et al., 2016; Clouse et al., 2013; Phillips, McNairy, Zerbe, Myer, & Abrams, 2015; Rana et al., 2010; Siddiqui et al., 2014; Wilcox, Levi, & Garrett, 2016). In Siddiqui et al.’s (2014) retrospective chart review of 213 women receiving care at an HIV prenatal program in Houston, Texas, the mean age for women who did not follow-up with care was 26.1
years, compared to those with suboptimal follow up (Mean=27.2) and optimal follow-up (Mean=28.6). Optimal follow-up was defined as having at least one clinic visit with a primary care provider in the sixth month postpartum, while suboptimal follow-up was measured the same way but for a 12-month postpartum period. The difference in means for these groups was statistically significant at \( p<.05 \) (Siddiqui et al., 2014).

Rana et al. (2010) conducted a retrospective chart review of 274 women receiving PNC at a specialized HIV clinic in Mississippi. Their research aim was to investigate sociodemographic and HIV-related parameters that influence quality of life and morbidity among women of reproductive age. Their sample consisted mostly of minority women, 89% of whom were Black. Using both univariate and multivariate logistic regression analyses, the authors found no significant relationship between age and optimal follow-up (at least two visits with an HIV provider within one year postpartum). They did find that early presentation to PNC was the only significant factor associated with optimal follow-up (OR=2.1, \( p=.02 \)). Further analysis into the characteristics of these women revealed that they were aged 25–32 years (\( p=.04 \)).

In a cross-sectional study of 289 WLWH enrolled from an obstetric unit of a national referral and teaching hospital in Kampala, Uganda, the authors sought to determine the level of adherence to a postnatal PMTCT (PN-PMTCT) program and the factors associated with this adherence (Nassali et al., 2009). Adherence to PN-PMTCT was measured as women who kept their appointment by the end of the eighth week postpartum. These authors found that women older than 20 years had statistically significant (\( p<0.001 \)) greater odds of adhering to the PN-PMTCT program (OR=2.7; 95% CI=1.74.4) compared to women 25 or younger. From the results of the studies described
above, it appears that WLWH who are younger than 25 are at increased risk of being LTFU during the postpartum period.

In contrast, other studies determined that age was not a predictor of being LTFU postpartum (Aebi-Popp et al., 2016; Bengtson et al., 2016; Clouse et al., 2013; Phillips et al., 2015). One study conducted in Switzerland contended that the effectiveness of the PMTCT programs in developed countries (like Switzerland) encourages pregnancy among WLWH regardless of age (Aebi-Popp et al., 2016). Therefore, the dissociation between adequate PMTCT care and age may have been portrayed inadvertently in this study.

**Income.** Several studies have found associations between income and treatment engagement among pregnant and postpartum WLWH (Arrivillaga, Ross, Useche, Springer, & Correa, 2010; Mellins et al., 2008; Nassali et al., 2009; Panditrao et al., 2011). Among these studies, lower income was consistently associated with greater likelihood of disengagement. Income level was estimated based on annual earnings (Mellins et al., 2008), access to electronic devices (e.g., cellphone; Nassali et al., 2009), family’s economic status (Panditrao et al., 2011), and dependence on a partner or family members for economic assistance (Buchberg et al., 2015; Painter et al., 2005). In one study, low income patients made up the majority of women LTFU postpartum (Mellins et al., 2008).

The relationship between higher income level and postpartum HIV treatment engagement was illustrated clearly in two studies. In one mixed-method study conducted in Alabama, a woman recounted how she must “cough up” (p. 579) $3,000 every year for her medical treatment in addition to paying a $300 monthly deductible for her
medications (Boehme et al., 2014). In a second study, Panditrao et al. (2011) conducted a retrospective cohort analysis of data obtained from pregnant WLWH enrolled into a large-scale, private sector PMTCT program in Maharashtra, India. The authors examined the sociodemographic factors associated with being LTFU in the PMTCT program. LTFU after delivery was defined as women who delivered live babies but failed to return for regular postnatal visits until the baby’s HIV status was determined (Panditrao et al., 2011). The authors found that women from poor families were 1.42 times (95% CI=1.05–1.91) more likely to be LTFU than were women from middle class or wealthy families.

Results from another study, conducted in Uganda, indicated that younger mothers with phone access were twice as likely to adhere to a PN-PMTCT (OR=2.2; 95% CI=1.3–3.5) program, a statistically significant finding ($p<.01$; Nassali et al., 2009). The authors asserted that women who give the clinic their phone numbers may be more open to advances and innovations (use of technology) in their treatment regimen, and more willing to collaborate with their providers to work towards optimum health (Nassali et al., 2009). These women were of higher socioeconomic level than were those without phones, and were able to make more informed choices about their health (Nassali et al., 2009). In another study, the convenience of receiving medical advice over the phone facilitated treatment engagement for postpartum women (Boehme et al., 2014). Other studies conducted with young Black mothers living with HIV highlighted two benefits of them having a phone that facilitated treatment engagement: the ability to receive phone call reminders from clinic staff (Kempf et al., 2010), and set appointment/treatment reminders/alarms on their phones (Kempf et al., 2010; Yehia et al., 2015).
Employment. Studies of Black WLWH have found that work schedules often interfere with their ability to attend their medical appointments or take HIV medications (Blackstock et al., 2015; Kempf et al., 2010; Moneyham et al., 2010). Work schedules can be a particular hindrance for postpartum women who have exhausted their maternity leaves and must return to work. In fact, several studies have examined the associations between employment and the likelihood of HIV treatment disengagement among postpartum women (Bengtson et al., 2016; Nassali et al., 2009; Phillips et al., 2014).

In one retrospective cohort analysis conducted with women in Lusaka, Zambia, researchers at the University of North Carolina Chapel Hill found that among their 2,029 participants, more unemployed women or housewives were LTFU at six months postpartum (n=361, 80.9%), than were employed women (n=85, 19.1%; Bengtson et al., 2016). Patients were considered LTFU on the 61st day after a missed appointment. The authors considered both pharmacy refills and clinic appointments in their analysis. Women lost in the immediate postpartum period were allowed 30 days to schedule an appointment, after which they were considered lost if no appointments or visits were kept by the 91st day after delivery. Results of a multivariate logistic regression model indicated that unemployed women or housewives were more likely to be LTFU at six months postpartum (OR=1.56; 95%CI: 1.17–2.07) compared to employed women. This finding was statistically significant at $p<.10$ (Bengtson et al., 2016).

Other studies confirmed that unemployed women were more likely to be LTFU than employed women. In one study, employment was regarded as one of the indicators of a higher socioeconomic status, and unemployed women were more likely to be lost due to limited or no income source (Nassali et al., 2009). This study portrayed a
relationship between income retrieved from employment and its influence on HIV treatment engagement among postpartum women. In contrast to the above studies, one study did not find a significant difference in employment status among women who were LTFU and women who were retained in care (Phillips et al., 2014).

**Education.** Lower education levels have been associated with greater odds of pregnant and postpartum women being LTFU. This finding was common in studies in which most participants were not educated at college levels or greater (Buchberg et al., 2015; Kempf et al., 2010; Mellins et al., 2008; Panditrao et al., 2011). Across studies, individuals in three education categories were more likely to be LTFU: those with less than a graduate education (Painter et al., 2005; Panditrao et al., 2011), no formal education (Boateng et al., 2013), or only a secondary or tertiary education (Bengtson et al., 2016; Phillips et al., 2014). Panditrao et al. (2011) found that women with less than a graduate level of education had greater odds of being LTFU postpartum compared to those with a graduate level education or higher (adjusted risk ratio [aRR]=1.82; 95% CI=1.03–3.22).

Regarding knowledge, Boateng et al (2013) found that women who missed more than two ART appointments in the previous two months had inadequate knowledge about ART and PMTCT treatment strategies and were 3.5 times more likely to default in ART than were their more knowledgeable counterparts (Boateng et al., 2013). In addition, there were more women with inadequate HIV-related knowledge among those with no formal education than there were among those with a formal education (Boateng et al., 2013). Therefore, these results show that formal education and greater HIV-related knowledge are potentially linked to treatment engagement.
Health insurance. The influence of health insurance on HIV treatment engagement is apparent in the literature. Studies have found that insufficient health insurance (Moneyham et al., 2010; Yehia et al., 2015) or a lack of private health insurance (Toth et al., 2013; Wilcox et al., 2016) are barriers to HIV treatment engagement among minority WLWH. Among studies specific to postpartum women in the US, a majority either were enrolled in Medicaid or had no insurance rather than holding private insurance (e.g., CHIP; Siddiqui et al., 2014; Wilcox et al., 2016). These authors reported that a higher proportion of women LTFU postpartum were enrolled in Medicaid over other private health insurance policies. For example, in their retrospective cohort analysis of 213 women in Texas, Siddiqui et al. (2014) found that of the 83 women who did not follow-up with their treatment in 12 months postpartum, 71% were enrolled in Medicaid, 27% were enrolled in CHIP, and 2% had other forms of health insurance. However, these differences in follow-up for the health insurance groups were not statistically significant (Siddiqui et al., 2014). A study conducted in New York found statistically significant results that women enrolled in Medicaid or no insurance were more likely to miss postpartum medical visits (Wilcox et al., 2016) compared to women enrolled in private insurance. In this study, Wilcox et al. (2016) retrospectively analyzed data of 6,489 women who had live births at a large-scale urban health system in New York. After examining specific predictors of postpartum visit non-attendance during a one-year period, the authors found that women with Medicaid or no insurance had higher odds of missing postpartum care visits within 12 months (aRR=1.4; 95% CI=1.2–1.6). This finding was significant at $p<.01$. Taken together, results from these studies suggest
that women without health insurance or enrolled in non-private insurance policies (e.g., Medicaid) may be at a greater risk for being LTFU.

**Maternal health status.** The prenatal and perinatal health status of WLWH can influence treatment retention in the postpartum period. The health issues of concern are HIV-related health status, gynecologic/obstetric health, and psychosocial health.

Maternal HIV health status involves how HIV disease progression affects treatment engagement, including such factors as HIV diagnosis timing (i.e., occurring before or during pregnancy; Rana et al., 2010), mode of HIV acquisition (i.e., perinatally or behaviorally; Meade et al., 2018; Swain et al., 2016b), CD4 and VL values at baseline and delivery (Aebi-Popp et al., 2016; Buchberg et al., 2015; Swain et al., 2016a, 2016b), and women with a history of being LTFU before pregnancy (Swain et al., 2016b).

**HIV-related health status.** Among studies conducted in the US, approximately 32–37% of women were newly diagnosed in pregnancy (Rana et al., 2010; Siddiqui et al., 2014). Generally, women with a diagnosis that was made closer to delivery were more likely to be LTFU (Adams et al., 2015; Swain et al., 2016b). Adams et al. (2015) found that women diagnosed with HIV less than two years before delivery were significantly less likely to be retained in care at two years postpartum (AOR=0.55; 95% CI=0.34–0.88) compared to women diagnosed more than two years before delivery. Additionally, Onoya, Sineke, Brennan, Long, and Fox (2017) found that women with incident pregnancy (i.e., conceived while using ART) had a lower risk of being LTFU (hazards ratio [HR]=0.9; 95% CI=0.7–0.9) compared to women with a prevalent pregnancy (i.e., ART initiated during pregnancy; HR=1.3; 95% CI=1.2–1.5). These results suggest that being diagnosed with HIV during pregnancy may be problematic for women regarding
postpartum treatment engagement. Similarly, HIV diagnosis at a later gestational age was related to an increased likelihood of being LTFU in Swain et al.’s (2016a) study. These authors found that women diagnosed in their third trimester were at significantly greater risk of being LTFU postpartum (aRR=2.17; 95% CI=1.37–3.44) compared to women who were diagnosed earlier.

In contrast to the above studies, Rana et al. (2010) found no significant association between a previous HIV diagnosis and treatment engagement. These authors noted that women with an early presentation trimester were significantly more likely to follow-up optimally with treatment postpartum. Moreover, further investigation into women with an early presentation trimester showed that these women were more likely to have an established HIV care provider before pregnancy ($p=.003$). Thus, women with early presentation to obstetric care, a significant facilitator of engagement, generally were diagnosed before pregnancy and under the care of an HIV provider (Rana et al., 2010).

Swain et al. (2016b) found that women who acquired HIV perinatally were least likely to be LTFU postpartum. Compared to women who acquired HIV behaviorally (heterosexually or through intravenous drug use [IDU]) or through an unknown source, women with PAHIV had the lowest odds of being LTFU within one year postpartum (RR=0.55; 95% CI=0.33–0.91). However, while women with PHIV are shown to have the lowest odds of disengagement in postpartum care (Swain et al., 2016b), their rates still remain suboptimal to national goals for HIV treatment retention. Meade et al.’s (2018) study explored the pregnancy, reproductive, and HIV health outcomes at two years postpartum for 22 women with PHIV who were obtaining treatment at a large, publicly-funded hospital in Atlanta. The authors found low retention rates among these
women starting from 90 days postpartum to two years postpartum. While all 22 women were on ART during pregnancy, only six were retained in care at 90 days postpartum. This number had decreased to four by the 12th month postpartum and to two by the 24th month postpartum (Meade et al., 2018).

In addition to diagnosis timing and mode of acquisition, studies have evaluated the influence of HIV biomarkers on treatment engagement postpartum. Several studies found that women with a higher VL at delivery (Aebi-Popp et al., 2016; Swain et al., 2016a; Swain et al., 2016b) and baseline (Buchberg et al., 2015), as well as lower CD4 counts at delivery (Buchberg et al., 2015) are significantly more likely to be LTFU postpartum. Aebi-Popp and colleagues (2016) analyzed the data of 580 women (695 pregnancies) enrolled in the Swiss HIV Cohort Study (SHCS; a multicenter observational study for interdisciplinary HIV research in Switzerland) from 1996–2011 to determine the proportion LTFU after pregnancy and delivery and identify the associated risk factors. LTFU was defined as having no contact with HIV medical care in one postpartum year. A second outcome, delayed visit, was defined as no contact with HIV medical care in more than 180 days postpartum. The authors found that women with a detectable VL at delivery were 2.54 times (OR=2.54; 95% CI=1.32–4.88) more likely to be LTFU compared to women with an undetectable VL (Aebi-Popp et al., 2016).

The same trend was observed by Swain and colleagues (2016a, 2016b) in their study of women diagnosed with HIV during pregnancy. They found that women with unsuppressed VL at delivery were 1.90 times (RR=1.90; 95% CI=1.25–2.91) more likely to be LTFU postpartum compared to those with suppressed VL (Swain et al., 2016a). Among women diagnosed before pregnancy, having a VL >200 copies/mL at delivery,
(compared to ≤200) was associated with an increased likelihood of being LTFU postpartum (Swain et al., 2016b). Similarly, Buchberg et al. (2015) found that women with higher CD4 counts at delivery (Median [IQR]: 512 [364, 746] versus 369 [285, 637]; p=0.04) and lower VL at baseline (Median [IQR]: 83 [48, 542] versus 3,900 [49, 35,500]; p=.03) were significantly more likely to retained in a follow-up obstetric visit within three months and a primary care physician visit within six months, respectively. From these studies, it appears that women with increased HIV-related morbidity at the time of delivery are more likely to be LTFU postpartum. While this association does not seem logical, a possible explanation could be that the combined challenges of dealing with a new, yet progressed HIV disease at the time of delivery and caring for a newborn can become overwhelming for a new mother and deter follow-up. As noted in one study, some women were not diagnosed with HIV until their third trimester of pregnancy (Swain et al., 2016a).

Gynecologic health status. Gynecologic health status is the combination of health issues women suffered in the past or concurrently with their HIV that influences their treatment engagement postpartum. These issues include sexually transmitted infections (STI; Rana et al., 2010), which can influence treatment engagement. Although Rana et al. (2010) found no significant association between LTFU and other medical comorbidities, they determined that women with early presentation to PNC (a group with higher odds of optimal postpartum follow-up [OR=2.1; 95% CI=1.1–3.9, p=.02]) were more likely to have a non-HIV related medical (p=.002) or psychiatric (p=.03) diagnosis. A possible explanation for this association is illustrated in one qualitative study examining the barriers and facilitators of treatment retention among WLWH in the Southeastern US
(Kempf et al., 2010). In this study, participants recounted how failing health (HIV-related or otherwise) motivated them to seek treatment. One participant recounted how her diagnosis of cervical cancer served as an incentive for her to be more careful with her health and keep all her doctor’s appointments (Kempf et al., 2010).

**Obstetric health status.** This status refers to pregnancy and delivery outcomes that can negatively affect postpartum treatment engagement. These outcomes include adequacy of prenatal care utilization (A-PNCU), the type of delivery (vaginal or C/S; Panditrao et al., 2011; Swain et al., 2016a; Wilcox, Levi, & Garrett, 2016), term at birth (preterm or full term; Bengtson et al., 2016), and birth outcomes (e.g., stillbirth and/or miscarriage; Painter et al., 2005).

**Adequacy of Prenatal Care Utilization (A-PNCU).** Having insufficient health insurance can affect the A-PNCU for WLWH. According to the Kessner/Institute of Medicine (IOM) Adequacy of Prenatal Care Index (Kessner, Singer, Kalk, & Schlesinger, 1973), A-PNC is measured by gestational age at entry into PNC, gestational age at delivery, and number of PNC visits. An improved version of this scale—the Adequacy of Prenatal Care Utilization scale developed by Kotelchuck (1994)—focuses on two main constructs: the adequacy of initiation to PNC and the adequacy of received services. In reviewing the literature on HIV treatment disengagement among pregnant and postpartum women, associations were found between inadequate PNC and the odds of being LTFU postpartum (Bengtson et al., 2016; Panditrao et al., 2011; Rana et al., 2010; Siddiqui et al., 2014; Swain et al., 2016a, 2016b).

Studies of HIV treatment engagement in postpartum WLWH commonly report that less than half of participants received adequate PNC (Adams et al., 2015; Meade et
Furthermore, compared to women with adequate PNC, women with inadequate or intermediate PNC were more likely to be LTFU postpartum (Adams et al., 2015). In their retrospective cohort analysis of 561 HIV-positive women who delivered live infants in Philadelphia from 2005–2011, Adams et al. (2015) evaluated factors affecting treatment retention and viral suppression for up to two years postpartum among WLWH. Retention was measured as ≥1 CD4 or VL tests in each six-month interval of a given 12-month period, with ≥ 60 days between tests. Retention in the second postpartum year was determined only for women retained in the first year. Of the 695 deliveries examined in the study, only 42.5% of women received adequate PNC. Following a logistic multivariate analysis, the authors found that women who had inadequate or no PNC were less likely to be retained in care by the second postpartum year (aOR=0.40; 95% CI=0.22–0.72; Adams et al., 2015). Although Meade et al.’s (2018) study did not examine the relationship between adequacy of PNC and being LTFU, the authors noted similar trends in the proportion of women receiving PNC. Of the 22 women enrolled in that study, only seven received adequate PNC. Further, while these women acquired HIV perinatally, only 29% were on ART when their pregnancy was diagnosed (Meade et al., 2018).

Several studies have cited late entry into PNC as a predictor of HIV treatment disengagement for postpartum women (Panditrao et al., 2011; Rana et al., 2010; Siddiqui et al., 2014; Swain et al., 2016a, 2016b). Women who presented to PNC at the second or third trimester had higher odds of being LTFU postpartum compared to women with earlier presentation. In Siddiqui et al.’s (2014) study, the mean gestational age at first HIV obstetric visit for women with no follow-up was 20.6 weeks, compared to 17.2
weeks for women with suboptimal follow-up, and 15.9 weeks for women with optimal follow-up. This difference in means was significant at $p=.003$. Further analysis using multivariate logistic regression determined that the odds for being LTFU was greater among women with later presentation to care (OR=1.069, 95% CI=1.031–1.109). Similar trends were noted in Swain et al.’s (2016a; 2016b) studies. Both studies explored predictive factors of being LTFU HIV care in the first postpartum year and had similar designs (retrospective cohort analysis), geographic settings (New York), time frame (2008–2010), and measure of postpartum retention (two or more CD4 or VL tests separated by at least 90 days). However, these studies varied in three ways regarding their selection of participants. First, Swain et al. (2016a) examined LTFU for women diagnosed HIV during pregnancy, while Swain et al. (2016b) examined LTFU for women previously diagnosed at least one year before the first pregnancy in the study period. Second, in addition to obtaining data from the New York State (NYS) Department of Health Surveillance Registry, Swain et al (2016b) also matched their data with those from the NYS Perinatal Database. Third, Swain et al. (2016a) examined data of 198 women who initiated HIV care before delivery (of whom 30% were LTFU in the first postpartum year), while Swain et al. (2016b) examined data of 980 women (of whom 24% were LTFU in the postpartum year). Results from both studies showed higher crude risk ratios (RR) of LTFU for women presenting to PNC at >20 weeks (RR=1.98; 95% CI=1.27–3.07) compared to women who presented to care at <20 weeks of pregnancy (Swain et al., 2016a). Additionally, women who had no PNC visit (RR=3.01; 95% CI=1.91–4.72) or presented to a PNC visit in their third (RR=2.07; 95% CI=1.39–3.08) or second trimester (RR=1.59; 95% CI=1.20–2.11) had higher RR than those who presented to care
in their first trimester (Swain et al., 2016b). Similar trends were noted in the aRR for both studies.

The adequacy of PNC is another factor that is evaluated against the proportion of kept PNC visits. Insufficient PNC visits or prenatal ART intake have been associated with postpartum HIV treatment disengagement (Adams et al., 2015; Bengtson et al., 2016; Swain et al., 2016b). Bengtson et al. (2016) noted that women with one or two PNC visits had greater odds of being LTFU (OR=1.31, 95% CI=0.97–1.76) compared to women with ≥3 visits. Also, women who had received cART for 1–4 weeks were 1.69 times (95% CI=1.23–2.32) more likely to be LTFU compared to women who received cART for >4 weeks. Similar findings were noted in Swain et al.’s (2016b) study, in which women who did not receive prenatal ART treatment had greater risk of being LTFU postpartum (RR=2.30, 95% CI=1.64–3.21) compared to women who received ART during pregnancy. Taken together, these studies suggest that women who attend PNC visits and take ART are likely to continue these practices postpartum.

*Type of delivery.* Compared to C/S, vaginal delivery poses a lower risk of postpartum infection, which can have deleterious effects for immunocompromised women. Despite lower infection risk, vaginal delivery is recommended for pregnant WLWH only when the mother has been in PNC throughout her pregnancy, has a VL less than 1,000 copies/mL, and is taking AZT with or without other anti-HIV drugs (HHS, 2005). Although study findings have shown a significant relationship between being LTFU postpartum and method of delivery, there are discrepancies in these findings. While Panditrao et al. (2011) and Wilcox et al. (2016) found that women who delivered vaginally were more likely to be LTFU, Swain et al. (2016a) found the opposite. In their
study, Wilcox and colleagues (2016) examined the predictors of non-attendance to a postpartum follow-up visit among 4,049 WLWH receiving PNC at a university hospital in New York. Non-attendance was defined as women who did not attend a postpartum follow-up visit within 12 weeks of delivery. Using a multivariate logistic regression and modified poisson regression analyses, the authors found that women who delivered vaginally had greater odds of being LTFU postpartum (RR=1.2, 95% CI=1.1–1.4, \( p=.0003 \)) than did women who delivered via C/S. Panditrao et al. (2011) found that the odds of being LTFU was almost two times greater for women who delivered vaginally (RR=1.75; 95% CI=1.30–2.36) than for women who delivered via C/S. In contrast to these findings, Swain et al. (2016a) found that women who delivered via C/S were 1.90 times (RR=1.90; 95% CI=1.25–2.91) more likely to be LTFU than were women who delivered vaginally. None of these studies provided possible explanations for these findings. However, based on previous research on engagement for minority WLWH (Kempf et al., 2010), it can be hypothesized that women whose health was more compromised (i.e., they delivered via C/S rather than vaginally) had a greater incentive to attend all of their doctor appointments. This point is illustrated by the decreased odds of being LTFU for women who delivered via C/S as noted in Panditro et al. (2011) and Wilcox et al. (2016).

**Term at birth.** In addition to delivery method, other birth outcomes such as low birthweight (<2,500 grams) or preterm delivery (<37 weeks gestation) may be associated with women being LTFU postpartum. Two studies have evaluated these relationships (Bengtson et al., 2016; Painter et al., 2005). Of the 507 women who were LTFU at six months in their study, Bengtson et al. (2016) found that 86% of them did not have a low
birthweight infant. After evaluating LTFU frequency based on delivery term, they noted that of the 507 women LTFU at six months, 58.9% delivered a full-term baby (Bengtson et al., 2016). Therefore, a greater proportion of the women LTFU delivered at term and did not have a low birthweight infant. Although, this finding was not statistically significant when included in a multivariate logistic regression analysis (Bengtson et al., 2016), it follows similar trends discussed above about the incentive to seek care for women who might be sicker or have sicker infants.

**Pregnancy outcomes.** Pregnancy outcomes of miscarriages, stillbirths, infant deaths, and abortions also may be linked with women being LTFU postpartum. In one cross-sectional study conducted in Cote d’Ivoire, the authors examined the sociodemographic factors associated with participation in a PMTCT program implemented by the Cote d’Ivoire Ministry of Public Health and the CDC (Painter et al., 2005). They compared data from two groups of women recruited via purposive sampling: one group of 30 participants (P) and another group of 27 non-participants (NP). The P group included women who returned for their postpartum visits, while the NP group included women who failed to attend their postpartum visits, but continued to attend visits related to the infant’s health (e.g., prenatal visits, vaccinations, and baby weight appointments). The authors found that, compared to Ps, NPs were more likely to report a miscarriage, stillbirth, or infant birth (69% versus 33%). This difference was statistically significant at $p=.012$. The authors suggested that poverty—a possible reason for non-participation among NPs—could have contributed to the high rate of stillbirths and infant deaths noted in this group.
**Psychosocial health.** Studies have demonstrated that maternal psychosocial health is important to maintaining treatment engagement postpartum. Several issues can adversely influence treatment engagement among pregnant and postpartum WLWH including depression (Buchberg et al., 2015, Kapetanovic et al., 2014), anxiety, HIV-related post-traumatic stress disorder (PTSD; Kempf et al., 2010), and substance use (Aebi-Popp et al., 2016; Mellins et al., 2008; Rana et al., 2010).

Depression, particularly PPD, can increase the risk of pregnant and postpartum WLWH being LTFU postpartum. Depression and other psychological disorders (e.g., anxiety and HIV-related PTSD) are prevalent among pregnant and non-pregnant WLWH (Illangasekare, Burke, Chander, & Gielen, 2014; Kapetanovic et al., 2014; Kempf et al., 2010; Olga et al., 2014). Such disorders can reduce treatment engagement (Buchberg et al., 2015). In their mixed-method study, Buchberg and colleagues (2015) identified factors leading to postpartum LTFU among 30 WLWH who were recruited from two county clinics in Texas. These researchers defined postpartum retention as attending a postpartum obstetric visit. Depression was measured using the 20-item Center for Epidemiologic Studies Depression Scale (CES-D). The authors found that the mean depression score was higher for women who did not follow-up with their obstetric appointment within three months (Mean=23.5; SD=15.81), compared to women who did (Mean=15.24; SD=8.11). This difference approached statistical significance at \( p=.05 \).

Women with high-risk pregnancies caused by physical, psychological, or neurological problems (including HIV) are found to be at greater risk for the development of PPD (Katon et al., 2014). For example, Katon et al. (2014) found that women who developed PPD were significantly more likely to be younger and have pre-
pregnancy illness (Katon et al., 2014). Despite this link, the literature on the prevalence of PPD among HIV positive women is limited to only two studies. The results from a study conducted in Zimbabwe showed a 54% rate of PPD among their 31 participants who also had HIV (Chibanda et al., 2010). Results from a study conducted in Thailand had a 74% incidence rate of depressive symptoms among their 85 participants with HIV (Ross et al., 2011). In contrast, results from a study conducted in the US indicated no differences in viral suppression and treatment engagement between women who were depressed (confirmed clinical depression and/or signs and symptoms of depression) and those who were not (Momplaisir et al., 2018a). These conflicting results indicate the need to explore further PPD among WLWH, particularly Black women, to determine any direct relationships between PPD and LTFU in HIV care postpartum.

Similar to depression, substance use also may hinder postpartum HIV treatment engagement among WLWH (Aebi-Popp et al., 2016). Substances such as alcohol, cigarette smoke, and illicit drugs were used by approximately 20% of participants in two studies: Adams et al. (2015) and Rana et al. (2010). Of the 695 deliveries analyzed in Adams et al. (2015), 155 were birthed from women who used alcohol, tobacco, or marijuana during pregnancy. Of these women, 103 did not engage in care within 90 days postpartum. Despite this finding, substance use was not associated with care retention at one and two years postpartum in this study (Adams et al., 2015). Conversely, Aebi-Popp et al. (2016) found that women with a history of IDU were almost three times (aOR=2.79; 95%CI=1.32–5.88; \( p=0.007 \)) more likely to be LTFU postpartum than were non-users. This finding suggests an association between being socially marginalized and disengaging from postpartum HIV treatment.
Relationship Level

**Relationship status.** Women’s relationship status has been associated with their degree of engagement in PMTCT postpartum. In their retrospective cohort study, Woelk et al. (2016) investigated levels of engagement in a Rwandan PMTCT program among unpaired mothers and mother-infant pairs at six different time points: 30 days after registration; six weeks after delivery; and three, six, nine, and 12 months after delivery. The authors also examined other individual and health system factors that could influence engagement. Retention was defined as “clinic attendance of the mother in addition to clinic attendance of the mother and infant as a pair” (p. 2). LTFU was defined as missing three consecutive clinic visits in the study’s measured time periods. At 12 months postpartum, retention for mothers was 58% (95% CI=52%–64%), compared to 81% (95% CI=76%–86%) retention for infants. Furthermore, retention was poor for the unmarried women, with single women having the lowest retention at delivery (48%; 95% CI=30%–66%), nine months postpartum (41%; 95% CI=23%–59%), and 12 months postpartum (41%; 95% CI=23%–59%). Divorced/separated women had the lowest retention rate at six weeks postpartum (43%; 95% CI=17%–69%), three months postpartum (36%; 95% CI=11%–61%), and six months postpartum (36%; 95% CI=11%–61%) postpartum. When included in a multivariate logistic regression model, married women had greater odds of being retained in care (aRR=1.26, 95% CI=1.11–1.43, \( p<.001 \)) than did single, living as married, and divorced/separated women. This study’s findings demonstrated that single and divorced women have higher frequencies of treatment disengagement than do married women (Woelk et al., 2016). It could be suggested that single and divorced women lack spousal and familial support, an
Caregiver burden. WLWH, particularly postpartum women with new infants, may be burdened by childcare issues, which can be overwhelming and compete for the time needed to attend to other responsibilities (Arrivillaga, Ross, Useche, Springer, & Correa, 2011; Boehme et al., 2014; Buchberg et al., 2015). This situation can adversely influence treatment engagement, as women may become unable to fit their treatment plan into their daily schedule as new moms (Arrivillaga et al., 2010; Buchberg et al., 2015). In the literature, caregiver burden often is operationalized as the number of living children a woman has (Buchberg et al., 2015). A higher number of children reflects a greater caregiver burden as well as an increased risk of treatment disengagement for WLWH. Caregiver burden may be greater for women with younger children: toddlers, preschoolers, children who are too young to attend school, or children who are in school except on holidays (i.e., when school is not in session; Boehme et al., 2014). This difficulty is reflected in the statement of a woman who participated in a qualitative study conducted in Birmingham, Alabama. This woman described how difficult it was for her to attend appointments without child care, “… you got kids now, [and] it is hard to bring them wherever you go…” (Boehme et al., 2014, p. 578). Similarly, a woman from a mixed-method study conducted in Houston, Texas recounted how competing demands on her time caused by lack of childcare hindered her treatment engagement, “they tell you that you’re supposed to relax, get bed rest for six weeks or whatever, but they set out appointments right after you get out... we had like three or four appointments for the baby and I’m trying to shuffle mine, and I’m tired... it’s just too much” (Buchberg et al., 2015,
Results from the same study showed that women who attended an obstetric postpartum appointment within the first three months postpartum had fewer children (Mean=1.13; SD=1.26) than did women who were LTFU (Mean=2.40; SD=1.96). This difference was statistically significant at p=0.03. These studies demonstrate that caregiver burden is a common problem among pregnant and postpartum WLWH that can adversely influent treatment engagement.

**Abuse.** There is a scarcity of research on the influence of abuse (domestic or intimate partner violence) on HIV treatment engagement for pregnant and postpartum women (Hatcher, Smout, Turan, Christofides, & Stoeckl, 2015). To date, no studies in the US have examined the relationship between abuse and treatment engagement, specifically for pregnant and postpartum WLWH. While a few researchers have investigated the relationship between abuse and treatment retention for minority WLWH, they did not focus on pregnant or postpartum women, nor did they find a statistically significant relationship between the two variables (Blackstock et al., 2015; Blank et al., 2015).

Outside the US, some researchers have evaluated how abuse impacts treatment engagement among WLWH (Hatcher et al., 2016; Illangasekare et al., 2014). The authors of one qualitative study conducted in South Africa sought to understand the intricacies of abuse and its effect on treatment engagement for pregnant and postpartum women (Hatcher et al., 2016). Guided by the SEM and using a narrative constructive approach, the authors conducted in-depth interviews of 32 pregnant and postpartum women WLWH who reported experiencing abuse. The median time for the interview was 46 minutes (Range=26 min.–1 hr. 40 min). Seventy-five percent of the women reported experiencing
physical and emotional violence, 9.4% only emotional abuse, and 15.6% physical, sexual, and emotional abuse. From a content analysis of the interview data, the authors found four main pathways by which IPV influences adherence to a PMTCT program. First, the fear of potential abuse deters women from disclosing their HIV status to their partners. This non-disclosure makes them cautious about engaging in activities related to HIV, possibly resorting taking breaks from or stopping treatment entirely. Second, abuse can cause mental health problems such as depression or suicidal thoughts (e.g., “life is not worth living” [p. 134]) that can hinder ART adherence. Third, partner dominance, control, and isolation of the woman can hinder peer and family support (an important facilitator for treatment engagement) among pregnant and postpartum WLWH. Fourth, the developing fetus can serve as a strong motivator to engage in treatment despite experiencing abuse. In such cases, women endured IPV and continued treatment because they wanted better health for their babies (Hatcher et al., 2016). This study provided evidence that pregnant and postpartum WLWH who are experiencing abuse may be at greater risk of being LTFU to treatment. Nonetheless, given the lack of research on this association, there is a crucial need for this finding to be investigated further by the scientific community.

**HIV disclosure.** The impact of HIV disclosure on treatment engagement is closely related to the negative influence of HIV-related stigma. There is a dearth of research on how HIV disclosure affects HIV treatment engagement for pregnant and postpartum WLWH. Only a few studies—from developing countries (Spangler, Onono, Bukusi, Cohen, & Turan, 2014) and US studies on minority WLWH—have observed that HIV non-disclosure negatively affects treatment engagement (Buchberg et al., 2015;
Kempf et al., 2010). In their qualitative study, Kempf et al. (2010) examined the barriers and facilitators to care retention among 39 WLWH in Southeastern US, of which 92% were Black. They found that HIV non-disclosure due to stigma was a barrier to care retention. The women in the study stated that when childcare was not available, they would rather miss their appointments than bring their children (to whom they had not disclosed their HIV status) with them. The researchers of another mixed-method study wanted to understand the barriers to postpartum retention in care among a sample of 35 WLWH, of whom 94% were minorities and 77.1% were Black. These women expressed that a lack of social support from those outside of their immediate family, secondary to non-disclosure of their HIV status, was a barrier to care retention (Buchberg et al., 2015). The women hesitated to disclose their status due to previous experiences in which they felt stigmatized after disclosure (Buchberg et al., 2015)

A third study was conducted to examine the influence of disclosure on maternal and PMTCT service utilization in a sample of pregnant and postpartum WLWH in a developing country (Spangler et al., 2014). The sample consisted of 390 women (73 WLWH with undisclosed status, 72 WLWH with disclosed status, and 245 HIV-negative or unknown status; Spangler et al., 2014). The authors found that women who had not disclosed their HIV status to anyone had the lowest rate of maternal and PMTCT service utilization, and disclosure to a male partner significantly impacted maternal and PMTCT service utilization (Spangler et al., 2014). Specifically, when comparing rates of antenatal care (ANC) visit attendance (≥4 visits), the proportion of WLWH with disclosed status attending ≥4 ANC visits was higher [51%] than was that of WLWH with undisclosed status [32%] (p=.03). Regarding ART use and PMTCT, 88% of WLWH with disclosed
status used ART for PMTCT compared to only 56% of WLWH with undisclosed status ($p=.002$). Furthermore, after using a multiple regression model, the authors found that women who had disclosed their HIV status to anyone were 5.8 (95% CI=1.9–17.8) times more likely to use ART and three times (95% CI=1.4–5.7) more likely to give birth in a health facility (Spangler et al., 2014). Though few, these studies highlight the negative effects HIV non-disclosure can have on HIV treatment engagement for pregnant and postpartum women. The findings further suggest that HIV disclosure could potentiate treatment-seeking tendencies and engagement among these women.

**Social support.** The physical, psychological, and psychosocial benefits of obtaining support from peers, family members, and healthcare providers during the course of HIV treatment cannot be understated. Receiving social support from clinic staff and peers has been cited as an important element of sustaining treatment engagement among WLWH (Kempf et al., 2010). In their qualitative study using focus groups of 40 women (92% of whom were Black), Kempf et al. (2010) examined barriers and facilitators to HIV treatment retention among WLWH in rural Southeastern regions of the US. These women mentioned that receiving appointment reminders from clinic staff helped them keep their appointments. They also stated that their ability to provide empathy to other women motivated them to come to the clinic. For these women, providing hope to other newly diagnosed women in clinic waiting areas “gave them a feeling of purpose beyond caring for their own health” (Kempf et al., 2010, p. 518).

In two other qualitative studies using in-depth interviews, the authors sought to examine the barriers and facilitators to HIV treatment retention among low-income postpartum WLWH (Buchberg et al., 2015) and those living in a rural Southeastern area
of the US (Boehme et al., 2016). Buchberg et al. (2015) interviewed 35 postpartum WLWH, of whom 77.1% were Black, and Boehme et al. (2016) interviewed 18 postpartum WLWH, of whom 83.3% were Black. Boehme et al. (2016) found that support from family, peers, and clinic staff was mentioned as a facilitator both for keeping clinic appointments and adhering to medication regimens, while a lack of such support from outside of immediate family members was a barrier to care retention. Women commonly cited how ease of electronic communication between them and their healthcare providers and clinic staff facilitated their treatment (Boehme et al., 2016). They also noted that phone calls from family members to check on them and their treatment regimen/appointments was great support (Boehme et al., 2016). On the other hand, a lack of support from people other than family members discouraged adequate treatment engagement. Women in this study mentioned that their hesitancy in disclosing their status to non-family members prevented them from obtaining support from such persons (Buchberg et al., 2015). These studies demonstrate that social support is a critical element for HIV treatment engagement among WLWH, particularly Black women with low-income and those residing in rural areas.

**Conclusion**

A review of the literature uncovered several research gaps concerning HIV treatment engagement for pregnant and postpartum WLWH including information about the associated factors that put such women at risk for LTFU during pregnancy and the postpartum period. First, the review highlighted the paucity of research on this US public health problem, as most studies about this topic were conducted in developing countries. Second, findings showed that HIV treatment disengagement during pregnancy is not
prevalent in the US. Fortunately, treatment strategies have improved over the years, drastically reducing the rate of mother-to-child HIV transmission to <1% (CDC, 2019b).

Third, research results indicated that HIV treatment disengagement in the US is more prevalent among postpartum women than among pregnant women. This finding provided the rationale for the researcher of the current study to focus on postpartum women. Furthermore, the review showed that treatment disengagement among postpartum WLWH mostly occurs within the first three months postpartum. Therefore, efforts to engage women during the first three months postpartum could help improve ongoing engagement, viral suppression, and lifelong optimal health for these women. Fourth, engagement measures vary across studies and are dependent on a number of factors such as the relationship between the patient and the prescribing provider, the treatment facility, and various HIV treatment modalities used by healthcare systems in different countries. Fifth, associations between treatment engagement and certain sociodemographic variables identified in the literature were consistent across studies and therefore require further exploration. For example, across all studies, lower age, income, and education levels all were associated with higher odds of being LTFU. In contrast, there were inconsistent findings for the variables of employment and mode of delivery. For example, while some studies found that women who delivered vaginally were more likely to be LTFU postpartum (Panditrao et al., 2011; Wilcox et al., 2016), others found just the opposite (Swain et al., 2016a). Sixth, there is a lack of US research on the relationships between the identified variables of abuse and PPD with treatment engagement. Seventh, while the literature has consistently highlighted associations between various sociodemographic variables and treatment disengagement, to date no study in the US has
evaluated the social determinants of postpartum treatment engagement with a sample of only Black women (a particularly vulnerable group in the US). Additionally, no study has used a theory to guide an evaluation of disengagement predictors. The current study was designed specifically to address these seven literature gaps with the goal of producing information that can be used to improve the health of this vulnerable population.
Chapter 3 – Methods

This chapter discusses this study’s methodology, including the study purpose, hypotheses, design, sample, setting, variable measurement, data analysis, protection of human rights, and results dissemination.

Purpose

The purpose of this study was to investigate the social determinants of HIV treatment engagement among Black postpartum WLWH at the intrapersonal and interpersonal levels of the SEM. Within the context of this purpose, the researcher used two separate models to investigate the social determinants of two measures of engagement: immediate postpartum engagement (PPE) and ongoing primary care engagement (PCE).

The social determinants investigated at the individual (intrapersonal) level were age, income, education, employment, health insurance, adequacy of PNC, and maternal health status (HIV-related, gynecologic, obstetric, and psychosocial). The social determinants investigated at the relationship (interpersonal) level were relationship status, caregiver burden, abuse, HIV disclosure, and social support.

Research Questions, Specific Aims, and Hypotheses

Research Question 1

The first research question for this study was What are the differences in social determinants of PPE and postpartum PCE in HIV treatment among Black postpartum WLWH at the intrapersonal and interpersonal levels of the SEM? This research question includes the specific aims and hypotheses described below.
Specific Aim 1.1. The first aim related to research question one was to determine whether there are differences in social determinants of PPE in HIV treatment among Black postpartum WLWH at the intrapersonal levels (age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health) and interpersonal levels (relationship status, caregiver burden, abuse, HIV disclosure, and social support) of the SEM.

Hypothesis 1.1. The hypothesis related to research question one and specific aim 1.1 was that there are differences in social determinants of PPE in HIV treatment among Black postpartum women WLWH at the intrapersonal levels (age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health) and interpersonal levels (relationship status, caregiver burden, abuse, HIV disclosure, and social support) of the SEM.

Specific Aim 1.2. The second aim related to research question one was to determine whether there are differences in social determinants of ongoing, postpartum PCE in HIV treatment among Black postpartum WLWH at the intrapersonal levels (age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health) and interpersonal levels (relationship status, caregiver burden, abuse, HIV disclosure, and social support) of the SEM.

Hypothesis 1.2. The hypothesis related to research question one and specific aim 1.2 was that there are differences in social determinants of ongoing, postpartum PCE in
HIV treatment among Black postpartum WLWH at the intrapersonal levels (age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health) and interpersonal levels (relationship status, caregiver burden, abuse, HIV disclosure, and social support) of the SEM.

**Research Question 2**

The second research question for this study was What are the SDH that predict engagement in HIV treatment among Black postpartum WLWH at the intrapersonal and interpersonal levels of the SEM? This research question includes the specific aims and hypotheses described below.

**Specific Aim 2.1.** The first aim related to research question two was to determine the predictors of PPE in HIV treatment among Black Postpartum WLWH at the intrapersonal and interpersonal levels of the SEM.

**Hypothesis 2.1.** The hypothesis related to research question two and specific aim 2.1 was The predictors of PPE in HIV treatment among Black postpartum WLWH in South Florida at the intrapersonal level of the SEM are age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health; and the predictors at the interpersonal level are relationship status, caregiver burden, abuse, HIV disclosure, and social support.

**Specific Aim 2.2.** The second aim related to research question two was to determine the predictors of postpartum PCE in HIV treatment among Black Postpartum WLWH at the intrapersonal and interpersonal levels of the SEM.
**Hypothesis 2.2.** The hypothesis related to research question two and specific aim 2.2 was The predictors of ongoing PCE in HIV treatment among Black postpartum WLWH in South Florida at the intrapersonal level of the SEM include age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health; and the predictors at the interpersonal level of the SEM are relationship status, caregiver burden, abuse, HIV disclosure, and social support.

**Design**

This study was a secondary data analysis in which the researcher retrospectively reviewed data of a cohort of Black WLWH who received PNC and follow-up postpartum care at the PRIM clinic and ongoing primary care at the WISH clinic up to one year postpartum. This type of design involves the researcher looking back in time to observe factors that might have influenced participants’ exposure to an outcome of interest. Given the lack of studies investigating this outcome, a retrospective study allows for feasibility in investigating such an outcome and adding to nursing and public health scientific knowledge (Setia, 2016).

**Setting**

The setting for this study was the University of Miami’s (PRIM) and WISH clinics. The PRIM clinic is the largest perinatal HIV clinic in the US. It is located in the large metropolitan city of Miami, Florida, Southern Florida’s largest city. Since its inception in 1985, the clinic has served approximately 4,000 pregnant WLWH (approximately 100–125 annually). The clinic provides comprehensive medical, psychological, social, and case-management services including referrals for ancillary
services as needed for each patient including psychiatry, imaging tests, and homeless shelter referrals. The clinic serves low-income pregnant WLWH, most of whom are from a racial or ethnic minority (e.g., African American, Haitian, and Hispanic individuals). Approximately 70% of the women are Black. The care team is comprised of an interdisciplinary network of physicians, advanced-practice registered nurses, psychologists, medical assistants, and support staff (social workers, case managers, and eligibility specialists).

The WISH clinic is managed by a multidisciplinary team of providers from the University of Miami including specialists from the departments of medicine, psychiatry, and behavioral sciences. Since its inception in 1990, the clinic’s aim has been to support the health of immunocompromised women from adolescence through menopause and beyond. The clinic also engages in a multitude of research opportunities to improve the health of these women. The clinic provides full range of services including preconception counseling, adolescent sexual health services, obstetrical care including postpartum and transition care, gynecological care including colposcopy and LEEP procedures, primary care, and behavioral health including mental health assessments and treatment. New mothers are introduced to the WISH clinic, which offers effective postpartum transitioning into primary care, particularly for women who were newly diagnosed during pregnancy at PRIM, were ART-naïve, and/or did not have an HIV care provider.

At the PRIM clinic, postpartum WLWH who delivered via C/S are scheduled for postpartum visits at two weeks and six weeks postpartum, and women who delivered vaginally at six weeks postpartum. Women then are referred to the WISH clinic to continue primary HIV care. While this option is offered to all women, it mostly is utilized
by women who were diagnosed with HIV during pregnancy, and therefore do not have an HIV care provider. Those diagnosed before pregnancy may wish to continue treatment with their original primary HIV care provider at a different location. Therefore, only a portion of women who deliver at PRIM continue postpartum and ongoing primary care at the WISH clinic. The staff at the PRIM clinic follow-up with the women who transition to the WISH clinic postpartum after delivery at PRIM. This means that women who decide to continue treatment at WISH can be analyzed conveniently for disengagement by the 12th month postpartum.

**Sample**

The cohort comprised Black women receiving immediate postpartum care at the PRIM clinic who then transitioned into ongoing primary care at the WISH clinic from May 2009 to May 2017. The inclusion criteria were WLWH age 18 and older who self-identified as Black and received at least one month of PNC at the PRIM clinic prior to the delivery of a live neonate/infant, who then transitioned to ongoing primary care at the WISH clinic. The exclusion criteria were women who had not clocked one-year postpartum by May 2018, who had a multifetal gestation (twins or more), who delivered infants with serious health issues diagnosed at delivery or within three months of life, whose infants did not survive the delivery process or suffered intrauterine fetal death, who had severe health problems, and who delivered premature infants (<21 weeks of gestation). These exclusion criteria were selected because of their potential influences on study variables. For example, a sick infant or dead fetus could influence a mother’s psychological health and ability to engage in postpartum HIV treatment.
The PRIM delivers approximately 100 babies annually, of whom about 50% transition to primary care at WISH. This percentage is further reduced for women who are Black, delivered live infants, and/or transitioned to the WISH clinic for ongoing primary care. Based on these circumstances, about 143 women from May 2009–May 2017 were included in this study.

**Data Collection**

All data for this study were obtained from manual and electronic review of patients’ medical files from the PRIM clinic’s database, CAREWare and the University of Miami Health System Electronic Health database (UMHS-EHD). Data collected include the patient’s age, income, employment, education, health insurance, adequacy of PNC, maternal health status (HIV, gynecologic, and obstetric health history), relationship status, caregiver burden, abuse, HIV disclosure, social support, clinic appointments, and any other medical history pertinent to answering the study’s research questions and specific aims.

**Measurement of Variables**

This study includes variables on both the intrapersonal and interpersonal levels of the SEM. Following is a discussion of how these variables were measured. This information also is detailed in Table 1.

**Intrapersonal Level Social Determinants of Engagement**

McLeroy et al. (1988) defined intrapersonal factors as “characteristics of the individual such as knowledge, attitudes, behavior, self-concept, skills, and the developmental history of the individual” (p. 355). The intrapersonal factors examined in
the current study were age, income, education, employment, health insurance, adequacy of prenatal health utilization, and maternal health status.

**Age – conceptual definition.** The Organization for Economic Cooperation and Development’s (OECD; 2006) Glossary of Statistical Terms defined age as “the interval of time between the day, month, and year of birth, and the day and year of occurrence of the event expressed in the largest completed unit of solar time such as years for adults and children; and months, weeks, days, hours, or minutes of life, as appropriate, for infants under one year of age (Gregorian calendar)” (OECD, 2006, para. 1).

**Age – operational definition.** Age was operationally defined as the value obtained from the patient’s chart as the patient’s age in years. This value was automatically calculated by the software following the patient’s response to the question about their date of birth. This variable was measured as a continuous variable (ratio data).

**Income – conceptual definition.** The US Internal Revenue Service (IRS; 2017) defined income as earned or unearned. Earned income includes all taxable monies one makes from working for oneself or another. This income includes wages, salaries, tips, other taxable employee pay, union strike benefits, and long-term disability benefits received prior to minimum retirement age. Unearned income is not taxable and includes monies received from alimony, child support, unemployment benefits, social security benefits, retirement income, interest and dividends, and payments one receives while working as an inmate in a penal institution (IRS, 2017).

**Income – operational definition.** Income was operationally defined as the value obtained from patients’ self-report of their annual household income as indicated on their medical chart. In CAREWare, patients’ annual income was automatically converted to a
percentage of the Federal poverty level (FPL). This variable was measured as a continuous variable (ratio data).

**Employment – conceptual definition.** Lauerbach (1977) defined employment from an economic perspective as “activities that are remunerated financially and are considered *productive*, either directly or indirectly.” From a legal perspective, employment is defined as “an activity or service performed for another, especially for compensation or as an occupation” (Merriam-Webster Dictionary, 2018b, para. 1). Both definitions share a common underpinning, that employment involves activities done for some sort of gratification, monetary or otherwise.

**Employment – operational definition.** Employment was operationally defined as patients’ self-report of their employment status as indicated on their medical chart. This variable was measured categorically as employed (0) or unemployed (1).

**Education – conceptual definition.** Merriam-Webster’s dictionary defines education for English language learners as “the knowledge, skill, and understanding that you get from attending a school, college, or university” (Merriam-Webster Dictionary, 2018a, para 2).

**Education – operational definition.** Education was operationally defined as the response indicated on patients’ medical chart as their self-report to the highest level of education attained. This variable was measured categorically (ordinal data) as less than high school (1), high school diploma (2), or some college or more (3).

**Health insurance – conceptual definition.** According to HealthCare.gov (n.d.; a government website managed and paid for by the US Centers for Medicare and Medicaid
Services), health insurance is defined as “a contract that requires your health insurer to pay some or all of your healthcare costs in exchange for a premium” (para. 1).

**Health insurance – operational definition.** Health insurance was operationally defined as patients’ self-report about their primary source of health insurance as indicated on their medical chart. This variable was measured categorically (nominal data) as no insurance (1), Medicaid (2), or private insurance or other (3).

**Maternal health status.** The WHO (n.d.) defined health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (bullet one). In the current study, the physical, mental, and social well-being of postpartum WLWH were examined in relation to postpartum treatment engagement, as described below.

**Mode of acquisition – conceptual definition.** This variable was conceptually defined as the route of HIV transmission from the host to the patient. The modes are perinatal (transmission from mother to child during pregnancy, either in-utero or via breastfeeding), sexual (cases transmitted through sexual contact), and IDU (cases transmitted through IDU or blood transfusion).

**Mode of acquisition – operational definition.** This variable was operationally defined as a patient’s self-report of mode of HIV transmission, measured categorically as perinatal (1), sexual (2), IDU (3)

**Timing of HIV diagnosis – conceptual definition.** This term refers to the day, month, and/or year of a patient’s HIV diagnosis. A definitive HIV diagnosis is one that has been confirmed by a Western blot test performed after a positive antibody test (HHS, 2018a).
Timing of HIV diagnosis – operational definition. This variable was obtainable from patient’s medical record based on indicated date of HIV diagnosis. For women who were diagnosed before pregnancy and had no record at PRIM, this data was operationally defined as patients’ self-reported estimated/probable time of HIV diagnosis. This variable was measured categorically (nominal data) as before pregnancy (0) or during pregnancy (1).

Viral load (VL) – conceptual definition. VL was defined as “the amount of HIV in a sample of blood... reported as the number of HIV RNA copies per milliliter of blood” (HHS, 2018b, para. 1) following a laboratory VL test.

Viral load (VL) at baseline – operational definition. This variable was operationally defined as the laboratory value obtained for patients’ VL test taken at the beginning of their PNC, as indicated on their medical chart. This variable was measured categorically using a threshold of HIV RNA 200 copies/m. The HHS (2018d) described an inability to achieve or maintain viral suppression at less than 200 copies/mL as virologic failure. Therefore, this variable was measured categorically based on cases of virologic failure or otherwise, as follows VL<200 (0) or VL ≥200 (1).

Viral load (VL) at delivery – operational definition. This variable was operationally defined as the last obtained laboratory value for patients’ VL test, taken before delivery, as indicated on their medical chart. This variable was measured similar to VL at baseline as VL<200 (0) or VL ≥200 (1).

CD4 count – conceptual definition. According to the HHS (2018c), a CD4 count is “a laboratory test that measures the number of CD4 T lymphocytes (CD4 cells) in a sample of blood. In PLWH, the CD4 count is the most important laboratory indicator of
immune function and the strongest predictor of HIV progression. The CD4 count is one of the factors used to determine when to start ART. The CD4 count is also used to monitor response to ART” (para. 1). A CD4 count of greater than 500 is considered normal.

**CD4 at baseline – operational definition.** This variable was operationally defined as the laboratory value for patients’ CD4 test obtained at the beginning of their PNC, as indicated on their medical chart. It was measured categorically as $\geq 500$ (0) or $<500$ (1).

**CD4 at delivery – operational definition.** This variable was operationally defined as the last obtained laboratory value for patients’ CD4 test taken before delivery, as indicated on their medical chart. It was measured categorically as $\geq 500$ (0) or $<500$ (1).

**Medical comorbidities – conceptual definition.** A medical comorbidity means that “more than one disease or condition is present in the same person at the same time” (CDC, 2018a, para. 1). Such diseases or conditions often are chronic and long term. Other terms used for this concept are multimorbidity or multiple chronic conditions.

**Medical comorbidities – operational definition.** This variable, grouped under the heading of gynecological health status, was operationally defined as a count of any additional medical diagnosis (excluding STIs) that patients had in addition to HIV, such as diabetes or gestational diabetes, asthma, hypertension, preeclampsia, eclampsia, and sickle cell anemia, as indicated on their medical chart. The variable was measured as a continuous ratio data.
Adequacy of prenatal care utilization (A-PNCU) – conceptual definition. The Kotelchuck (1994) A-PNCU index was used to determine each patient’s adequacy of prenatal care utilization. The index examines two distinct constructs: the adequacy of initiation to PNC (determined by the month of entry into PNC), and the adequacy of received services (determined by the proportion of kept visits). Based on the first construct, a woman is considered to have adequate plus PNCU if she begins PNC in the first or second gestational month; adequate PNCU if she begins at three to four months; intermediate PNCU if she begins at five to six months; and inadequate PNCU if she received no care or began care at seven to nine months gestation.

The second construct was determined by the proportion of kept visits. The proportion of kept visits is the number of American College of Obstetrics and Gynecologists (ACOG) recommended PNC visits kept by the woman after adjusting for her gestational age at entry into PNC. For a woman to be considered adequate plus, adequate, or intermediate, she must have begun PNC at four months gestation. A woman who receives 110% or more of her recommended visits is considered to have adequate plus PNCU, 80–109% is considered adequate PNCU, and 50–79% is considered intermediate PNCU. Women who received no PNC, began PNC beyond four months gestation, or kept fewer than 50% of their recommended visits are considered to have inadequate PNCU. The Kotelchuck (1994) index has been used by researchers investigating HIV treatment engagement among postpartum women (Adams et al., 2015; Meade et al., 2018), and PNC utilization for Black women (Mikhail, 2000). This measure demonstrates adequate sensitivity and specificity (Kotelchuck, 1994). For this study, the results from both constructs were combined into a final measure of A-PNCU.
Adequacy of prenatal care utilization (A-PNCU) – operational definition. For this study, APNCU was grouped under obstetric health status and measured based on its constructs—the month of entry into PNC and the duration of PNC in days. Both of these variables were measured as continuous variables in months and days, respectively.

Type of delivery – conceptual definition. There are two main modes of giving births: vaginal and C/S. Vaginal birth is defined as the birth of a fetus through the vagina. Vaginal birth is termed either assisted (when devices like forceps or vacuums are used) or spontaneous (when no assistive devices are used; ACOG, 2014). C/S birth is defined as the delivery of a fetus from the uterus through abdominal surgical incisions (ACOG, 2014). These terms do not apply in ectopic or abdominal pregnancies (ACOG, 2014).

Type of delivery – operational definition. This variable was operationally defined as the patient’s mode of delivery, as indicated in their obstetrical profile on their medical chart. This variable was measured as a categorical data vaginal (0), or C/S (1).

Term at birth – conceptual definition. A preterm birth was defined as the birth of a fetus occurring at <37 weeks of gestation (ACOG, 2014). Term birth is defined as the birth of a fetus occurring at ≥37 weeks and 0 days of gestation, using the patients’ best estimated due date (ACOG, 2014). There are four classifications of term birth: early term (occurring 37 weeks and 0 days through 38 weeks and 6 days), full term (occurring 39 weeks and 0 days through 40 weeks and 6 days), late term (occurring 41 weeks and 0 days through 41 weeks and 6 days), and post term (occurring later than or equal to 42 weeks and 0 days; ACOG, 2014).

Term at birth – operational definition. This variable was operationally defined as patients’ term at birth, as noted on their obstetrical profile and retrieved from their
medical chart. The variable was measured categorically as term birth (0) or preterm birth (1).

**Depressive symptoms – conceptual definition.** Regarding the inquiry into psychosocial health systems, there are two types of depression that can affect pregnant and postpartum woman: PND and PPD. *Prenatal or antepartum depression* is a mood disorder that occurs during pregnancy. This biological illness is caused by the influences of pregnancy hormonal fluctuations on the brain chemistry (American Pregnancy Association [APA], 2015). Other PND triggers include genetics; stress; a history of abuse, trauma, or pregnancy loss; pregnancy complications; and relationship problems (APA, 2015). Women with depression during pregnancy may experience chronic (two weeks or more) depressive symptoms such as suicidal thoughts, anxiety, sadness, hopelessness, guilt, changes in eating and/or sleeping habits, problems with concentration, and anhedonia (APA, 2015). *Postpartum or postnatal depressive symptoms* are depressive symptoms that continue up until 12 months postpartum or with an onset during peripartum or in the four weeks following delivery. Typically occurring within two weeks of delivery, PPD can include extreme feelings of misery, tension, or gloom after labor that affect the new mother’s capacity to function, (ACOG, 2013, para. 16).

**Depressive symptoms – operational definition.** Both variables (PND and PPD) were operationally defined as any indication of prenatal or postpartum depressive symptoms—noted manually on either the PRIM Clinic Mental Health Screening form (Appendix A), the Postpartum Mental Health Screening Form (Appendix B), or electronically on CAREWare or the UMHS-EHD—based on assessments and notes by
the patient’s psychosocial healthcare providers (including the clinical psychologist, psychiatrist, and social workers). Both variables were measured categorically as no depressive symptoms (0), prenatal OR postpartum depressive symptoms present (1), or prenatal AND postpartum depressive symptoms present (2).

**Substance use – conceptual definition.** Formerly known as substance abuse, this term refers to the destructive or risky use of psychoactive substances including liquor and illegal medications (WHO, 2018).

**Substance use – operational definition.** This variable was operationally defined as patients who were noted to be substance-users—either manually on the PRIM Clinic Mental Health Screening form (Appendix A) or electronically on CAREWare or the UMHS-EHD—based on assessments and notes by the patient’s psychosocial healthcare providers (including the clinical psychologist, psychiatrist, and social workers). The variable was measured categorically as no substance use (0) or substance use (1).

**Interpersonal Level Social Determinants of Engagement**

McLeroy et al. (1988) defined the interpersonal processes and primary groups of health promotion as the “formal and informal social network and social support systems including the family, work group, and friendship networks” (p. 355). The interpersonal factors examined in the current study were relationship status, caregiver burden, and intimate partner violence.

**Relationship status – conceptual definition.** This concept is the “civil status of each individual in relation to the marriage laws or customs of the country (i.e., never married, married, widowed and not remarried, divorced and not remarried, married but legally separated, [and] de facto union” (OECD, 2017, para. 1).
**Relationship status – operational definition.** This variable was operationalized defined as patients’ self-report of their relationship status—as indicated manually on either the PRIM Clinic Mental Health Screening form (Appendix A), the Postpartum Mental Health Screening Form (Appendix B) or electronically on CAREWare or the UMHS-EHD—based on assessments and clinic notes by their healthcare providers. This variable was measured categorically (nominal data) as married and living with partner (1), single, never married, separated/divorced (2), or single and in a relationship (3).

**Caregiver burden – conceptual definition.** Caregiver burden was defined as the physical, psychological, emotional, social, and financial burden experienced by postpartum women who are caregivers for their newborns or other living children. Such burden is thought to be greater for women with more children under their care.

**Caregiver burden – operational definition.** This variable was operationalized as the number of living children under a woman’s care. Children not living with or directly cared for by the mother were excluded. This information—indicated manually on either the PRIM Clinic Mental Health Screening form (Appendix A), the Postpartum Mental Health Screening Form (Appendix B) or electronically on CAREWare or the UMHS-EHD—was based on assessments and clinic notes by their healthcare providers. This variable was measured as a continuous variable, based on the number of living children in the care of the WLWH.

**Intimate partner violence/abuse – conceptual definition.** Intimate partner violence was defined as “abusive behaviors (physical, sexual, emotional, or psychological) perpetrated by an intimate partner... against another” (Barocas, Emery, & Mills, 2016). These authors asserted that IPV is a subset of domestic violence—a broad
term that includes both IPV and family violence (among adult children, parents, adult siblings, or elderly family members). In this study, all cases of intimate partner violence and domestic violence were regarded as abuse.

**Intimate partner violence/abuse – operational definition.** This variable was operationally defined as any indication of IPV or domestic violence—noted manually on either the PRIM Clinic Mental Health Screening form (Appendix A), the Postpartum Mental Health Screening Form (Appendix B), or electronically on CAREWare or the UMHS-EHD—based on assessments and clinic notes by their healthcare providers. The variable was measured categorically, as no abuse (0) or abuse (1).

**HIV disclosure – conceptual definition.** HIV disclosure is defined as whether or not a person has revealed their positive HIV status to another person.

**HIV disclosure – operational definition.** The variable was operationally defined as patients’ self-report of HIV disclosure—as noted manually on either the PRIM Clinic Mental Health Screening form (Appendix A), the Postpartum Mental Health Screening form (Appendix B) or electronically on CAREWare or the UMHS-EHD—based on assessments and clinic notes by their healthcare providers. This variable was measured categorically as non-disclosed (0) or disclosed (1).

**Social support – conceptual definition.** This variable was defined as social relationships that have the potential to provide emotional, material, time, and cognitive resources, feedback, or guidance to an individual experiencing a specific problem (Williams, Barclay & Schmied, 2004).

**Social support – operational definition.** This variable was operationally defined as patients’ self-report of having either a strong supportive network or limited support—
as noted manually on either the PRIM Clinic Mental Health Screening form (Appendix A), the Postpartum Mental Health Screening Form (Appendix B), or electronically on CAREWare or the UMHS-EHD—based on assessments and clinic notes by their healthcare providers. The variable was measured categorically, as absence of or limited support (0) or presence of a strong supportive network (1).

**Dependent Variables**

**HIV treatment engagement – conceptual definition.** Of the various definitions of HIV treatment engagement and/or retention in the literature, the most frequently used were the proportion of missed visits, visit adherence, visit constancy, and gap in care, as well as measures by the CDC (2019e), the HHS (2012), and the HRSA HAB (2017).

**HIV treatment engagement – operational definition.** Engagement was operationalized as the number of medical appointments kept by each woman in a measuring time period, supported by a normal CD4 count and an absence of virologic failure. In this study, patients were considered engaged in the first 12 months postpartum based on the terms described below.

**Immediate postpartum engagement (PPE) – operational definition.** Each patient’s PPE was assessed at three months postpartum. This time point was chosen because of its sensitivity to postpartum disengagement, as reflected in the literature (Buchberg et al., 2015; Meade et al., 2018; Myer et al., 2012; Nassali et al., 2009). Because women were expected to have at least two of three scheduled visits by their third postpartum month at WISH, women were considered engaged if they attended at least 70% of their scheduled postpartum medical appointments in the first three months postpartum. In addition, they ought to have a normal CD4 count and an absence of
virologic failure, measured by their CD4 and VL counts at delivery. The variable was measured categorically (nominal data) as not engaged (0) or engaged (1). The following formula was used to determine PPE: \( PPE = \geq 70\% \text{ Visit Adherence} + \text{CD4} \geq 500 + \text{VL} < 200. \)

**Postpartum primary care engagement (PCE) – operational definition.** This engagement measure assesses for ongoing postpartum treatment with a primary care provider from the first three months until one year postpartum. Therefore, women were assessed for their degree of visit adherence to medical appointments scheduled with a primary HIV care provider after immediate postpartum care was completed. By the twelfth postpartum month, it is expected that women ought to have had at least two of their four scheduled medical appointments with a HIV primary care provider. Therefore, women were considered engaged if they attended at least 50% of their scheduled primary care visits, in addition to having a normal CD4 count and an absence of virologic failure, measured by their CD4 and VL counts at delivery. The variable was measured categorically (nominal data) as not engaged (0) or engaged (1). The following formula was used to determine PCE: \( PCE = \geq 50\% \text{ Visit Adherence} + \text{CD4} \geq 500 + \text{VL} < 200. \)
Table 1. Measurement of Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Levels of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Intrapersonal Level Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Sociodemographic</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Continuous (Ratio)</td>
</tr>
<tr>
<td>Income (FPL)</td>
<td>Continuous (Ratio)</td>
</tr>
<tr>
<td>Employment</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>Education</td>
<td>Categorical (Ordinal)</td>
</tr>
<tr>
<td>Health Insurance</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>Maternal HIV Status</td>
<td></td>
</tr>
<tr>
<td>Mode of Acquisition</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>Time of HIV Diagnosis</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>Viral Load</td>
<td>Categorical (Ordinal)</td>
</tr>
<tr>
<td>CD4</td>
<td>Categorical (Ordinal)</td>
</tr>
<tr>
<td>Maternal Gynecologic Health Status</td>
<td></td>
</tr>
<tr>
<td>Medical Comorbidities</td>
<td>Continuous</td>
</tr>
<tr>
<td>Maternal Obstetric Health Status</td>
<td></td>
</tr>
<tr>
<td>Adequacy of Prenatal Care Utilization</td>
<td></td>
</tr>
<tr>
<td>Gestational Month of PNC Entry</td>
<td>Continuous</td>
</tr>
<tr>
<td>Duration of PNC (days)</td>
<td>Continuous</td>
</tr>
<tr>
<td>Type at Delivery</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>Term at Birth</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>Maternal Psychosocial Health</td>
<td></td>
</tr>
<tr>
<td>Depressive Symptoms</td>
<td>Categorical (Ordinal)</td>
</tr>
<tr>
<td>Substance Use</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td><strong>Interpersonal Level Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Relationship Status</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>Caregiver Burden</td>
<td>Continuous</td>
</tr>
<tr>
<td>Abuse</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>HIV Disclosure</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>Social Support</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
</tr>
<tr>
<td>Immediate Postpartum Engagement (PPE)</td>
<td>Categorical (Nominal)</td>
</tr>
<tr>
<td>Postpartum Primary Care Engagement (PCE)</td>
<td>Categorical (Nominal)</td>
</tr>
</tbody>
</table>
Data Analysis

The data obtained from the electronic health charts was imported into the IBM Statistical Package for the Social Sciences (SPSS). Data was assessed for missing values and any discrepancies. When there were missing values, the researcher thoroughly reviewed caregiver notes (by the physician, nurse, social worker, midwife, or nurse practitioner) in the electronic health charts to obtain these values. Values that could not be obtained were estimated using the maximum likelihood estimation (MLE) method. After the data were cleaned and all discrepancies resolved, the data were analyzed for descriptive statistics including measures of central tendency and dispersion. These tasks included obtaining frequencies, percentages, range, mean, and standard deviation for each variable.

To determine if there were significant differences in means within different groups of each categorical variable (e.g., the different categories of education) in relation to the outcome variable, a t-test or chi-square test was conducted as appropriate for each independent variable. In addition, univariate and multivariate logistic or hierarchical regression was used to test the relationship between the independent and dependent variables. First, in a univariate analysis, each variable was entered into the model to examine for a significant relationship with postpartum HIV treatment engagement. The relationship between both variables (i.e., independent and outcome variables) were estimated using odds ratio, and confidence intervals, given a 5% probability of making a type 1 error. Variables found to have significant effects on postpartum HIV treatment engagement then were entered into a multivariate logistic regression model (Figure 3).
Protection of Human Subjects

This study was a secondary analysis of patient information obtained from the electronic health records of Black postpartum WLWH who received PNC at the PRIM clinic and postpartum care at the WISH clinic, both managed by the University of Miami Health System. To maintain confidentiality and anonymity, the data was de-identified, and each patient was assigned a special code. Only the researcher had access to the UMHS-EHD containing identifiable information that could be matched to the de-identified data. A new Microsoft Excel document was created to retrieve data and match de-identified information to identifiable information. This information was accessible only the researcher and was stored on a password-protected computer. Approval was obtained from University of Miami’s Institutional Review Board (IRB) to conduct the study. The dataset was downloaded into IBM SPSS Version 25.0 on a password-protected computer accessible only to the researcher.

Summary

Understanding the factors that influence postpartum engagement in HIV treatment among Black women is crucial for developing screening tools to identify these women during the prenatal and perinatal periods. Furthermore, identifying the biological, psychological, sociological, and behavioral factors for engagement specific to Black women is important for developing culturally specific interventions aimed at improving maternal child outcomes for this vulnerable population. The results of this analysis are discussed in chapter four.
Immediate Postpartum Engagement (PPE)

Postpartum Primary Care Engagement (PCE)

Figure 3. Hypothesized Model of Engagement in HIV Treatment among Black Postpartum WLWH
Chapter 4 – Results

This chapter reports findings of the quantitative analysis of secondary data obtained from both a manual and electronic review of patient’s medical files from the PRIM and WISH clinics database, CAREWare, and the UMHS-EHD. This analysis examined the social determinants of HIV treatment engagement. The proposed social determinants were divided into intrapersonal (age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health) and interpersonal factors (relationship status, abuse, caregiver burden, HIV status disclosure, and social support) based on theoretical underpinnings of the SEM (McLeroy et al., 1988). The data were analyzed using IBM SPSS® Version 25.0 (IBM Corp., 2017). This chapter begins with a description of the sample, based on the intrapersonal and interpersonal factors under study, and is followed by the hypotheses testing results. The hypotheses for research question one were tested using the chi-square test of independence (for categorical independent variables) and the t-test (for continuous independent variables) to observe group mean differences in the outcome (HIV treatment engagement). The hypotheses for research question two were tested using univariate and multivariate logistic regression to check for predictors of the outcome variable.

Description of Sample

The sample consisted of 143 women who began PNC at the PRIM clinic and transitioned to the WISH clinic. It was important that only women who transitioned to WISH from PRIM, and remained in WISH till twelve months postpartum, were included in the sample, to avoid possible attrition in the study’s cohort at twelve months.
postpartum that could have affected study findings. Therefore, data was analyzed for women who began PNC at PRIM for at least one month and continued treatment for up to one year postpartum at WISH. Of the 143 women who delivered at PRIM, 47 (32.9%) were engaged at PPE and only 35 (24.5%) were engaged at PCE.

**Intrapersonal Level Social Determinants of Engagement**

**Sociodemographic**

The sociodemographic statistics for the women in the study are presented below. There was one missing data on ethnicity and four missing data on employment.

**Immediate postpartum engagement (PPE).** Among the 47 women engaged at PPE, 51.1% were unemployed, 71.7% had a high school diploma or more, and 78.1% had health insurance. More details are presented in Table 2.

**Ongoing primary care engagement (PCE).** Similar to the PPE findings, of the 35 women engaged in treatment, 68.6% were unemployed, 74.2% had a high school diploma or more, and 74.3% had health insurance (Table 2).
Table 2. Sociodemographic Characteristics of Black Postpartum WLWH

<table>
<thead>
<tr>
<th>Sociodemographic Characteristic</th>
<th>Overall Mean (SD)</th>
<th>Not Engaged (n = 96) M(SD)</th>
<th>Engaged (n = 47) M(SD)</th>
<th>Not Engaged (n = 108) M(SD)</th>
<th>Engaged (n = 35) M(SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>29.4 (5.9)</td>
<td>29.6 (5.8)</td>
<td>29.1 (6.2)</td>
<td>29.5 (5.8)</td>
<td>29.0 (6.2)</td>
</tr>
<tr>
<td>Income (FPL [%])</td>
<td>58.9 (62.9)</td>
<td>54.9 (56.4)</td>
<td>67.2 (74.5)</td>
<td>56.1 (55.3)</td>
<td>67.7 (82.6)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>88 (61.97)</td>
<td>60 (63.15)</td>
<td>28 (59.57)</td>
<td>67 (62.62)</td>
<td>21 (60.00)</td>
</tr>
<tr>
<td>Haitian American</td>
<td>54 (38.02)</td>
<td>35 (36.84)</td>
<td>19 (40.43)</td>
<td>40 (37.38)</td>
<td>14 (40.00)</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed (UE)</td>
<td>90 (62.94)</td>
<td>66 (68.75)</td>
<td>24 (51.06)</td>
<td>66 (61.11)</td>
<td>24 (68.57)</td>
</tr>
<tr>
<td>Employed (E)</td>
<td>53 (37.06)</td>
<td>30 (31.25)</td>
<td>23 (48.94)</td>
<td>42 (38.89)</td>
<td>11 (31.43)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school (&lt; HSD)</td>
<td>40 (28.77)</td>
<td>27 (29.03)</td>
<td>13 (28.26)</td>
<td>31 (29.81)</td>
<td>9 (25.71)</td>
</tr>
<tr>
<td>High school diploma (HSD)</td>
<td>53 (38.13)</td>
<td>38 (40.86)</td>
<td>15 (32.61)</td>
<td>40 (38.46)</td>
<td>13 (37.14)</td>
</tr>
<tr>
<td>Some college or more (SC/M)</td>
<td>46 (33.09)</td>
<td>28 (30.10)</td>
<td>18 (39.13)</td>
<td>33 (31.73)</td>
<td>13 (37.14)</td>
</tr>
<tr>
<td>Health Insurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Insurance (NI)</td>
<td>32 (22.37)</td>
<td>22 (22.92)</td>
<td>10 (21.27)</td>
<td>23 (21.29)</td>
<td>9 (25.71)</td>
</tr>
<tr>
<td>Medicaid (M)</td>
<td>84 (58.74)</td>
<td>52 (54.16)</td>
<td>32 (68.08)</td>
<td>60 (55.55)</td>
<td>24 (68.57)</td>
</tr>
<tr>
<td>Private or Other (P/O)</td>
<td>27 (18.88)</td>
<td>22 (22.92)</td>
<td>5 (10.64)</td>
<td>25 (23.15)</td>
<td>2 (5.71)</td>
</tr>
</tbody>
</table>

Maternal Health Status

**Immediate postpartum engagement (PPE).** More women acquired HIV before pregnancy (66%) and most acquired it behaviorally (95.7%) compared to other means. There was a greater percentage of C/S deliveries than vaginal deliveries, and more term births (85.1%) than preterm births. HIV RNA load generally was lower at delivery than at baseline for all women. However, the counts for engaged women were lower at baseline and delivery than were those of unengaged women. In addition, engaged women had better APNCU than unengaged women, with engaged women entering PNC at 3.3 months, compared to unengaged women who started PNC at 3.9 months. This finding translated into more days of PNC utilization for engaged women (163 days) compared to...
that of unengaged women (143 days). The estimated gestational age (EGA) at delivery also differed slightly for engaged women (37.6 weeks) versus that of unengaged women (37.2 weeks). More details are presented in Table 3a-c.

**Postpartum primary care engagement (PCE).** All 35 (100%) of the engaged women acquired HIV behaviorally. More than half of these women delivered vaginally (54.3%), gave birth at term (94.3%), were diagnosed with HIV before pregnancy (65.7%), and were non-substance users (82.2%). VL generally was lower at delivery than at baseline for all women. Additionally, VL and CD4 counts were more improved for women engaged at PCE than at PPE, with engaged women having better APNCU (entering PNC at 3.3 months) compared to unengaged women (entering PNC at 3.9 months). This finding translated into more days of PNC utilization for engaged women (167 days) compared to unengaged women (143 days). The EGA at delivery also differed slightly for engaged women (37.9 weeks) versus unengaged women (37.1 weeks). More details are provided in Table 3a-c.
<table>
<thead>
<tr>
<th>Table 3a. Intrapersonal SDE for Black Postpartum WLWH – Maternal Health Status (variables measured continuously)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Maternal Health Status (HIV-related)</strong></td>
</tr>
<tr>
<td><strong>VL.BL (copies/mL)</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Overall Mean (SD)</td>
</tr>
<tr>
<td>Not Engaged (n = 96)</td>
</tr>
<tr>
<td>Engaged (n = 47)</td>
</tr>
<tr>
<td>Not Engaged (n = 108)</td>
</tr>
<tr>
<td>Engaged (n = 35)</td>
</tr>
<tr>
<td>PPE</td>
</tr>
<tr>
<td>M (SD)</td>
</tr>
<tr>
<td>22359.8 (67139.8)</td>
</tr>
<tr>
<td>884 (4827.0)</td>
</tr>
<tr>
<td>465.77 (276.3)</td>
</tr>
<tr>
<td>485.36 (271.58)</td>
</tr>
<tr>
<td><strong>Maternal Health Status (Gynecologic)</strong></td>
</tr>
<tr>
<td>Medical Comorbidities</td>
</tr>
<tr>
<td>2.49 (1.63)</td>
</tr>
<tr>
<td>2.5 (1.7)</td>
</tr>
<tr>
<td>2.5 (1.5)</td>
</tr>
<tr>
<td>2.5 (1.6)</td>
</tr>
<tr>
<td>2.6 (1.6)</td>
</tr>
<tr>
<td><strong>Maternal Health Status (Obstetrics)</strong></td>
</tr>
<tr>
<td>APNCU: Gest. Month at PNC Entry</td>
</tr>
<tr>
<td>3.72 (1.72)</td>
</tr>
<tr>
<td>3.9 (1.9)</td>
</tr>
<tr>
<td>3.3 (1.4)</td>
</tr>
<tr>
<td>3.9 (1.8)</td>
</tr>
<tr>
<td>3.3 (1.5)</td>
</tr>
<tr>
<td>PNC duration (days)</td>
</tr>
<tr>
<td>149.16 (52.28)</td>
</tr>
<tr>
<td>142.5 (56.0)</td>
</tr>
<tr>
<td>162.7 (41.0)</td>
</tr>
<tr>
<td>143.4 (53.6)</td>
</tr>
<tr>
<td>166.9 (44.0)</td>
</tr>
<tr>
<td>EGA at Delivery (weeks)</td>
</tr>
<tr>
<td>37.29 (2.10)</td>
</tr>
<tr>
<td>37.2 (2.0)</td>
</tr>
<tr>
<td>37.6 (2.2)</td>
</tr>
<tr>
<td>37.1 (2.3)</td>
</tr>
<tr>
<td>37.9 (1.0)</td>
</tr>
</tbody>
</table>
The women’s maternal health was also impaired by other medical comorbidities. These were classified as maternal gynecologic health status. The different categories of medical comorbidities in the sample can be found in Table 3c. In addition to HIV, most
women suffered other STIs and blood disorders. This was followed by cardiovascular and metabolic illnesses, with the least suffering respiratory illnesses in addition to HIV.

Table 3c. Categories of Medical Comorbidities – Maternal Health Status (Gynecologic; N=143)

<table>
<thead>
<tr>
<th>Medical Illness/Disease</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexually transmitted infections (STI)</td>
<td>95 (66.4%)</td>
</tr>
<tr>
<td>Blood disorders</td>
<td>63 (44.1%)</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>55 (38.5%)</td>
</tr>
<tr>
<td>Metabolic</td>
<td>47 (32.9%)</td>
</tr>
<tr>
<td>Uterine</td>
<td>29 (20.3%)</td>
</tr>
<tr>
<td>Endocrine</td>
<td>18 (12.6%)</td>
</tr>
<tr>
<td>Respiratory</td>
<td>16 (11.2%)</td>
</tr>
</tbody>
</table>

Interpersonal Social Determinants of Engagement

The interpersonal characteristics of the women are presented below. There was one missing data on abuse, nine missing data on HIV disclosure, and four missing data on social support.

Immediate Postpartum Engagement (PPE)

Of the 47 women engaged at three months, there were more single women who had disclosed their HIV status and self-reported having a strong supportive network. It is noteworthy that there were more details are presented in Table 4.

Ongoing Primary Care Engagement (PCE)

Of the 35 women engaged at 12 months, there were more single women who had disclosed their HIV status. More than half of the women self-reported having a strong supportive network, although at a lower percentage than PPE. More details are presented in Table 4.
### Table 4. Interpersonal Level SDE in HIV Treatment among Black Postpartum WLWH

<table>
<thead>
<tr>
<th>Interpersonal Characteristics</th>
<th>Overall Mean (SD)</th>
<th>PPE (143)</th>
<th>PCE (143)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Not Engaged (n = 96)</td>
<td>Engaged (n = 47)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M(SD)</td>
<td>M(SD)</td>
</tr>
<tr>
<td>Caregiver Burden</td>
<td>2.36 (1.35)</td>
<td>2.4 (1.3)</td>
<td>2.3 (1.4)</td>
</tr>
<tr>
<td>Relationship Status</td>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>Married/living with Partner (M+)</td>
<td>38</td>
<td>26 (27.1)</td>
<td>12 (25.5)</td>
</tr>
<tr>
<td>Single (separated/divorced; S)</td>
<td>78</td>
<td>54 (56.3)</td>
<td>24 (51.1)</td>
</tr>
<tr>
<td>Single (in a relationship; S+)</td>
<td>27</td>
<td>16 (16.7)</td>
<td>11 (23.4)</td>
</tr>
<tr>
<td>Abuse</td>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>No</td>
<td>122</td>
<td>78 (82.1)</td>
<td>44 (93.6)</td>
</tr>
<tr>
<td>Yes</td>
<td>20</td>
<td>17 (17.9)</td>
<td>3 (6.4)</td>
</tr>
<tr>
<td>HIV Disclosure</td>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>No</td>
<td>38</td>
<td>31 (33.7)</td>
<td>7 (16.7)</td>
</tr>
<tr>
<td>Yes</td>
<td>96</td>
<td>61 (66.3)</td>
<td>35 (83.3)</td>
</tr>
<tr>
<td>Social Support</td>
<td></td>
<td>N (%)</td>
<td>N (%)</td>
</tr>
<tr>
<td>Absent or Limited</td>
<td>42 (45.2)</td>
<td>16 (34.8)</td>
<td>44 (41.5)</td>
</tr>
<tr>
<td>Strong supportive network</td>
<td>51 (54.8)</td>
<td>30 (65.2)</td>
<td>62 (58.5)</td>
</tr>
</tbody>
</table>

**Hypotheses Testing**

PPE and PCE were analyzed independently of each other, meaning both outcomes were unpaired and analyzed separately. Results are presented for each of these two variables. To recap, the study’s research questions was What are the social determinants of engagement in HIV treatment among Black postpartum WLWH at the intrapersonal and interpersonal levels of the SEM? Within the context of this research question, the sub-questions described below were asked.
Research Question 1

What are the differences in the SDH at the intrapersonal and interpersonal levels of the SEM between Black postpartum WLWH engaged and unengaged in their HIV treatment?

Sub-question 1.1. What are the differences in the SDH at the intrapersonal and interpersonal levels of the SEM between Black postpartum WLWH engaged and unengaged in their HIV treatment at immediate postpartum?

Hypothesis 1.1. There are differences in the SDH at the intrapersonal (age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health) and interpersonal (relationship status, caregiver burden, abuse, HIV disclosure, and social support) levels of the SEM between Black postpartum WLWH who are engaged and unengaged in their HIV treatment at immediate postpartum.

To test this hypothesis, a chi-square homogeneity test and independent sample t-test were conducted. The chi-square homogeneity test assessed for group differences (engaged versus not engaged) in the outcome variable (PPE), for all levels of the categorical independent variables (employment, education, health insurance, maternal health, HIV-mode of acquisition, time of HIV diagnosis, type of delivery, term at birth, depressive symptoms, and substance use). The independent sample t-test examined differences in means for the continuous independent variables (age, FPL, VL at baseline, VL at delivery, CD4 at baseline, CD4 at delivery, medical comorbidities, gestational month at PNC entry, and PNC duration) across groups (engaged versus not engaged) for
the outcome variable (PPE). Prior to conducting both statistical analyses, the assumptions for both tests were checked.

**Assumptions for the independent sample t-test.** The independence of observations assumption was met, as there were no relationships among women within the engaged versus unengaged group and/or between both groups. All cases were independent of one another.

Regarding normality, skewness (S) and kurtosis (K) values and histograms were observed to check the data distribution for normality. Skewness should be within the range ±2, and kurtosis (K) within the range ±7 (Schreiber-Gregory & Henry M. Jackson Foundation [HJF], 2018). Overall, all data were normally distributed except for VL at baseline (S=5.6, K=36.4) and VL at delivery (S=7.9, K=68.3), which were skewed left and leptokurtic. Therefore, both variables were converted to categorical data and analyzed using a chi-square test of independence.

For the homogeneity of variance test, the Levene’s test for equality of variances was used to test this assumption. The focus of this hypothesis is PPE. Except for gestational month of PNC entry ($p=.041$), the values for all independent variables were not significant ($p >.05$). The appropriate t-test statistics (i.e., for equal variances not assumed) are reported for this variable, which violated this assumption.

**Assumptions for the chi-square test of independence.** According to McHugh (2013), the chi-square homogeneity test includes the six assumptions presented below. This study’s findings are presented after each assumption.

1. The data in the cells should be frequencies or counts of cases rather than percentages or some transformation. This assumption was met.
2. The levels (or categories) of the variables are mutually exclusive. Because both levels of the PPE (engaged versus unengaged), PCE (engaged versus unengaged), and all levels of the categorical independent variables were mutually exclusive, this assumption was met.

3. Each subject may contribute data to one and only one cell in the chi-square. This assumption was met, as participants contributed to only one cell at only one time point for both outcome variables (PPE and PCE).

4. The study groups must be independent and not paired. Because each group of the independent and dependent variables were independent of each other and unpaired, this assumption was met.

5. The independent and dependent variables are measured as categories, usually at the nominal level or ordinal level. This assumption was met for all the categorical independent variables included in this study and for both outcome variables (PPE and PCE).

6. The value of the cell with expected count should be five or more in at least 80% of the cells, and no cell should have an expected of less than one. For the PPE outcome, this assumption was met, as all cells had five or more counts of said category.

The results of the independent sample t-test analysis (Table 5), at the intrapersonal level social determinants of PPE, showed statistically significant differences in APNCU (PNC entry and duration) between engaged and unengaged women. Engaged women began PNC earlier at three months compared to unengaged women who on average began PNC at approximately four months, \( t(119.8) = 2.10, p = .040 \). The effect
size was small at \(d=.36\). Additionally, engaged women spent approximately 163 days in PNC compared to unengaged women who spent 143 days, \(t (120)=-2.22, p=.020\). This effect size was small at \(d=.41\).

### Table 5. Independent Sample T-Test for Immediate Postpartum Engagement (PPE)

<table>
<thead>
<tr>
<th></th>
<th>Not Engaged M(SD)</th>
<th>Engaged M(SD)</th>
<th>(t)</th>
<th>df</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intrapersonal (Individual)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sociodemographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>29.6 (5.75)</td>
<td>29.1 (6.2)</td>
<td>0.44</td>
<td>141</td>
<td>0.08</td>
</tr>
<tr>
<td>Income (FPL)</td>
<td>54.9 (56.4)</td>
<td>67.2 (74.5)</td>
<td>-1.10</td>
<td>141</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Maternal Health Status (Gynecologic)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Comorbidities</td>
<td>2.5 (1.7)</td>
<td>2.5 (1.5)</td>
<td>0.00</td>
<td>141</td>
<td>0</td>
</tr>
<tr>
<td><strong>Maternal Health Status (Obstetric)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APNCU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gest Month PNC Entry</td>
<td>3.9 (1.9)</td>
<td>3.3 (1.4)</td>
<td>2.10**</td>
<td>119.8</td>
<td>0.36</td>
</tr>
<tr>
<td>PNC Duration (days)</td>
<td>142.5 (56.0)</td>
<td>162.7 (41.0)</td>
<td>-2.22**</td>
<td>120</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Interpersonal (Relationship)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregiver Burden</td>
<td>2.4 (1.3)</td>
<td>2.3 (1.4)</td>
<td>0.63</td>
<td>141</td>
<td>0.07</td>
</tr>
</tbody>
</table>

**Sig at \(P <.05\); *Sig at \(P <.1\)

The result of the chi-square test of independence showed statistically significant differences in groups for employment, VL, CD4 count, and HIV disclosure at \(p<.05\). Of the engaged women, 24 were unemployed (51.1%) and 23 (48.9%) were employed, \(\chi^2 (1, N=143) = 4.23, p = .040\). At baseline, 29 (61.7%) women had viral load \(<200\) copies/mL and 18 (38.3%) had viral load \(\geq 200\) copies/mL, \(\chi^2 (1, N=141) = 16.34, p < .001\); while at delivery, all 47 of the engaged women had viral load \(<200\) copies/mL, and none had a viral load \(\geq 20\) copies/mL, \(\chi^2 (1, N=141) = 11.65, p = .001\). For CD4 count at baseline, 42 (89.4%) had CD4 count \(\geq 500\), and 5 (10.6%) had CD4 \(<500\), \(\chi^2 (1, N=142) = 55.67, p < .001\). All 47 of the engaged women had CD4 \(\geq 500\), and none had a CD4 \(<500\), \(\chi^2 (1, N=142) = 98.83, p < .001\). For HIV disclosure, 35 (83.3%) had disclosed their HIV status to
a significant other, family, or friends, and 7 (16.7%) had not disclosed their HIV status to anyone, $\chi^2 (1, N=134) = 4.12, p = .042$.

Therefore, in summary, the results of conducting an independent sample t-test for hypothesis 1.1 showed that there were statistically significant differences ($p < .05$) in SDH such as maternal obstetric health status (gestational age in months at PNC entry and duration of PNC) between women engaged and unengaged in their HIV treatment. The results of the chi-square test of independence for hypothesis 1.1 also showed statistically significant differences ($p < .05$) in employment, maternal HIV-related health status (VL at baseline, VL at delivery, CD4 at baseline, CD4 at delivery), and HIV disclosure between women engaged and unengaged in their HIV treatment.

**Sub-question 1.2.** What are the differences in the SDH at the intrapersonal and interpersonal levels of the SEM between Black postpartum WLWH engaged and unengaged in their HIV treatment at ongoing primary care?

**Hypothesis 1.2.** There are differences in the SDH at the intrapersonal (age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health) and interpersonal (relationship status, caregiver burden, abuse, HIV disclosure, and social support) levels of the SEM between Black postpartum WLWH engaged and unengaged in their HIV treatment at ongoing primary care.

To test this hypothesis, a chi-square test of independence and independent sample t-test were conducted. The assumptions of both tests have been enumerated and explained above. However, since this hypothesis focused on a different outcome (PCE), the assumptions needed to be reevaluated. The assumptions of independence of observations
and normality were met. Because VL at baseline and VL at delivery violated the assumptions for outliers, there were converted to categorical data and analyzed using the chi-square test of independence. For the Levene’s test for equality of variance, all values were not significant ($p>.05$) except for FPL ($p=.028$). Therefore, this assumption was met except for FPL. The appropriate t-test statistics (i.e., for equal variances not assumed) were reported for FPL, which violated this assumption. For the chi-square homogeneity test, the expected count of all cells in PCE were five or more except for the following three independent variables: mode of HIV acquisition, VL at delivery, and abuse. Because these variables violated this assumption, the Fisher’s exact test were reported.

The results of the chi-square test of independence (Table 6) for the intrapersonal level of PCE showed statistically significant differences for VL at baseline, VL at delivery, CD4 at baseline, CD4 at delivery, type of delivery, and term at birth. Of the 35 women engaged at PCE, 20 (57.1%) had viral load $<200$ copies/mL and 15 (42.9%) had viral load $\geq200$ copies/mL, $\chi^2 (1, N=141) = 7.00, p = .008$. All 35 of the engaged women had viral load $<200$ copies/mL, and none had a viral load $\geq20$ copies/mL, $\chi^2 (1, N=141) = 7.70, p = .006$. For CD4 count at baseline, 31 (88.6%) had CD4 count $\geq500$, and 4 (11.4%) had CD4 <500, $\chi^2 (1, N=142) = 35.50, p < .001$. All 35 of the engaged women had CD4 $\geq500$, and none had a CD4 <500, $\chi^2 (1, N=142) = 65.34, p < .001$. Further, 19 (54.3%) delivered vaginally, and 16 (45.7%) delivered via C/S. This difference in proportion was statistical significance $\chi^2 (1, N=143) = 5.38, p = .020$; and 2 (5.7%) women gave birth preterm, while 33 (94.3%) delivered at term. The difference in proportions was statistically significant, $\chi^2 (1, N=143) = 6.08, p = .014$. 
The results of the independent sample t-test analysis (Table 7) at the intrapersonal level social determinants of PCE showed statistically significant differences in APNCU only for PNC duration. Engaged women spent approximately 167 days in PNC compared to unengaged women who spent 143 days, \( t(141) = -2.35, p = .020 \). This effect size was moderate \( d = .5 \).

Table 6. Person Chi-Square (\( \chi^2 \)) for Immediate Postpartum Engagement and Postpartum Primary Care Engagement

<table>
<thead>
<tr>
<th></th>
<th>PPE Pearson ( \chi^2 )</th>
<th>df</th>
<th>PCE Pearson ( \chi^2 )</th>
<th>Df</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intrapersonal (Individual)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sociodemographic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment (UE, E)</td>
<td>4.23**</td>
<td>1</td>
<td>0.63</td>
<td>1</td>
</tr>
<tr>
<td>Edu (&lt;HSD, HSD, SCM)</td>
<td>1.31</td>
<td>2</td>
<td>0.40</td>
<td>2</td>
</tr>
<tr>
<td>Health Insurance (NI, M, P/O)</td>
<td>3.60</td>
<td>2</td>
<td>5.25*</td>
<td>2</td>
</tr>
<tr>
<td>Maternal Health Status (HIV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode of Acquisition (P, S, IDU)</td>
<td>3.48</td>
<td>2</td>
<td>4.04</td>
<td>2</td>
</tr>
<tr>
<td>Time of HIV Diagnosis (BP, DP)</td>
<td>0.99</td>
<td>1</td>
<td>0.71</td>
<td>1</td>
</tr>
<tr>
<td>VL_BL (&lt;200, ≥200)</td>
<td>16.34**</td>
<td>1</td>
<td>7.00**</td>
<td>1</td>
</tr>
<tr>
<td>VL_Del (&lt;200, ≥200)</td>
<td>11.65**</td>
<td>1</td>
<td>7.70**</td>
<td>1</td>
</tr>
<tr>
<td>CD4_BL (≥500, &lt;500)</td>
<td>55.67**</td>
<td>1</td>
<td>35.50**</td>
<td>1</td>
</tr>
<tr>
<td>CD4_Del (≥500, &lt;500)</td>
<td>98.83**</td>
<td>1</td>
<td>65.34**</td>
<td>1</td>
</tr>
<tr>
<td>Maternal Health Status (Obstetrics)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Delivery (V, C/S)</td>
<td>3.72*</td>
<td>1</td>
<td>5.38**</td>
<td>1</td>
</tr>
<tr>
<td>Term at Birth (PT, T)</td>
<td>1.26</td>
<td>1</td>
<td>6.08**</td>
<td>1</td>
</tr>
<tr>
<td>Maternal Health Status (Psychosocial)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressive Symp. (NDS, PND/PPD, PND+PPD)</td>
<td>1.43</td>
<td>2</td>
<td>1.91</td>
<td>2</td>
</tr>
<tr>
<td>Substance Use (no, yes)</td>
<td>1.54</td>
<td>1</td>
<td>0.04</td>
<td>1</td>
</tr>
<tr>
<td><strong>Interpersonal (Relationship)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship Status (M, S, S+)</td>
<td>0.94</td>
<td>2</td>
<td>0.78</td>
<td>2</td>
</tr>
<tr>
<td>Abuse (no, yes)</td>
<td>3.44*</td>
<td>1</td>
<td>1.17</td>
<td>1</td>
</tr>
<tr>
<td>HIV Disclosure (no, yes)</td>
<td>4.12**</td>
<td>1</td>
<td>2.97*</td>
<td>1</td>
</tr>
<tr>
<td>Social Support (Absent/limited or strong)</td>
<td>1.36</td>
<td>1</td>
<td>0.01</td>
<td>1</td>
</tr>
</tbody>
</table>

** Sig at \( p < .05 \); * Sig at \( p < .1 \)
Table 7. Independent Sample T-Test for Postpartum Primary Care Engagement (PCE)

<table>
<thead>
<tr>
<th></th>
<th>Not Engaged</th>
<th>Engaged</th>
<th>t</th>
<th>df</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intrapersonal (Individual)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sociodemographic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>29.5 (5.80)</td>
<td>29.0 (6.20)</td>
<td>0.43</td>
<td>141</td>
<td>0.08</td>
</tr>
<tr>
<td>Income (FPL)</td>
<td>56.1 (55.30)</td>
<td>67.7 (82.60)</td>
<td>-0.78</td>
<td>44.3</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>Maternal Health Status (Gynecologic)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Med Comorbidities</td>
<td>2.5 (1.60)</td>
<td>2.6 (1.60)</td>
<td>-0.34</td>
<td>141</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Maternal Health Status (Obstetric)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>APNCU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gest Month PNC Entry</td>
<td>3.9 (1.80)</td>
<td>3.3 (1.50)</td>
<td>1.76*</td>
<td>141</td>
<td>0.36</td>
</tr>
<tr>
<td>PNC duration (days)</td>
<td>143.4 (53.60)</td>
<td>166.9 (44.00)</td>
<td>-2.35**</td>
<td>141</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Interpersonal (Relationship)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caregiver Burden</td>
<td>2.4 (1.30)</td>
<td>2.2 (1.50)</td>
<td>0.79</td>
<td>141</td>
<td>0.14</td>
</tr>
</tbody>
</table>

**Sig at P <.05; *Sig at P <.1**

Therefore, in summary, the results of conducting an independent sample t-test for hypothesis 1.2 showed that there were statistically significant differences ($p<.05$) in SDH such as maternal obstetric health status (duration of PNC) between women engaged and unengaged in their HIV treatment. The results of the chi-square test of independence for hypothesis 1.2 also showed statistically significant differences ($p<.05$) in maternal HIV-related health status (VL at baseline, VL at delivery, CD4 at baseline, CD4 at delivery), and maternal obstetric health status (type of delivery, and term at birth) between women engaged and unengaged in their HIV treatment.

**Research Question 2**

What are the SDH that predict engagement in HIV treatment among Black postpartum WLWH, at the intrapersonal and interpersonal levels?
Hypothesis 2.1. The predictors of immediate PPE in HIV treatment among Black postpartum WLWH in South Florida at the intrapersonal level include age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health; and at interpersonal level include relationship status, caregiver burden, abuse, HIV disclosure, and social support.

To test this hypothesis, univariate and multivariate binomial logistic regression analyses were conducted. The assumptions of the binomial logistic regression include the presence of a dichotomous dependent variable, and one or more independent variables measures in the continuous or nominal scale; independence of observation (i.e., all levels of the independent variables and dependent variables must be mutually exclusive), linearity; and multicollinearity.

The first two assumptions were met. The two outcome variables (PPE and PCE) both were measured on binary levels as engaged or not engaged. All categories of the dependent and independent variables were mutually exclusive. The rest of the assumptions were tested as described below.

Linearity. Linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box-Tidwell (Box & Tidwell, 1962) procedure. A Bonferroni correction was applied using all 29 terms in the model, resulting in statistical significance being accepted when \( p < .0001 \) (Tabachnick & Fidell, 2014). Based on this assessment, all continuous independent variables were found to be linearly related to the logit of the dependent variable.
Multicollinearity. The multicollinearity statistic of variance inflation factor (VIF) values were used to test this assumption. All variables had values lower than five except CD4 at baseline (VIF=6.385) and CD4 at delivery (VIF=6.020). According to Field (2009), VIF values >5 are moderately high and could be problematic. To avoid errors that could be caused by including both variables in the multivariate model, they were both removed from the analysis. Also, because VL at baseline and VL at delivery measured same constructs (VL) but at different timepoints (baseline and delivery), a decision was made to remove one. The variable measured at first PNC (VL at baseline) was kept in the analysis, while VL at delivery was removed to avoid issues with multicollinearity.

Subsequently, a multivariate binomial logistic regression was performed to ascertain the effects employment, duration of PNC, VL at baseline, HIV disclosure, gestational age at PNC entry, delivery type, and abuse on PPE. The model was significant at \( p<.001 \). It explained 38.3% (Nagelkerke \( R^2 \)) of the variance in PPE and correctly classified 71.0% of cases. Sensitivity was 35.1%, specificity was 86.2%, positive predictive value was 52%, and negative predictive value was 75.8%. Of the seven predictor variables, four were statistically significant: VL at baseline, delivery type, HIV disclosure, and abuse (Table 8). Therefore, after controlling for all other predictors in the model, women with VLs at baseline of less than 200 copies/mL had six times higher odds of PPE than did women with VLs at baseline greater than 200 copies/mL. Women who had disclosed their HIV status to friends and/or family members had 3.5 times greater odds of PPE compared to women who had not disclosed their status. Women who delivered vaginally had 3.6 times greater odds of PPE than women who delivered via
C/S. Finally, women who were abused had a lower likelihood of PPE compared to women who were not abused.

### Table 8. Multivariate Logistic Regression Results for Immediate Postpartum Engagement (PPE) (N=47)

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>p</th>
<th>Odds Ratio</th>
<th>95% C.I. for Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment Status (employed)</td>
<td>.603</td>
<td>.490</td>
<td>1.519</td>
<td>1</td>
<td>.218</td>
<td>1.828</td>
<td>.700 - 4.773</td>
</tr>
<tr>
<td>PNC Duration</td>
<td>.014</td>
<td>.016</td>
<td>.845</td>
<td>1</td>
<td>.358</td>
<td>1.014</td>
<td>.984 - 1.046</td>
</tr>
<tr>
<td>VL_BL (&lt;200copies/mL)</td>
<td>1.818</td>
<td>.486</td>
<td>14.009</td>
<td>1</td>
<td>.000</td>
<td>6.157</td>
<td>2.377 - 15.948</td>
</tr>
<tr>
<td>HIV Disclosure Status (disclosed)</td>
<td>1.263</td>
<td>.641</td>
<td>3.879</td>
<td>1</td>
<td>.049</td>
<td>3.535</td>
<td>1.006 - 12.418</td>
</tr>
<tr>
<td>Abuse (abused)</td>
<td>-2.356</td>
<td>1.166</td>
<td>4.087</td>
<td>1</td>
<td>.043</td>
<td>.095</td>
<td>.010 - .931</td>
</tr>
<tr>
<td>Gest. Month PNC Entry</td>
<td>.297</td>
<td>.472</td>
<td>.395</td>
<td>1</td>
<td>.530</td>
<td>1.345</td>
<td>.533 - 3.392</td>
</tr>
<tr>
<td>Delivery Type (vaginal)</td>
<td>1.278</td>
<td>.491</td>
<td>6.778</td>
<td>1</td>
<td>.009</td>
<td>3.591</td>
<td>1.372 - 9.402</td>
</tr>
<tr>
<td>Constant</td>
<td>-6.540</td>
<td>4.157</td>
<td>2.475</td>
<td>1</td>
<td>.116</td>
<td>.001</td>
<td></td>
</tr>
</tbody>
</table>

Employment status (ref is unemployed), VL_BL (ref is VL≥200 copies/mL), HIV Disclosure Status (ref is undisclosed), Abuse (ref is no abuse), Delivery Type (ref is c/s).

In summary, to test hypothesis 2.1 and examine the SDH that predict PPE, univariate and multivariate binomial logistic regression analyses were undertaken. In the univariate analysis for PPE, results showed that employment, VL at baseline, duration of PNC, and HIV disclosure had statistically significant ($p<.05$) effects on PPE. These variables and those significant at $p<.1$ (that were found in the literature) were selected for inclusion in a multivariate logistic regression analysis. These variables were employment status, duration of PNC, VL at baseline, HIV disclosure, abuse, gestation age (in months) at entry into PNC, and delivery type. The results showed that controlling for the other
variables, VL at baseline, HIV disclosure, abuse, and delivery type remained statistically significant ($p<.05$) predictors of PPE. Figure 4 provides a pictorial representation.

**Hypothesis 2.2.** The predictors of ongoing PCE in HIV treatment among Black postpartum WLWH in South Florida at the intrapersonal level include age, income, employment, education, health insurance, adequacy of PNC, and maternal health status related to HIV health, gynecologic health, obstetric health, and psychosocial health; and at the interpersonal level include relationship status, caregiver burden, abuse, HIV disclosure, and social support.

To test this hypothesis, univariate and multivariate binomial logistic regression analyses were conducted. The assumptions of the binomial logistic regression have been tested and were reported above. Following evaluations of the assumptions discussed above, a univariate logistic regression was conducted for each variable at the interpersonal and intrapersonal levels of the SEM identified in the hypothesis. The results (Table 9) showed that at the intrapersonal level, health insurance, PNC duration, VL at baseline, type of delivery and term at birth had statistically significant relationships with PCE at $p<.05$. At the interpersonal level, no variable was statistically significant at $p<.05$. The variables significant at $p<.05$ then were included in a multivariate model.

Subsequently, a multivariate binomial logistic regression was performed to ascertain the effects of PNC duration, delivery type, term at birth, VL at baseline, and health insurance on PCE. The model was significant at $p<.001$. The model explained 35.1% (Nagelkerke $R^2$) of the variance in PCE and correctly classified 79.9% of cases. Sensitivity was 42.4%, specificity was 91.5%, positive predictive value was 60.9%, and
negative predictive value was 83.6%. Of the seven predictor variables, five were statistically significant: PNC duration, term at birth, VL at baseline, and health insurance at the second and third levels (Table 10). Therefore, after controlling for all other predictors in the model, women with baseline VL of <200 copies/mL had approximately 3.6 times higher odds of PPE than did women with a baseline VL of ≥200 copies/mL. Women who delivered at term had 11.7 times higher odds of PCE than did women who delivered preterm. Women who had private or other forms of insurance has significantly lower odds (OR=.069, \(p=.022\)) of PCE compared to women who had Medicaid. Finally, a greater number of days in PNC was associated with a greater likelihood of PCE.

In summary, univariate and multivariate binomial logistic regression analyses were undertaken to test hypothesis 2.1 and examine the SDH that predict PCE. In the univariate analysis for PCE, results showed that health insurance, VL at baseline, type of delivery, and term at birth, had statistically significant \((p<.05)\) effects on PCE. These variables were then added into a multivariate logistic regression analysis. The results showed that controlling for the other variables, PNC duration, term at birth, VL at baseline, and private/other health insurance remained statistically significant \((p<.05)\) predictors of PCE. Figure 4 provides a pictorial representation. Therefore, given the results of the analysis, the study’s research questions could be answered as described below.
Table 9. Univariate Logistic Regression Results for Social Determinants of PPE and PCE

<table>
<thead>
<tr>
<th>Intrapersonal Characteristics</th>
<th>PPE Odds Ratio</th>
<th>95% C. I for Odds ratio</th>
<th>PCE Odds Ratio</th>
<th>95% C. I for Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sociodemographic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.986</td>
<td>(.929–1.047)</td>
<td>-.014</td>
<td>(.923–1.052)</td>
</tr>
<tr>
<td>Income (FPL [%])</td>
<td>1.003</td>
<td>(.998–1.008)</td>
<td>1.003</td>
<td>(.997–1.008)</td>
</tr>
<tr>
<td>Employment Status (ref is unemployed)</td>
<td>2.108**</td>
<td>(1.030–4.316)</td>
<td>-.720</td>
<td>(.320–1.622)</td>
</tr>
<tr>
<td>Education (ref is &lt;HSD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School Diploma (HSD)</td>
<td>.820</td>
<td>(.336–2.000)</td>
<td>1.119</td>
<td>(.424–2.955)</td>
</tr>
<tr>
<td>Some College or More (SC/M)</td>
<td>1.335</td>
<td>(.549–3.245)</td>
<td>1.357</td>
<td>(.509–3.620)</td>
</tr>
<tr>
<td>Health Insurance (Medicaid)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No insurance</td>
<td>1.380</td>
<td>(.579–3.290)</td>
<td>.980</td>
<td>(.395–2.429)</td>
</tr>
<tr>
<td>Private Insurance or Other</td>
<td>.400</td>
<td>(.109–1.470)</td>
<td>.102**</td>
<td>(.012–.871)</td>
</tr>
<tr>
<td>Maternal Health Status (HIV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode of Acquisition (ref is IDU)</td>
<td>.111</td>
<td>(.007–1.776)</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Perinatal (P)</td>
<td>.157</td>
<td>(.016–1.558)</td>
<td>.337</td>
<td>(.046–2.486)</td>
</tr>
<tr>
<td>Time of HIV Diagnosis (ref is before pregnancy)</td>
<td>1.466</td>
<td>(.688–3.122)</td>
<td>1.421</td>
<td>(628–3.219)</td>
</tr>
<tr>
<td>During Pregnancy (DP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VL_ BL (ref is ≥200 copies/mL)</td>
<td>4.447**</td>
<td>(2.11–9.37)</td>
<td>2.824**</td>
<td>(1.289–6.184)</td>
</tr>
<tr>
<td>Maternal Health Status (Gynecologic)</td>
<td>1.000</td>
<td>(.807–1.239)</td>
<td>1.042</td>
<td>(.825–1.316)</td>
</tr>
<tr>
<td>Medical Comorbidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal Health Status (Obstetrics)</td>
<td>1.005*</td>
<td>(.639–1.013)</td>
<td>.795*</td>
<td>(612–1.032)</td>
</tr>
<tr>
<td>APNCU</td>
<td>1.008**</td>
<td>(1.001–1.016)</td>
<td>1.011**</td>
<td>(1.001–1.020)</td>
</tr>
<tr>
<td>Type of Delivery (ref is vaginal)</td>
<td>.498*</td>
<td>(.244–1.017)</td>
<td>.404**</td>
<td>(.186–.879)</td>
</tr>
<tr>
<td>Term at Birth (ref is preterm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Term (T)</td>
<td>1.699</td>
<td>(.668–4.321)</td>
<td>5.500**</td>
<td>(1.237–24.45)</td>
</tr>
<tr>
<td>Maternal Health Status (Psychosocial)</td>
<td>.614</td>
<td>(.266–1.414)</td>
<td>.570</td>
<td>(.222–1.464)</td>
</tr>
<tr>
<td>Depressive Symptoms (ref is no symptoms)</td>
<td>.949</td>
<td>(.397–2.265)</td>
<td>1.127</td>
<td>(.448–2.840)</td>
</tr>
<tr>
<td>PND or PPD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PND and PPD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substance Use (ref is no)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>.516</td>
<td>(.179–1.488)</td>
<td>1.108</td>
<td>(.399–3.072)</td>
</tr>
<tr>
<td>Interpersonal Characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship Status (ref is married)</td>
<td>.963</td>
<td>(.417–2.222)</td>
<td>1.187</td>
<td>(.483–2.919)</td>
</tr>
<tr>
<td>Single (never married, separated / divorced)</td>
<td>1.490</td>
<td>(.533–4.165)</td>
<td>.732</td>
<td>(.215–2.495)</td>
</tr>
<tr>
<td>Caregiver Burden</td>
<td>.919</td>
<td>(.705–1.197)</td>
<td>.888</td>
<td>(.661–1.192)</td>
</tr>
<tr>
<td>Abuse (ref is No)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>.313*</td>
<td>(.087–1.127)</td>
<td>.496</td>
<td>(0.136–1.807)</td>
</tr>
<tr>
<td>HIV Disclosure (ref is No)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2.541**</td>
<td>(1.013–6.373)</td>
<td>2.451*</td>
<td>(864–6.955)</td>
</tr>
<tr>
<td>Social Support (ref is No)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.544</td>
<td>(.743–3.209)</td>
<td>.963</td>
<td>(.437–2.124)</td>
</tr>
</tbody>
</table>

** Sig at P <.05; *Sig at P <.1
Table 10. Multivariate Logistic Regression Result for postpartum Primary Care Engagement [PCE] (N=35)

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>p</th>
<th>Odds Ratio</th>
<th>95% C.I. for Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>PNC duration</td>
<td>.012</td>
<td>.006</td>
<td>4.489</td>
<td>1</td>
<td>.034</td>
<td>1.012</td>
<td>1.001 - 1.024</td>
</tr>
<tr>
<td>Delivery Type (c/s)</td>
<td>.718</td>
<td>.463</td>
<td>2.399</td>
<td>1</td>
<td>.121</td>
<td>.488</td>
<td>.197 - 1.210</td>
</tr>
<tr>
<td>Birth Term (term birth)</td>
<td>2.464</td>
<td>1.076</td>
<td>5.244</td>
<td>1</td>
<td>.022</td>
<td>11.749</td>
<td>1.426 - 96.791</td>
</tr>
<tr>
<td>VL_BL (&lt;200copies/mL)</td>
<td>1.269</td>
<td>.468</td>
<td>7.356</td>
<td>1</td>
<td>.007</td>
<td>3.559</td>
<td>1.422 - 8.907</td>
</tr>
<tr>
<td>Health Insurance</td>
<td>5.528</td>
<td>2</td>
<td>.063</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No insurance</td>
<td>-.178</td>
<td>.540</td>
<td>.109</td>
<td>1</td>
<td>.742</td>
<td>.837</td>
<td>.290 - 2.413</td>
</tr>
<tr>
<td>Private or Other</td>
<td>-2.673</td>
<td>1.166</td>
<td>5.258</td>
<td>1</td>
<td>.022</td>
<td>.069</td>
<td>.007 - .678</td>
</tr>
<tr>
<td>Constant</td>
<td>-8.460</td>
<td>1.863</td>
<td>20.628</td>
<td>1</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
</tbody>
</table>

Employment status (ref is unemployed), VL_BL (ref is VL ≥ 200 copies/mL), HIV Disclosure Status (ref is undisclosed), Abuse (ref is no abuse), Delivery Type (ref is c/s).

**Research Question 1**

What are the social determinants of PPE in HIV treatment among Black postpartum WLWH at the intrapersonal and interpersonal levels of the SEM? Based on a univariate binomial logistic regression analysis, employment, duration of PNC, VL at baseline, and HIV disclosure status were statistically significant social determinants of PPE in HIV treatment among Black postpartum WLWH. Based on a multivariate binomial logistic regression analysis, VL at baseline, delivery type, HIV disclosure status and abuse were statistically significant social determinants of PPE in HIV treatment among Black postpartum WLWH.

**Research Question 2**

What are the social determinants of PCE in HIV treatment among Black postpartum WLWH at the intrapersonal and interpersonal levels of the SEM? Based on a univariate binomial logistic regression analysis, duration of PNC, delivery type, term at
birth, and VL at baseline were statistically significant social determinants of PCE in HIV treatment among Black postpartum WLWH. Based on a multivariate binomial logistic regression analysis, duration of PNC, term at birth, VL at baseline, and health insurance were statistically significant social determinants of PCE in HIV treatment among Black postpartum WLWH.

*Immediate Postpartum Engagement (PPE)*

*Postpartum Primary Care Engagement (PCE)*

*Figure 4. Social Determinants of Engagement in HIV Treatment among Black Postpartum WLWH*
Summary

Multiple statistical analyses were conducted to ascertain the social determinants of PPE and postpartum PCE at the intrapersonal and interpersonal levels among Black postpartum WLWH. These results are discussed in chapter five.
Chapter 5 – Discussion

This chapter discusses the findings of the quantitative analysis of data obtained from the manual and electronic review of patient charts to examine the social determinants of engagement in HIV treatment for Black postpartum WLWH. The analysis was conducted based on two outcomes of postpartum engagement: PPE for the first three months postpartum, and PCE for subsequent months leading up to the first postpartum year. Guided by McLeroy’s (1988) SEM, the following variables at the intrapersonal level were examined as proposed social determinants of engagement: age, income, employment, education, health insurance, and maternal health status. The following variables at the interpersonal level also were examined: relationship status, caregiver burden, abuse, HIV disclosure, and social support. The incidence of disengagement found in this study is compared to the incidence and prevalence of disengagement found in other studies. This information is followed by a discussion of SDH that influenced outcomes in the current study. The limitations of the study then are addressed. followed by recommendations for future nursing research, education, practice, and policy issues.

Incidence and Prevalence

Postpartum HIV treatment disengagement is a growing public health concern that has been addressed in the literature (Adams et al., 2015; Buchberg et al., 2015; Meade et al., 2018; Myer et al., 2012; Nassali et al., 2009; Rana et al., 2010). With its findings that only a portion of patients remained engaged at different timepoints postpartum, the current study significantly contributes to the growing evidence about postpartum HIV treatment disengagement. In this study, engagement was measured based on postpartum
HIV medical visit attendance, a normal CD4 and an absence of virologic failure (confirmed by patients’ CD4 and VL count).

In the current study, the rate of immediate engagement (PPE) was estimated at 24%. This rate is critically low when compared to other studies with rates ranging from 59% to 71.4% (Meade et al., 2018; Buchberg et al., 2015). This finding may be due to this study’s stringent measure of engagement, which—in addition to visit adherence—evaluated medication adherence (by measuring CD4 and VL counts), an indispensable aspect of HIV treatment engagement (Dombrowski et al., 2013; Horstmann, Brown, Islam, Buck & Agins, 2010). Additionally, this study’s finding of a 24% engagement rate further contributes to evidence that the three months postpartum mark is a critical timepoint in which a significant number of WLWH are likely to disengage from treatment (Buchberg et al., 2015; Meade et al., 2018; Nassali et al., 2009). Engagement at this critical point has been related to longer-term treatment engagement and viral suppression for postpartum WLWH (Adams et al., 2015). Therefore, this information can help inform providers in their efforts to detect problematic cases/patients at the three-month postpartum mark.

The current study’s PCE rate was 24% falls within the range of rates found in other US studies—from 61% (Siddiqui et al., 2014) to 20% (Meade et al., 2018). Despite measuring outcomes independently, the PCE rate was lower than the PPE rate. This finding is congruent with those of other studies in which researchers evaluating engagement at multiple time points found these rates to decrease as time went on (Buchberg et al., 2015; Meade et al., 2018; Myer et al., 2012). Nonetheless, the PPE and PCE rates obtained in this study both emphasize the underutilization of HIV care services.
among minority WLWH (Blackstock et al., 2015; Eastwood et al., 2015; Kempf et al., 2010; Moneyham et al., 2010; Quinlivan et al., 2013; Toth et al., 2013; Yehia et al., 2015). The barriers to these women attaining optimum engagement might be explained by the SDH discussed below.

**Social Determinants of Engagement in HIV Treatment Postpartum**

Based on McLeroy’s et al.’s (1988) SEM, the following SDH were evaluated in relation to the outcomes of this study.

**Intrapersonal Level Social Determinants of Engagement**

**Age.** Age was not a significant predictor of PPE or PCE. While unengaged women were slightly older than engaged women at both PPE and PCE, this was not a significant difference. However, it is noteworthy that the observed differences in age are contrary to most literature findings showing that younger women are more likely to disengage (Aebi-Popp et al., 2016; Phillips et al., 2015; Siddiqui et al., 2014; Watt et al., 2019; Wilcox, et al., 2016). A closer look into the data revealed a negative correlation between age and PNC duration ($r=-0.04$). Thus, older women were more likely to spend fewer days in PNC and, in this study, longer duration of PNC was a significant predictor of PCE. Although this correlation was weak, this finding is supported by another study in which early presentation to PNC was the only significant predictor of optimum follow-up at 12 months (Rana et al., 2010). Additionally, women with early presentation were significantly more likely to be non-Black and aged between 25–32 years (Rana et al., 2010). Perhaps older women have more time constraints related to work and family responsibilities, making it difficult for them to attend their medical appointments.
**Income.** In the current study, income levels were slightly higher for engaged versus unengaged women at both timepoints. Incomes also were higher for women still engaged after a longer period (i.e., PCE versus PPE). While these differences failed to reach significance, they are congruent with literature findings suggesting that higher income is associated with postpartum HIV treatment engagement (Boehme et al., 2014; Panditrao et al., 2011).

**Employment.** When controlling for other variables, employment was not predictive of PPE nor PCE. However, comparing women who were engaged versus unengaged at PPE and PCE indicated that a greater percentage of unemployed women were engaged at both PPE and PCE. Although these differences were not statistically significant, this finding is congruent with studies in the US that report employment as a barrier to HIV treatment engagement among postpartum women, due to time conflicts with work schedules (Blackstock et al., 2015; Boehme et al., 2016; Kempf et al., 2010).

In other studies evaluating possible effects of employment on engagement, the authors found unemployed women were more likely to disengage from treatment. However, these researchers associated employment with income (Bengtson et al., 2016; Nassali et al., 2009). Doing so, they suspected that barriers to engagement for unemployed women could be caused by the high cost of care, given that they may lack job-related health insurance coverage or have no income to pay for healthcare services (Bengtson et al., 2016; Nassali et al., 2009). Also, in some states (including Florida), women may take maternity leave lasting up to 12 weeks in any 12-month period under the Family and Medical Leave Act (FMLA) of 1993 (Electronic Code of Federal Regulations [ECFR], 2019). While such leave usually is unpaid, women may have
accrued some leave credits (ECFR, 2019). During maternity leave, women may experience financial difficulties that can negatively affect their treatment engagement. Such women likely could benefit from the services of a social worker or case manager. For women who are unable to take all 12 weeks of maternity leave due to financial or job restraints, providers may consider ways to offer them the best possible care despite such constraints. These ways might include arranging home visits by nurses or care provided via telehealth.

**Education.** Education was not a significant predictor of PPE or PCE in this study. However, the least engaged women at both PPE and PCE were those with less than a high school diploma, and the most engaged women at PPE were those with some college education or more. Even though the differences were not statistically significant, it appears congruent with literature findings that have associated disengagement with less than a secondary-level education (Bengtson et al., 2016; Panditrao et al., 2015). Literature findings describe the negative influences of low education level and poor knowledge on HIV health outcomes for minority WLWH, including testing and prevention strategies (Cianelli et al., 2019), and engagement in continued care after PMTCT (Panditrao et al., 2015). Therefore, efforts should be made to educate patients, nurses, and nursing students on advances in treating HIV disease, particularly for postpartum Black women. Such efforts are described in the nursing implications and recommendations section of this chapter.

**Health insurance.** This study found that, controlling for other variables and compared to women with Medicaid, women with private insurance or other forms of insurance outside Medicaid had significantly lower odds of engagement at 12 months.
However, this finding was not the case for PPE. While health insurance is generally found to influence HIV treatment engagement among minority WLWH (Moneyham et al., 2010; Toth et al., 2013; Wilcox et al., 2016; Yehia et al., 2015), the difference in its predictive value at specific timepoints postpartum (i.e., PPE and PCE) is an interesting finding in the current study. This finding could have resulted from women losing their pregnancy-related Medicaid coverage after two months postpartum and having to find other forms of health coverage (either through private insurers or other federally funded insurers). Eligible low-income pregnant women are given Medicaid coverage for the duration of their pregnancy (Ranji, Gomez, & Salganicoff, 2019). However, this pregnancy-related coverage lapses by 60 days postpartum (Ranji et al., 2019). Although Federal law requires that all states extend Medicaid eligibility to women with incomes up to 138% of FPL, not all states have adopted and implemented this expansion, including Florida (Ranji et al., 2019). Therefore, to continue care, these women must find other means of private or federally-funded public health insurance coverage outside Medicaid.

In the current study’s care settings, these women mostly are referred to the federally-funded Ryan White HIV/AIDS program or other health insurance providers for PLWH. Unfortunately, most women report experiencing difficulties with this transition. For example, some women reported having no means of transportation to the South Florida Aids Network (SFAN) office to complete their Ryan White program application. Others were unable to complete the program’s rigorous paperwork process. Some women were deterred by the slow bureaucratic process required for enrollment and the stigma associated with being seen at the site. Therefore, some of them lose interest before receiving coverage or are already lost to care and disengaged from treatment when they
are eventually approved. The 60th day postpartum lapse of Medicaid coverage roughly coincides with the three-months timepoint for PPE in the current study. Therefore, this break in pregnancy-related insurance coverage beyond 60 days postpartum could help explain the differences in the effect of health insurance on PPE and PCE between the current study and those in the literature.

Additionally, contrary to these findings, some studies reported an increased likelihood of disengagement among women with Medicaid or no insurance (Toth et al., 2013; Wilcox et al., 2016) compared to those with private insurance. One study cited Medicaid as a strong marker of financial hardship because in New York it was only provided to people whose income was insufficient to cover health needs (Wilcox et al., 2016). Therefore, the financial hardship may have affected other aspects of HIV treatment engagement despite the availability of health insurance.

**HIV-related health status.** Most women acquired HIV via sexual transmission (92%) compared to those who contracted the disease via perinatal (5%) and IDU (3%) transmission. This outcome is congruent with CDC (2018b) findings showing about 85% of women acquire HIV via heterosexual transmission. Among Black women, this number may be increased due to certain cultural practices and gendered perceptions within heterosexual intimate partner relationships (e.g., conservative cultural practices, emotional and financial dependence on partner, insubordination to males, spousal infidelity, distrust, rape, abuse, violence, and a resultant inability to negotiate condom use; Caldwell & Mathews, 2015; Quinlivan et al., 2013; Remien et al., 2010; Tufts, Clements, & Wessells, 2010; West, 2004). All of these factors might make Black women more vulnerable to HIV infection. Moreover, once exposed to HIV, this population
suffers poor treatment access and linkage (Cohen et al., 2016; Keller et al., 2017; Mugavero et al., 2009a; Woodward et al., 2015; Yehia et al., 2012), further predisposing them to suboptimal disease management. The combinations of these various risk factors might further predispose postpartum Black WLWH to HIV treatment disengagement postpartum, making them an especially vulnerable population. Nurses and other healthcare providers should be educated about these risks factors in order to pass on this knowledge to their patients. Such knowledge could help these patients manage their care more effectively.

Furthermore, the differences in HIV biomarkers between engaged and unengaged women at PPE and PCE indicate that women engaged at three months postpartum manage their HIV more effectively (in terms of their HIV biomarkers) than do women engaged at 12 months. The deterioration in their health might have been caused by attrition in engagement as time went on, a common finding in other studies (Buchberg et al., 2015; Meade et al., 2018; Myer et al., 2012).

Compared to women with VL ≥200 at baseline, women whose VL were <200 at baseline were six times more likely to be engaged at PPE. This finding is congruent with findings from other studies in which women with higher VLs were more likely to disengage from HIV treatment at baseline (Aebi-Popp et al., 2016; Buchberg et al., 2015). However, the findings for these studies were significant for engagement measured at six months (Buchberg et al. 2015) and one year (Aebi-Pope et al., 2016), and might not be comparable to these findings for the three-months postpartum mark. Nonetheless, all studies including the current one point to the fact that better virologic control encourages treatment engagement. In this study, this finding also was true for PCE. Hence, this
finding implies that either adequately managing the disease affords postpartum WLWH better health and physical strength to keep up with their treatment regimen (i.e., attending appointments, medication adherence, etc.) or they endeavored to be engaged despite failing health and the benefits of doing so encouraged them to continue treatment and remain engaged.

For the women who presented to their first PNC with VL<200 copies/mL, a plausible explanation for this finding is that because they were diagnosed before pregnancy, they also were engaged in their HIV treatment regimen before pregnancy. A closer look of this sample revealed that 83% of women who presented to their first PNC with VL<200 copies/mL were diagnosed before pregnancy, and women with such VLs had significantly higher odds of engagement at PPE and PCE. These findings highlight two important points. First, timely awareness of one’s HIV status and its subsequent linkage to and engagement in treatment promote a better HIV health status. Second, such treatment engagement habits sustained before and during pregnancy may be retained postpartum. As is evident in this study and some others (Aebi et al., 2016; Buchberg et al., 2015), women with adequate virologic control at their first PNC are more likely to be engaged postpartum. Therefore, the importance of early HIV testing, linkage to care, and retention for black postpartum WLWH should not be underestimated.

**Gynecologic health status.** Although, the disease processes of women’s comorbidities did not affect only the reproductive system, in this study, the women’s gynecologic health was measured based on the number of other physical medical comorbidities they suffered in addition to HIV which were not HIV-related or obstetric. This number ranged from one to seven for women in this study, with an approximate
mean of three. The most common comorbid conditions were hypertension and diabetes. Regarding its influence on treatment engagement, there is no consensus in the literature about the impact of medical comorbidities on HIV treatment engagement among postpartum WLWH. Some studies have reported no effect on engagement among WLWH based on a woman’s medical history or present comorbidity (Rana et al., 2010). Others studies indicate that debilitating health concerns motivate treatment-seeking tendencies and retention in care among such women (Kempf et al., 2010). In the current study, medical comorbidities had no significant effect on HIV treatment engagement at PPE or PCE. However, women engaged at PCE had slightly more medical comorbidities than did women who were not engaged. Although this difference was not statistically significant, future researchers could consider using a different approach to measuring maternal gynecologic health, including a larger sample for comparison, and providing additional information on the effect of this variable on HIV treatment engagement.

Obstetric health status. Longer duration of PNC was a significant predictor of PCE, but not PPE. Although one might expect the reverse to be true, or at least similar effects on both engagement outcomes, the literature supports findings that, regardless of the postpartum time point, adequate utilization of PNC can influence postpartum engagement in HIV treatment (Adams et al., 2015; Panditrao et al., 2011; Rana et al., 2010; Siddiqui et al., 2014; Swain et al., 2016a, 2016b). Women who received PNC for a longer period (i.e., began care earlier and stayed in care for the duration of their pregnancy) had a higher likelihood of postpartum engagement than did women with shorter PNC care periods (Adams et al., 2015; Panditrao et al., 2011; Rana et al., 2010; Siddiqui et al., 2014; Swain et al., 2016a, 2016b).
Furthermore, this study found that women who delivered vaginally were significantly more likely to be engaged in treatment than were those who delivered via C/S. The existing literature on the impact of delivery type on postpartum HIV treatment engagement indicates varied findings. While some studies report a lower likelihood of engagement with vaginal deliveries (Panditrao et al., 2011; Wilcox et al., 2016), others report lower odds with C/S deliveries (Swain et al., 2016a). It seems probable that women whose health was less compromised (in terms of medical comorbidities or injuries sustained during childbirth) had more physical strength to attend their healthcare appointments and engage in treatment. Conversely, it could be argued that sicker women wishing for better health would be more likely to attend their medical appointments and have higher odds of treatment engagement. Both explanations are plausible. Therefore, there is a need for more studies to examine this problem and provide more clarity and consensus on the pathway between delivery type and HIV treatment engagement among postpartum Black WLWH.

The third aspect of maternal obstetrics that was evaluated in connection to engagement was term at delivery. This variable failed to significantly predict PPE at three months, but it significantly predicted ongoing PCE at 12 months postpartum. These findings differ from literature findings suggesting that a greater proportion of women who delivered term babies were LTFU compared to women who delivered preterm babies (Bengtson et al., 2016). This outcome was evaluated at six months postpartum and may only partially explain these findings for PPE and PCE. One plausible hypothesis is that women with sicker babies are more likely to follow-up with their infant’s medical appointment and be LTFU on theirs, particularly if the care is provided at different
clinics. More studies are needed to examine this variable and its influence on care engagement.

**HIV treatment engagement among postpartum WLWH.** This category of maternal health evaluated the impact of depression and substance use on engagement. Among women who were engaged at PPE, there were more with no depressive symptoms than those with any or both types of depressive symptoms. A similar outcome was noted for PCE, for which there were more women with no depressive symptoms than those with any or both depressive symptoms. However, these differences were not significant. Nonetheless, depression has been shown to negatively influence HIV treatment engagement among postpartum WLWH (Buchberg et al., 2015).

Regarding substance use, there was no statistically significant effect of substance use on engagement at either PPE or PCE. However, among the engaged women, the proportion of non-substance users was greater than substance users for both PPE and PCE. While this finding was not statistically significant, it is supported by studies showing that substance use negatively influences HIV treatment engagement among postpartum WLWH (Aebi-Popp et al., 2016). Therefore, hospital administrators might consider requiring drug test screenings each trimester for pregnant women and quarterly for postpartum women through 12 months postpartum. Also, nurses should be on the alert for signs of substance use among these patients, as most likely will not willingly disclose their substance use.

**Interpersonal Level Social Determinants of Engagement**

**Relationship status.** This study did not find a significant relationship between a woman’s relationship status and postpartum engagement at three and 12 months.
However, contrary to literature findings showing that women who are married or partnered and/or living with their partner are more likely to be engaged given the availability of spousal support (Woelk et al., 2016), this study observed that a majority of women who were engaged at both PPE and PCE were single (separated/divorced). However, this finding was not statistically significance. Therefore, future studies should consider a much larger sample to examine more thoroughly the effect of relationship status on HIV treatment engagement for this population.

**Caregiver burden.** Women engaged at both PPE and PCE had slightly fewer living children in their care. Consequently, they experienced less caregiver burden compared to unengaged women. While this finding was not statistically significant, the literature provides evidence associating caregiver burden with HIV treatment disengagement postpartum (Boehme et al., 2014; Buchberg et al., 2015). In addition, this burden is thought to increase with having more children at younger ages (Boehme et al., 2014). This knowledge should prompt nurses to ask pregnant women about the number of children they have to care for and if doing so is posing an undue burden, especially regarding HIV treatment engagement. Assessing this variable among Black postpartum WLWH is particularly important given that minorities and PLWH are disproportionately affected by multiple socioeconomic problems (CDC, 2019b) that can hinder their ability to care for children. Moreover, the added stress of caring for a newborn infant (Psaros et al., 2015) can add to this burden. Nurses and nurse practitioners may be in a position to advocate for these women by referring them to support services, such as a social worker, to help them address issues related to caregiver burden. Nurses also could consider
helping these women connect to support services by providing information (e.g., pamphlets) and possibly offering to help them set up a first appointment.

**Abuse.** Abuse had a significant effect on PPE but not PCE. Women who were abused had lower odds of engagement at PPE. Intimate partner violence and abuse (IPV/A) often has been cited in the literature as hindrances to HIV treatment engagement among minority WLWH (Blackstock et al., 2015; Blank et al., 2015; Hatcher et al., 2016). However, to date there is no evidence of such findings among Black postpartum WLWH in the US. To the researcher’s knowledge, the current study presents the first of such evidence. The WHO (2011b) reported an increasing incidence and prevalence of intimate partner violence or abuse among pregnant women globally. Unfortunately, the effects of such abuse can linger and even escalate postpartum (ACOG, 2019). The consequences of abuse are categorized into fatal (homicide and suicide) and non-fatal (negative health behaviors, poor physical and mental health; WHO, 2011a) consequences. These negative health behaviors often are initiated as coping mechanisms for the stress, pain, and suffering associated with abuse (WHO, 2011a). Furthermore, women may experience delays in seeking PNC or miss appointments due to abuse-inflicted injuries (WHO, 2011a). While these findings present strong evidence about the influence of IPV/A on women’s health, more research is needed to examine the influence of IPV/A on HIV treatment engagement among postpartum WLWH. While abuse occurring PCE was not documented in this study, evidence indicates that the consequences of IPV/A during pregnancy may continue postpartum, including an increased risk of PPD and anxiety (WHO, 2011b), which can hinder engagement. However, since the consequences of abuse typically last through 12 months postpartum
(ACOG, 2013), their effect on engagement may have diminished by this time. This fact may be a possible reason abuse was detected as a significant contributor to disengagement at PPE and not PCE. Regardless, more research is needed to investigate this assumption further, as the onset of IPV/A is not bound to pregnancy and may begin at any time postpartum.

**HIV disclosure.** In this study, women who had disclosed their HIV status to a family member, or friend, had almost four times higher odds of engagement at three months postpartum than did women who had not. This finding is congruent with multiple literature findings on the positive impact of HIV disclosure on HIV treatment engagement among minority WLWH (Buchberg et al., 2015; Kempf et al., 2010). However, there is a lack research on the effects of disclosure on treatment engagement, specifically for postpartum women in the US. Most studies examining the effects of HIV disclosure on treatment engagement among postpartum WLWH were conducted in developing countries (Spangler et al., 2014; Watt et al., 2019). These findings showed that postpartum WLWH who had disclosed their HIV status had improved PMTCT care utilizations and lower likelihoods of treatment disengagement (Spangler et al., 2014; Watt et al., 2019). The current study remains the first to find a significant influence between HIV disclosure and treatment engagement among Black postpartum WLWH in US. Benefits of disclosure for the postpartum WLWH include having familial and spousal/partner support, improved medication adherence, and increased medical visit attendance (Spangler et al., 2014; Watt et al., 2019).

**Social support.** Social support is well documented as being important to the successful management of pregnancies, chronic illnesses, and HIV (Boehme et al., 2014;
Multiple studies have cited the positive impact a support system has on HIV treatment engagement among postpartum WLWH (Boehme et al., 2014; Buchberg et al., 2015). However, this variable did not significantly predict PPE nor PCE in the current study. This finding may be due to the limited variations in the measurement of social support. However, more than half of the women who were engaged reported having a strong supportive network. Future studies could evaluate this finding with a larger sample.

**Strengths and Limitation**

**Strengths**

The strengths of this study include its sample of exclusively Black postpartum WLWH. Additionally, this is the first study to examine the issue of HIV treatment engagement among Black postpartum WLWH, particularly in Miami, South Florida—the region with the highest rate of HIV infection in the nation (CDC, 2018c). Using an exclusively Black sample ensures that results are likely to be representative of the actions of Black WLWH in South Florida regarding postpartum engagement among WLWH. The results also might be generalizable to a larger population of Black postpartum WLWH in the US. Therefore, findings from the study could be used to inform the development of unique, culturally-targeted interventions for the benefit of this US population.

Another strength of this study was the cohesive nature of its engagement measure, and the inclusion of additional measures of HIV treatment engagement including medication adherence and HIV biomarkers indicative of adequate disease control. These
additional factors ensured that treatment engagement taking place outside the clinic was captured.

Finally, the study evaluated the outcome of engagement using an SDH approach from the SEM (McLeroy et al., 1988). Despite the effect social factors can have on HIV treatment engagement among postpartum WLWH, the SEM theoretical framework has not been used for any previous studies. The results of this study confirmed that social factors within the human ecosystem are capable of influencing health behaviors.

**Limitations**

Despite examining outcomes for participants seen at the clinic for over a decade (May 2009–May 2017), this study was limited by a small sample size. The small size of this sample may be due to underutilization of prenatal and special women’s health services by WLWH in the Miami, South Florida region. Additionally, although the statistically analyses needed to answer the research questions were conducted with much scrutiny and assumption evaluation, a G*power analyses (Faul, Erdfelder, Lang, & Buchner, 2007) revealed that, with a sample size of 143, the statistical power of the results are estimated at the 90th percentile. Therefore, care must be taken in interpreting and extrapolating these findings.

The retrospective study design required the researcher to rely solely on the information that was available. Patient’s self-reported information could have been affected by recall bias. Further, using a binary method of measuring some of the study variables (HIV disclosure, social support, and depressive symptoms) may have been too stringent, not allowing for variations in measuring their effects on engagement.
Nursing Implications and Research Recommendations

This study highlights important areas of concern and issues to address while confronting the problem of HIV treatment disengagement among Black postpartum WLWH. The nursing implications for future research, teaching, practice, and policy are discussed in the following sections.

Future Studies and Research

Nursing research remains at the forefront of evidence-based practice in nursing (Cullum, Ciliska, Haynes, & Marks, 2008). Addressing the issue of HIV treatment engagement for Black WLWH begins with revealing which factors predict this phenomenon. The first step in addressing this public health problem is identifying at-risk patients. Currently, there is no standardized measure of HIV treatment engagement for pregnant or postpartum WLWH. Perhaps the decreased rate of MTCT in the US (<1%, (CDC, 2019b) has obscured the gravity and impact of postpartum treatment disengagement. For a study examining the barriers and facilitators of HIV testing, treatment entry, and engagement for women of color, the researchers developed a qualitative research guide that included a list of barriers and facilitators and asked their sample to respond to it (Messer et al., 2013). While the exhaustive list provided useful information on the weight of these barriers and facilitators to engagement, no psychometric properties were obtained from its use. In an attempt to develop a measure of HIV treatment engagement for Black WLWH guided by Messer et al.’s (2013) study results, this researcher created the HIV Treatment Engagement Questionnaire (Ojukwu, 2016) for WLWH. This measure is being tested and used in an ongoing study to understand the culture of health for minority older WLWH in South Florida. The current
study provides unique information to further strengthen and adapt this measure to Black postpartum WLWH. Future studies may utilize this measure of HIV Treatment Engagement for postpartum Black WLWH to ascertain its consistency, reliability, and validity estimates. After such testing, the tool could be used by nurses in the clinical settings—for research or practice—to identify women at risk of disengagement.

To improve the representativeness of this study’s sample and therefore its generalizability to a larger population of minority women, future studies could include samples of multiple ethnicities within different minority groups and from other geographic locations. A sample that constitutes more minorities and evaluates possible differences in engagement across these minority groups would enhance knowledge and provide a better understanding of the cultural factors that influence HIV treatment engagement among minority postpartum WLWH. Cultural factors should be studied in relation to postpartum HIV treatment engagement. These could include such factors as the familismo, marianismo, and machismo cultural precepts of Hispanics/Black Hispanics (Cianelli, 2010; Cianelli et al., 2013) and the unique dynamics of heterosexual relationships within Black cultures that can predispose Black women to IPV/abuse, and negative health outcomes (Finfgeld-Connett, 2015; Tufts, Clements, & Wessells, 2010; West, 2004). Undoubtedly, the information and knowledge garnered from such studies could help researchers and clinicians adapt interventions to serve each minority group more efficiently.

Further, researchers of future studies who plan to collect data over a long time period could consider a longitudinal method that also evaluates the trajectory of this research problem and how it may have changed over the years. Such research could take
a long view of several factors and how they have affected treatment engagement over the years. These factors could include the availability of resources and/or technology to curb the problem, advances in technology and treatment strategies, and changes in healthcare professionals within a given health institution. Such information will be crucial for the development of interventions to curtail this public health concern and improve HIV treatment engagement among Black postpartum WLWH.

**Education**

Nursing education is an important vehicle for translating research into clinical practice (Cullum et al., 2008). Knowledge obtained from research must be communicated to current and future nurses in order to aid its translation. The findings from this study revealed some of the social determinants of HIV treatment engagement among Black WLWH. Translating these findings into practice first requires that nurses become aware of them. Therefore, nurses and nursing students need to be educated specifically on HIV disease pathways, modes of infection, treatment terminologies (such as the HCC, virologic failure, and low-level viremia), and treatment strategies to encourage engagement specifically among pregnant and postpartum women.

To accomplish this task at the secondary-level of education, flyers could be posted in classrooms, hallways, restrooms, and laboratories. In addition, pamphlets on the mechanisms of HIV transmission, prevention, and management could be distributed at student health fairs. At the tertiary level, the nursing school curricula could be updated to emphasize health disparities, minority health, and the SDH. Students also could benefit from educational activities (e.g., seminars, health fairs, and conferences) organized within the school system and specifically targeted at improving the health of minority
pregnant and postpartum WLWH. Objective Structured Clinical Examination (OSCE) specific to the care of minority pregnant and postpartum WLWH could be introduced to assess students’ knowledge of and competence in the care of these patients. Such a strategy is especially important for nurse midwife and women’s health nurse practitioner students whose careers would be focused on caring for such patients.

Given the significant effect HIV disclosure had on treatment engagement in this study, nursing school curricula and continuing education should include content on HIV disclosure tailored to pregnant and postpartum WLWH. Studies focused on WLWH have found that women hide their status due to a fear of discrimination (Obermeyer, Baijal, & Pegurri, 2011), including from their healthcare providers (Obermeyer et al., 2011; Paxton et al., 2005). Nurses could help encourage disclosure among their patients during the sensitive periods of pregnancy and postpartum by being empathetic to their needs and encouraging them to join support groups. Patients should be educated on the benefits of disclosure, especially its positive effects on HIV treatment engagement, as shown in this study.

This study demonstrated a significant relationship between health insurance and HIV treatment engagement at 12 months postpartum. Minority WLWH of low socio-economic status who are unable to afford health insurance either may not know about other free or reduced cost resources available to them (e.g., the Ryan White and other private health insurance programs such as Simply Healthcare). Some of the healthcare benefits provided by these insurers include support services related to transportation, feeding, home health services, and case management (HRSA HAB, 2016). Moreover, patients may not be aware that the ACA (HHS, 2010) enacted rules to provide healthcare
coverage for people regardless of any pre-existing conditions (including HIV) and prevented insurance companies from putting yearly or lifetime maximum coverage limits on such persons (Kates & Dawson, 2017). To advocate for their patients, nurses and nursing students first should educating themselves on the health policies and insurance plans and resources available to their patients, so they in turn can educate their patients about these options.

**Practice and Policy**

In addition to educating themselves, nurses must apply their new knowledge in order to effect change. As was seen in this study, women who endorsed abuse were less likely to engage in treatment at three months postpartum. This fact is disturbing, as it not only shows the prevalence of abuse at the delicate time periods of pregnancy and immediate postpartum, but it also highlights its negative influence the new mother’s ability to work towards optimum health. The evidence from the literature (Green, 2017; Finfgeld-Connett, 2015; Tufts et al., 2010; West, 2004) and the current study confirm that intimate partner violence and abuse negatively impacts the health of Black WLWH. Nurses should remain cognizant of this phenomenon and assess for the physical signs of abuse among pregnant and/or postpartum Black WLWH. Research has found that certain physical signs of intimate partner violence or abuse—such as headaches and gastrointestinal problems—often are overlooked by healthcare providers (Tufts et al., 2010). Therefore, nurses should be cognizant of these uncommon signs of abuse, as these women also might present with gastrointestinal symptoms as a side effect of antiretrovirals, which might mask gastrointestinal problems from abuse (such as a blow to the stomach).
Research findings indicate that Black women who are abused are reluctant to report their abusers because they have negative preconceived notions of the legal system (Finfgeld-Connett, 2015) or feel racially profiled/discriminated by it (West, 2004). Nurses can help support women by dispelling commonly held notions that abuse is a common trend among the Black population, or a “Black crime.” Rather than instill fear by threatening prosecution for their partners, nurses and the healthcare system should assess for IPV/A from a standpoint of intervention. Such assessments should be a part of routine checks for all patients, regardless of race or ethnicity, which are included in all steps of the HCC for these women (Tufts et al., 2010). In her qualitative study, Finfgeld-Connett (2015) found that abused Black women prefer Afrocentric healing services, due to a perceived cultural or spiritual connection to the healer. When such services are not available, they often believe creating bonds with the non-Afrocentric source may help foster their healing. In light of this, it might be assumed that Black WLWH may prefer to speak about their abuse to Black healthcare providers (including nurses; Finfgeld-Connett, 2015). This finding highlights the importance of having diversity, empathy, cultural-humility, and cultural-sensitivity in healthcare systems.

In addition to the unique cultural dynamics of heterosexual relationships that can predispose Black women to HIV treatment disengagement, poor socioeconomic status (insufficient income, employment) as was seen in the current study, can hinder access to HIV services. In one study which provided free HIV services to postpartum women recorded a maximum follow-up rate of 64 months with only 26.9% LTFU (Asiimwe, Kanyesigye, Bwana, Okello, & Muyindike, 2016). This rate of attrition is impressive given that the characteristics that predicted patients being LTFU were congruent with
advanced HIV stage and possibly death (Asiimwe et al., 2016). Therefore, healthcare policies could be adapted to include free services for pregnant and postpartum WLWH up to one year postpartum at least. Such free clinics could greatly benefit Black WLWH, especially those with low SES who are unable to afford medical coverage, and have no health insurance. Patients unable to attend appointments at these clinics could benefit from a home visit by a designated nurse. To reduce the costs associated with home visits, institutional policies must enforce a thorough scrutiny of patient case files to ensure that such services are warranted.

The results of this study showed that patients who were relatively healthy (low VL), had a low-risk delivery (vaginal, and term births), and had adequate PNC utilization were more likely to engage in treatment. Therefore, it is important for nurses in birthing clinics for WLWH to assess HIV biomarkers of patients who present to their first PNC. Research has shown that most WLWH only seek care when they feel sick or are pregnant (Aziz & Smith, 2017; Messer et al., 2013), and are usually found to have AIDS at the time of diagnosis (CDC, 2018b). This fact strengthens claims that women presenting to PNC with very high VLs and poor CD4 counts may be treatment returnees or individuals unaware of their acute infection and soon to be diagnosed with their current pregnancy. These patients need to be followed closely due to their history of non-compliance. For those whose first PNC revealed their HIV status, they also must be watched closely as such news and the need for illness management may be very daunting and possibly deter treatment engagement. Nurses may intervene by linking such patients to care immediately and encouraging them to remain in treatment for their health and that of their fetuses.
HIV disclosure also was found to significantly affect engagement in this study. Therefore, it is important for nurses to inquire about their patients’ HIV disclosure status and address possible hindrances to it such as the threat of stigma, feelings of shame, and possible discrimination (Obermeyer et al., 2011). Nurses can provide support by educating patients on the benefits of disclosure (Black & Miles, 2002; Obermeyer et al., 2011), offering to assist them in the disclosure process (through a nurse-facilitated disclosure intervention), and by encouraging them to join support groups. In the nurse-facilitated disclosure intervention, nurses help these women by facilitating a therapeutic discussion between them and their spouse or significant other, during which time the nurse discloses the patient’s HIV status to other person while remaining present to provide support and answer any questions that arise. Research on postpartum WLWH showed that more women disclosed their status to partners and family members when they were offered a nurse-facilitated disclosure approach, and the reactions from partners and friends mostly were positive (Geubbels et al., 2018). Also, the use of peer counsellors has been found to encourage disclosure among PLWH (Obermeyer et al., 2011). This approach also can be applied in prenatal and postpartum clinics, as the peer counselor is a female who has gone through pregnancy while living with HIV. The peer counselor’s role is to educate patients on the benefits of disclosure and support them in disclosing. Clinic nurses also may help facilitate encounters between patients and these peer counselors.

Furthermore, patients often report experiencing anxiety when sitting in HIV clinic waiting areas, due to their fear of being recognized by outsiders. Institutional policies might include avoiding the acronym (HIV) when referring to these clinics as well as
when speaking to patients in waiting areas. Issues regarding privacy, confidentiality, and HIPAA laws should be tightened within these organizations. Also, institutional policies could include disciplinary measures to prevent discrimination among PLWH from healthcare providers.

**Summary**

Despite advances in research and HIV treatment strategies, women, particularly postpartum minorities, continue to have suboptimal rates of HIV treatment engagement and inadequate viral suppression. This may be because, located at the core of intersectionality, Black WLWH are a highly disadvantaged group. Several factors put this population at risk of HIV infection and hinder their access to care and treatment retention. These factors include the complexities of being part of a racially disadvantaged group, societally-based gender inequalities (Gramlich, 2017), and gender roles in heterosexual relationships (conservative cultural practices, emotional and financial dependence on partner, insubordination to males, spousal infidelity, and rape; Quinlivan et al., 2013; Remien et al., 2010).

This study’s results highlighted the fact that HIV treatment disengagement among Black postpartum WLWH is a serious public health problem. The study contributed valuable evidence on the underutilization of HIV care services among Black postpartum WLWH, and the social and ecological factors that can further impede their care. Such factors evaluated in this study included health insurance; maternal obstetric, gynecologic, and HIV-health status; intimate partner violence or abuse; and HIV disclosure.

This study also highlighted the fact that even as early as three months postpartum, a large proportion of Black women already are disengaged from their HIV treatment.
This rate continues to decline as time passes. The rates obtained in this study were particularly alarming, as they were much lower than those observed in the literature. Therefore, these findings support a call for aggressive interventions to reduce this public health problem in the State of Florida and throughout the country.

To accomplish this task, efforts must be made to manage this disease more effectively among postpartum Black WLWH. Additionally, nurses, who spend a significant amount of their time in direct patient care (Kakushi & Evora, 2014), have major roles to play by assessing patients who might be at risk of disengagement and intervening promptly based on this study’s recommendations. The rates of engagement found in this study highlight the amount of work that needs to be done to reach the UNAID 2020 goals for HIV disease management among all PLWH: a 90% awareness rate (diagnosis), a 90% rate of care receipt and retention, and 90% rate of viral suppression (UNAID, 2014). Therefore, providers need to ensure that Black WLWH are engaging in their HIV treatment postpartum, including showing adequate compliance to treatment regimens and medication adherence beyond the four walls of their clinic.
References


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Appendix A

PRIM Clinic - Mental Health Screening Form

Patient Name: ________________________________ Date: ________________
JMH: __________________ Language (please circle): English Spanish Creole

Pregnancy Status: # of weeks: # of children/ages:

Marital status: Intimate relationship: Social support system: Partner HIV status:
[ ] single, never married [ ] not currently in relationship [ ] supportive network [ ] Positive dx
[ ] engaged ___ months [ ] currently in a serious relationship [ ] limited support [ ] Negative
dx
[ ] married for ___ years [ ] open relationship with partner [ ] supportive network [ ] Unknown
[ ] divorced for ___ years [ ] live-in for ___ years [ ] N/A

HIV Disclosure: ______________________________________________________

Living with: Years of Education.

Employment status: Source of income:

History of Presenting Illness:
________________________________________________________

Previous Psychiatric History:
Outpatient History: oyes ONO If yes, Where

When

Inpatient History oyes ONO If yes, Where

When

Past suicide attempts: oYes ONO; If yes, explain:

EtOH/Dugs: oYes oNo If yes, explain:

Perceived Stress: How much stress do you believe you've been under in the last 6 months? o Low o Med o High
Stressor (s):

Coping: When you experience stressful events, what do you usually do?

- Active coping
- Planning
- Suppression of competing activities
- Restraining coping
- Seeking social support-instrumental
- Seeking social support-emotional
- Positive reinterpretation and growth
- Acceptance
- Turning to religion
- Focus on and venting of emotions
- Alcohol-drug disengagement
- Mental disengagement
- Behavioral disengagement
- Denial
- Humor
- Restraining coping
- Focus on and venting of emotions
- Humor
- Seeking social support-emotional
- Alcohol-drug disengagement
- Substance use

HIV Diagnosis Information:

First diagnosed at: ____________________  Transmission Risk:

- Perinatal  
- Sexual Assault
- Transfusion/Receipt of blood products  
- Heterosexual contact
- Sex with drug user  
- Intravenous drug use  
- Occupational
- Unknown  

Other ________________________________

CD4 ____________ VL ____________ Date: ____________ (Refer to Cerner)

Other Medical Conditions:

List Medications:

Adherence:

People often miss taking their medicines, for a whole range of reasons. Thinking Of the last 7 days:

A) HOW MUCH of each medicine have you MISSED taking in the last 7 DAYS? ____________

If patient has missed any:

Here are examples of reasons other people have given for missing medicines. THINKING OF THE MEDICINE YOU MISSED IN THE LAST 7 DAYS, which of the following statements best describe what happened (you can choose more than one option)?

- I decided not to take it  (Reason. if any given: ____________________________)
- I forgot to take it
- I was unable to take it

Other (please specify):
Family History:
Psychiatric Illness Yes ONO; If yes, explain:

EtOH/Drug Use O Yes ONO: If yes, explain: Suicide Yes ONO; If yes, explain:

Results of Mental Health Screen:
Negative
Positive For:
- Depression
- Panic
- Anxiety
- Abuse
- PTSD

PTSD/HIV
Substance Abuse
Cognition
Psychosis

Provisional DSM V OX Evaluation:

Recommendations:

☐ F/U by psychology for behavioral intervention on:
☐ Therapy at THP: Scheduled on:
☐ Substance Abuse Tx: Referred to:
☐ Completed Psychiatric Evaluation or F/U Onsite: Prescribed:
☐ Referred to In-network Provider for F/U:
☐ No further txt warranted at this time. F/U screen within a year.

Other:

Clinician

Supervisor
Appendix B

Post-Partum Mental Health Screening

Patient Name: ___________________________ Date: ______________.

JMH: __________ Language (please circle): English Spanish Creole

The information below serves as an update to the initial screen conducted on ___________

Post-partum: _____ weeks # of children/ages______________

Marital status:

[ ] single, never married
[ ] engaged ___ months
[ ] married for ___ years
[ ] divorced for ___ years
[ ] separated for ___ years
[ ] live-in for ___ years

Intimate relationship:

[ ] not currently in relationship
[ ] currently in a serious relationship
[ ] open relationship with partner

Social support system

[ ] supportive network
[ ] limited support
[ ] supportive network

Partner HIV status:

[ ] Positive dx
[ ] Negative
[ ] Unknown
[ ] N/A

Last unprotected sexual encounter with partner (HIV+ or unknown status):

__________________________________

HIV Disclosure:

__________________________________

Living with:

__________________________________

Overall adjustment to newborn at home:

__________________________________

Presenting Concerns;

__________________________________

Perceived Stress: How mech stress do you believe you’ve been under in, the last 6 months?

[ ] Low
[ ] Med
[ ] High

Stressor(s):
Coping: When you experience stressful events, what do you usually do?

- Active coping
- Planning
- Suppression of competing activities
- Restraining coping
- Seeking social support-instrumental
- Seeking social support-emotional
- Positive reinterpretation and growth
- Acceptance
- Turning to religion
- Focus on and venting of emotions
- Mental disengagement
- Behavioral disengagement
- Denial
- Humor
- Alcohol-drug disengagement
- Substance use

PDSS Results:
Normal
Significant Symptoms of Post-partum Depression
Positive for Major Post-partum Depression

Provisional DSM V DX Evaluation:

Recommendations:

Other
- [ ] F/U by psychology for behavioral intervention on:
- [ ] Therapy at THP: Scheduled on:
- [ ] Substance Abuse Tx: Referred to
- [ ] Completed Psychiatric Evaluation or F/U Onsite: Prescribed:
- [ ] Referred to In-network Provider for F/U:
- [ ] No further txt warranted at this time. F/U screen within a year.

Clinician: ___________________________  Supervisor: ___________________________