3-20-2014

Maternal-Fetal Attachment and Health Behaviors among Women with HIV/AIDS

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MATERNAL-FETAL ATTACHMENT AND HEALTH BEHAVIORS AMONG WOMEN WITH HIV/AIDS

A dissertation submitted in partial fulfillment of

the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

SOCIAL WELFARE

by

Julieta P. Hernandez

2014

To: Dean Michele Ciccazzo
R.Stempel College of Public Health and Social Work

This dissertation, written by Julieta P. Hernandez, and entitled Maternal-Fetal Attachment and Health Behaviors among Women with HIV/AIDS, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

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Date of Defense: March 20, 2014

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DEDICATION

To my parents who nurtured me believing in myself and caring for others: Remigio and Julieta Penagos. Your lives ended but your legacy is alive.

To my unconditionally supportive husband, the love of my life, my strength: Miguel. We share this achievement. To our wonderful children, who brightened the journey with humor and kept me a real mom: Andrea and Armando.

To the resilient mothers and infants who participated in the dissertation study.

ACKNOWLEDGMENTS

I am grateful to my main professor, Dr. David Cohen for his steady guidance, dedication and support. His mentorship enhanced the confidence on my abilities for scholarly work and firmed up my passion for social work research. I thank my spectacular committee members, Dr. Miriam Potocky, Dr. Mark Macgowan, Dr. Consuelo Beck-Sague, and Dr. Ana Garcia for generously sharing their expert knowledge and enthusiastically supporting my efforts to complete this dissertation. The many lessons I learned from them and the relationships we developed will influence my personal and career life forever. I thank the faculty members and staff in the doctoral program that played a role in achieving this meaningful personal and academic milestone. I would like to acknowledge Ms. Angeline Low and Dr. Jiabin Zhu from FIU University Graduate School statistical consulting services for the competent statistical guidance.

This dissertation would not have been possible without the support from the Florida Education Fund McKnight family, Dr. Lawrence Morehouse, Mr. Charles Jackson, faculty, staff and fellows. Your generous financial, educational and emotional support is greatly appreciated. A special mention goes to Dr. Vernetta Williams, Dr. Sylvia Holladay, and Dr. Elizabeth Metzger for their patience in helping me sharpen my scholarly writing. The lessons I learned from Dr. Marvin Dawkins and Dr. Mohsen Milani during the Summer Institutes on becoming an excellent researcher were invaluable. The support and friendship from other McKnight fellows meant a lot to me.

I would like to thank the nuclear and extended family members who helped me pursue this degree and complete this dissertation. My husband, Miguel for taking over the responsibilities of the household and caring for the family while I studied for several

years. My children, Andrea and Armando, supported my decision to go back to graduate school and maturely respected the long academic journey until the end. My sister, Nancy and her adult children Aldo, Veronica, Claudia and Loretta allowed me to temporarily exit the family life, yet kept me grounded in our loving relationships for support and refueling of energy. I thank my extended family in Lima–Peru for the long distance encouragement.

I am very appreciative to my mentors, colleagues and supporters in the University of Miami. Dr. Armstrong and Dr. Morgan embraced my doctoral education from beginning to end. Dr. Gwendolyn Scott and Dr. Potter opened the doors of their clinics to my research study. I learned so much from Dr. Yasin, Dr. Ana Garcia, and their respective clinical teams! Michelle-Ann Rhoden, my former graduate student, helped me with data preparation activities. I could have not completed the doctoral program and the research study without your generous initial endorsement and ongoing support!

I thank my dear friends and colleagues from Lima– Peru, New York, and Miami for cheering me all the way through this long journey. I thank my friends and fellow or former doctoral students for inspiring and supporting me to persist until completion: Adi, John, Julie, Dr. Mariana, Dr. Beverly, Dr. Bora, Dr. Sheila, Sherry, Cherelle, and Dr. Juliette G.

ABSTRACT OF THE DISSERTATION

MATERNAL-FETAL ATTACHMENT AND HEALTH BEHAVIORS

AMONG WOMEN WITH HIV/AIDS

by

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Background: Mothers with HIV often face personal and environmental risks for poor maternal health behaviors and infant neglect, even when HIV transmission to the infant was prevented. Maternal-fetal attachment (MFA), the pre-birth relationship of a woman with her fetus, may be the precursor to maternal caregiving. Using the strengths perspective in social work, which embeds MFA within a socio-ecological conceptual framework, it is hypothesized that high levels of maternal-fetal attachment may protect mothers and infants against poor maternal health behaviors. Objective: To assess whether MFA together with history of substance use, living marital status, planned pregnancy status, and timing of HIV diagnosis predict three desirable maternal health behaviors (pregnancy care, adherence to prenatal antiretroviral therapy–ART, and infant's screening clinic care) among pregnant women with HIV/AIDS. Method: Prospective observation and hypothesis-testing multivariate analyses. Over 17 consecutive months, all eligible English- or Spanish-speaking pregnant women with HIV (n = 110) were approached in the principal obstetric and screening clinics in Miami-Dade County, Florida at ≥ 24 weeks' gestation; 82 agreed to enroll. During three data collection periods from enrollment until 16 weeks after childbirth (range: 16 to 32 weeks), participants reported on socio-demographic and predictor variables, MFA, and pregnancy care. Measures of adherence to ART

and infant care were extracted from medical records. Findings: Sociodemographic, pregnancy, and HIV disease characteristics in this sample suggest changes in the makeup of HIV-infected pregnant women parallel to the evolution of the HIV epidemic in the USA over the past two decades. The MFA model predicted maternal health behaviors for pregnancy care (R^2 = .37), with MFA, marital living status, and planned pregnancy status independently contributing (β = .50, β = .28, β = .23, respectively). It did not predict adherence to ART medication or infant care. Relevance: These findings provide the first focused evidence of the protective role of MFA against poor maternal health behaviors among pregnant women with HIV, in the presence of adverse life circumstances. Social desirability biases in some self-report measures may limit the findings. Suggestions are made for orienting future inquiry on maternal health behaviors during childbirth toward relationship and protection.

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CHAPTER I: INTRODUCTION

Research Problem

Few studies have examined what facilitates desirable health behaviors among pregnant women with HIV, such as caring for oneself during pregnancy or caring for one's infant after giving birth. Findings from these studies suggest that the developing emotional relationship between the pregnant woman and her fetus, called maternal-fetal attachment (MFA) in the present study, may motivate women to practice optimal maternal health behaviors (D'Auria et al., 2006; Mellins et al., 2008). This suggestion, however, has not been empirically tested, and the present study does so.

Over the last decade, authors have discussed and researched disruptions in the caregiving role of HIV-infected mothers, and the impact of mothers' HIV disease on the emotions and behavior of their school-aged children (Fair, 2006; Hough et al, 2003; Murphy et al., 2006; Murphy et al., 2011; Rotherum-Borus et al., 2001). In contrast, difficulties related to early infant caregiving among these mothers are less understood. The field of infant mental health offers conceptual tools to understand why early caring relationships and safe family environments before and after childbirth result in optimal socio-emotional development of infants exposed to HIV (Shonkoff & Phillips, 2000). The importance of maternal-fetal attachment, postulated as a pre-birth mother-infant relation, lies in its potential for promoting optimal maternal health behaviors during pregnancy and after childbirth, including the reduction of omissions in infant medical care.

The present study integrates findings from the recent literature on pregnant women with HIV/AIDS, child maltreatment, infant mental health, and pregnancy. From an ecological analytical framework (Bronfenbrenner, 1979) and a strengths-based approach to women living difficult circumstances (Saleebey, 1992, 2006), this study examines directly the link between maternal-fetal attachment and health behaviors among pregnant women with HIV. It posits that high levels of maternal-fetal attachment will be associated, in the period surrounding birth, with more desirable pregnancy-related, HIV-related, and infant-related maternal health behaviors. In addition, maternal-fetal attachment together with history of illicit substance use, marital partner status, planned pregnancy status and HIV diagnosis before or during pregnancy, will predict these desirable maternal health behaviors. To test these hypotheses, data are gathered using a prospective observational study and linear relationships between the variables are estimated in regression equations.

If HIV-infected women with a high level of attachment to their fetus are more likely to treat their chronic illness, nurture their pregnant body, and protect their infants from HIV infection exacerbated by non- or lesser adherence with prenatal antiretroviral therapy and from other adverse outcomes, then practitioners could explore the possibility of enhancement of these mothers' and children's wellbeing by enhancing maternal-fetal attachment or addressing unresolved issues related to the development of this prenatal relationship.

Significance of the Study

Among the estimated 1.1 million persons living with HIV in the U.S. by the end of 2010, 280,000 (24%) were women; 60% Black, 19% Hispanic/Latina, and 18% White.

That year women accounted for 20% of new infections (The Kaiser Family Foundation, 2013). For the first time since 2008, new HIV infection among women decreased significantly by 21%; however, Black and Hispanic/Latina women accounted for 64% and 15% of new infections, while representing only 13% and 16% of the US female population, respectively (The Kaiser Family Foundation, 2013). Moreover, HIV incidence rates are 20 (38.1 per 100,000) and 4 (8.0 per 100,000) times higher for Black and Hispanic/ Latina women, respectively, compared to White women (1.9 per 100,000; Kates et al., 2013).

The effectiveness of currently used combined ART to achieve HIV suppression means that women with HIV are living longer and healthier lives (Kates et al., 2013). Moreover, prenatal ART is associated with a mother-to-child HIV transmission rate of less than 2% today, compared to 25% in untreated women (Thorne, 2005; Whitmore et al., 2011). The success in preventing mother to child transmission in the U.S. has undoubtedly strengthened HIV-infected women's desire for childbearing and their perception of this disease as manageable and not precluding procreation (Lindau et al., 2005). An increasing number of women are more likely to become pregnant, continue a pregnancy, or have multiple pregnancies after their HIV diagnosis than in previous years (Blair et al., 2004; Firth et al., 2012). Yet despite improved treatments, timely utilization of health care remains problematic among women diagnosed with HIV/AIDS; indeed, the continuum of care from diagnosis to viral suppression shows a dramatic "treatment cascade," from 85% of the estimated 280,000 seropositive women receiving a diagnosis in 2010, to only 26% of them achieving viral suppression (Kates et al., 2013).

Approximately 76% of new HIV infections in women occur in the childbearing years, between the ages of 13 and 44; in recent surveys, over a third of women living with HIV/AIDS identified themselves as parents (39%) and/or caregivers (52%; Murphy et al., 2002; Kates et al., 2013). Whitmore et al. (2009) estimated that in 2006 the number of births to all women living with HIV in the U.S. was between 8,650 and 8,900. Even though less than 2% of infants are infected at birth in mothers who receive ART in the U.S., maternal adherence to ART regimens and related clinical services (i.e., adherence to clinic visits for HIV viral load measures), prenatal care visits, and follow-up pediatric visits for testing of the HIV-exposed infant vary across individuals.

The variation in women's ability to practice prescribed maternal health behaviors goes beyond individual awareness of HIV status and personal coping strategies to the diagnosis or disease, and relates to specific demographic, psychological and social characteristics (Firth et al., 2012; Riley et al., 2011). For example; U.S.-born HIV-infected women living in Rhode Island tend to have two or less prenatal care visits, and higher likelihood of child protection agency involvement with their children, compared to those foreign-born. Conversely, women born outside the U.S. often experience language, educational and economic difficulties in obtaining prenatal care (Firth et al.). Firth et al.'s findings about the changing face of HIV during pregnancy in the U.S. alert health social workers to assess personal and contextual barriers and facilitators in adherence to existing protocols to prevent the transmission of HIV from mother to child. The present study explored whether variations in maternal-fetal attachment modified by history of pre-pregnancy drug use, marital relationship status, planned pregnancy status and timing of

HIV diagnosis predict variations in HIV-, pregnancy-, or infant-related maternal health behaviors.

Regardless of HIV status, timely and adequate prenatal care offers women the opportunity to reduce the risk of poor pregnancy outcomes such as low birth weight and pre-term birth, and to promote maternal health. Additionally, for pregnant women with HIV, prenatal care may help to prevent mother-to-child HIV transmission and to encourage their adherence to ART. Poor prenatal care highly compromises the health of the HIV-exposed unborn child. As a result, in child welfare laws in many states (Dubowitz, 2002; US Department of Health and Human Services, 2011, Wolf et al., 2001), poor attendance to postnatal HIV screening infant care visits is considered a form of medical child neglect. In turn, medical child neglect is considered among the most common type of child maltreatment, according to conceptual definitions (English et al., 2005).

This study is significant for three reasons. First, adjusting the research lens on maternal health behavior in pregnancy from a deficit to a strengths-perspective (Saleebey, 1992) may broaden explanations for facilitators of maternal health behaviors beyond the facilitators conventionally observable in medical settings, to include the under-recognized abilities of women manifested in maternal-fetal attachment. Second, by assessing prenatal and postnatal maternal health behaviors in relation to maternal-fetal attachment, this study may add to the knowledge on ecological models of resilience in pregnancy and birth. Third, this research may uncover uncharted opportunities to promote positive maternal health behaviors and prevent child maltreatment (i.e. infant medical neglect), which could alter these families' life trajectories long before childhood or adolescence.

Overall, strengths-framed research (Saleebey, 1992) among HIV-infected pregnant women has been scarce yet appears necessary as the treatment-impacted course of HIV/AIDS no longer dooms a mother to very early death. The strengths perspective is used here within a larger socio-ecological conceptual framework of pregnancy, childbirth and early child development, where maternal-fetal attachment is embedded in a multilayered socio-economic milieu (Bronfenbrenner, 1979; Dunkel Schetter et al., 2011). Based on the literature, personal, familial and socio-cultural conditions assessed in this study include the following self-reported variables: history of drug use, number of life births, partner cohabitation, planned or unplanned pregnancy, timing of HIV diagnosis, housing, educational level, income, and race/ethnicity. This study may contribute to a better conceptual definition of maternal resilience in pregnancy and birth; it may advance the design of interventions aiming to promote positive maternal health behaviors and prevent infant medical neglect by strengthening prenatal attachments among mothers and infants affected by HIV/AIDS.

CHAPTER II: LITERATURE REVIEW

Maternal Health Behaviors among Pregnant Women with HIV/AIDS

Coping with HIV/AIDS and pregnancy. Pregnant women living with HIV face the double task of coping with stressors associated to different stages of pregnancy, and HIV disease progression (Abatemarco et al., 2008; Ethier et al., 2002). Pregnancy may have varying effects on these women, relative to the timing of the HIV diagnosis and other factors in the life of each woman. Pregnancy may expose some to new stressors, while serving to "inoculate" others from the stressors; or the same woman may have mixed reactions at once or throughout the pregnancy (Gil & Loh, 2010; Jenkins & Coons, 1996). For example, a woman living with HIV who becomes pregnant may feel discouraged by the added burden of reproductive health-related concerns or judgment from family and friends. She may delay seeking prenatal care. Or, she could optimistically embrace the pregnancy, appraising it as a positive life-affirming event that prompts her to adhere to her medication regimen in order to improve her health and protect her fetus (Ivanova et al., 2012; McIntosh & Roselli, 2012). On the one hand, for the women who acquired HIV at birth and grew up with this disease, pregnancy is only one more struggle in the lifelong set of personal, developmental, medical and social struggles to survive HIV/AIDS (Millery et al., 2012; Badell & Lindsay, 2012). On the other hand, a woman who receives the HIV diagnosis during pregnancy may react to the traumatic news with shock, anger and fear of dying. Simultaneously, the prospect of a new life may provide her with hope, optimism and motivation to live. The concerns to protect the unborn child from the threat of HIV may strengthen her determination to stay healthy and survive, or it may distract her from dealing with this devastating diagnosis

(Kelly et al., 2012). The wide range of reactions of the newly HIV diagnosed women in the context of pregnancy may include fear of dying, and concern for the welfare of the fetus, mixed with a renewed sense of self-worth and self-confidence in the maternal role. After learning about her HIV diagnosis, a woman may decrease or increase her adherence to antiretroviral medication, or may deteriorate or strengthen her emotional health, depending on her coping strategies (Njie-Carr et al., 2013). Regardless of timing of the HIV diagnosis, the positive reframing of the pregnancy, in the face of multiple stressors, may predict enhanced psychological health, and positive health among women living with HIV/AIDS (McIntosh & Roselli).

Notwithstanding the sociocultural differences among cohorts of HIV-infected women around the world, international studies have observed similar findings on the diverse and evolving emotional or behavioral reactions of women who simultaneously face HIV and pregnancy, further helping to understand the coping behaviors of women diagnosed during pregnancy. Pereira and Canavarro (2012) found that pregnancy in the presence of HIV infection intensifies negative (e.g., fear, guilt, sadness) and positive (e.g., happiness) emotionality. Pregnancy itself and the later arrival of the infant may buffer against the negative effects of HIV infection on the woman's emotional health; or for the newly diagnosed, the negative impact may delay timely access into prenatal care (Tariq et al. 2012). However, three months postpartum, Kotze et al. (2013) observed the fading of the beneficial effect of pregnancy and motherhood on the active coping behaviors (e.g. maternal medication adherence or follow up with pediatric clinic visits for the infant) in 224 South African women diagnosed with HIV during pregnancy. Six months after diagnosis, the women reported an increased use of avoidant coping

behaviors (Kotze et al.); and six months after delivery, 57.5 % of 300 South African women testing positive to HIV during pregnancy discontinued care (Clouse et al., 2013).

Furthermore, the woman's ability to manage a complicated disease and its prescribed treatment (i.e. maternal health behaviors indicated for either pregnancy and/or HIV disease) may be further compromised by environmental and societal macro-structural challenges beyond her control. These include delayed diagnosis, poor access to care and ART, competing priorities related to the woman's caregiver role and social location, HIV-related stigma, drug use, poverty, intimate partner violence, lack of social support, low educational attainment, and psychological distress (Kates et al., 2013; Lachat et al., 2006; Watkins-Hayes et al., 2012). Individual coping with an HIV diagnosis in the presence of pregnancy is embedded in an array of psychosocial variables and macro-structural forces, any of which could, in turn, influence coping positively or negatively (Kotze et al., 2013). After birth, even if transmission has been prevented, these mother-infant dyads continue coping with the same or exacerbated family and environmental conditions that led to poor maternal health behaviors during pregnancy, now leading to disruptions in the mother-infant relationship, or even, possibly infant medical or other forms of child neglect. For example, some of these new mothers may struggle with symptoms of depression and/or anxiety while caring for their new infant. Simultaneously, they may count on few protective factors or resilience resources (such as a wide network of family and friends) to counterbalance their emotional distress, promote the use of optimal maternal health behaviors and protect their infants from neglect (Dunkel Schetter, 2011; Landy & Menna, 2006; Oswalt & Biasini, 2012; Warner et al., 2003). Furthermore, mothers who attend mental health or drug use services may reduce

their emotional distress and perhaps alleviate their addiction; however, these interventions may not be enough to effectively optimize their caregiving behaviors and prevent child neglect. Infants born to HIV-infected women with high rates of substance use problems and psychological distress could be more likely to be neglected (Oswalt & Biasini). The disproportionate number of minority, low-income women diagnosed with HIV, the social isolation frequently resulting from HIV-stigma, and the incidence of domestic violence related to partner disclosure of their HIV status place these mothers and their infants in situations with a high potential for disruptions in caregiving, and/or higher risk for child maltreatment (Machtinger et al., 2012; Oswalt & Biasini).

Antiretroviral adherence. HIV-infected pregnant women have reported higher rates of adherence across different types of ART regimens during pregnancy compared to the postpartum period (Bardeguez et al., 2008; D'Auria et al., 2006; Ickovics et al., 2002; Kreitchman et al., 2012; Nachega et al., 2012). None of these national and international surveys of pregnant women with HIV/AIDS measured the relationship between maternal-fetal attachment and ART adherence. Nonetheless, they reported that the health of the fetus, the desire to protect the fetus from their own infection, and the motivation to prevent mother-to-child transmission were the primary reasons women offered to account for their better adherence during pregnancy, compared to the period after childbirth (Ekama et al., 2012; Mellins et al., 2008; Michel et al., 2012; Nachega et al.). Similar themes, such as getting tested and adhering to ART medication early in pregnancy to protect the health of the fetus and/or proactively guard the women's own health, clearly emerge among the findings of two, one national another international, qualitative studies (Kelly et al., 2012; Njie-Carr et al., 2012). The explanations and themes expressed by

HIV-infected pregnant women participating in these studies closely allude to their experience of maternal-fetal attachment. Kelly et al. (2012) indicate that the themes of "motherhood" and "hopes for the new life of the unborn child" become a source for optimism and motivation to practice optimal maternal health behaviors, in the context of adversity. The present study used maternal-fetal attachment to conceptualize these themes and tested the hypothesized facilitative influence of maternal-fetal attachment on maternal health behaviors, before and after childbirth, in this population.

Adherence to ART among pregnant women diagnosed with HIV/AIDS has been extensively researched in the U.S. Demas et al. (2005) found a positive association between progressive gestational age and short-term adherence among a subset of 78 HIV-infected pregnant women participants of the New York City Perinatal HIV Transmission Collaborative Study. Mellins et al. (2008) and Bardeguez et al. (2008) found that advanced HIV status, higher viral load, more overall health- related symptoms, and alcohol, tobacco or marijuana use were positively associated with medication non-adherence; or negatively associated with "perfect adherence." Bardeguez et al. observed that "never missing prenatal vitamins" was the only factor significantly associated with perfect adherence to ART in pregnancy. This finding suggests that adherence to prenatal care may permeate or parallel ART adherence. Laine et al. (2000) found that young, minority and urban HIV-infected pregnant women had greater risk for poor ART adherence. Previous research reported mixed findings on whether initiating ART during or before pregnancy contributes to better medication adherence (Bardeguez et al.; Laine et al.).

Additional contextual psychosocial risk factors and macro-structural forces contributing to problematic ART adherence among women living with HIV/AIDS include: advanced HIV disease, use/history of illegal drugs, homelessness, decreased number of prenatal visits, mental health problems, avoidant coping, intimate partner violence, less disclosure of maternal HIV status to children, increased parenting stress, and single parenthood (Kates et al., 2013; Mellins 2008; Sandelowski 2009; Watkins-Hayes et al., 2012). For example, the language, educational, and economic difficulties of the foreign-born HIV-infected women of Rhode Island compromise their ability to adhere with prescribed medication regimens and prenatal or postnatal follow up visits (Firth et al. 2012). Riley et al. (2011) found that among the population of unstably housed HIV-infected women in San Francisco, California, unmet subsistence needs most strongly influenced their mental and gynecological health, relegating ART adherence to a lesser priority.

Substance use. The prevalence of substance abuse pre- and during pregnancy among HIV-infected women is high enough to indicate concern for its effect on the women's health, health behaviors and overall wellbeing (Bardaguez et al., 2008; Ethier et al., 2002). Mothers with history of drug use diagnosis, compared to those without this history, reported stronger effect of avoidant coping on psychological distress, and employed larger support networks as a means of coping (Burns et al., 2008). However, women with a history of drug abuse did not benefit as much from the increased social support, as did those without this history (Burns et al., 2008). Mellins et al. (2002) found that a diagnosis of psychiatric or substance abuse disorders and parenting stress strongly correlated with ART non-adherence in a cohort of HIV-infected mothers living in a U.S.

inner-city setting. Those mothers who reported a diagnosed psychiatric or substance use disorder, negative stressful events, more household members, and parenting stress struggled with long-term adherence issues; they missed either taking their medications and/or attending their medical appointments (Mellins et al., 2003). Additionally, in the long-term, baseline substance abuse diagnosis and lack of disclosure of their HIV status to family were associated with missed pills and missed medical appointments, respectively (Mellins et al., 2003). In the population of unstably housed HIV-infected women, drug use has the most empirical influence on their physical health, rather than the most influential factors of income, race, and education among the general population in the U.S. (Riley et al., 2011).

Social support. In contrast to the studies reviewed earlier, which examined risk factors or macro-structural barriers for medication adherence, research examining social support, mostly defined as active coping, has led to the identification of protective factors against poor health practices among the population of pregnant women: disclosure of HIV status to women's mothers, participation in support groups, and greater perceived availability of social support (Demas et al., 2005). Less disclosure of their HIV diagnosis to the children and single parent status correlated with missing medical appointments among HIV-infected mothers (Mellins et al., 2003).

The social support that a woman receives during pregnancy may facilitate access to prenatal care and promote adherence with HIV treatment regimens (Demas et al., 2005; Dunkel-Schetter, et al., 2001). This conclusion is consistent with research findings on social support in the pregnancy literature; specifically, the support a pregnant woman receives from the infant's father most effectively lessens stress, anxiety and depression,

and promotes better utilization of prenatal care (Dunkel-Schetter et al., 2001). The women carefully choose to disclose their HIV status to those family members or friends who will offer support and suppress disclosure when they fear some form of retribution, including partner violence and withdrawal of emotional or financial support (Njie-Carr et al., 2013).

Napravick et al. (2000) found lack of support along with unplanned pregnancy, poverty, periodic homelessness, addiction to illicit substances, perceptions of the health care system as threatening, and HIV-related mental health problems (e.g., self-reported depression and isolation) as the most important barriers to access prenatal care. Conversely, support from health professionals along with the availability of treatment emerged as the most prominent facilitating factor (Napravick et al.).

Qualitative studies conducted in Kenya and Brazil on women coping with a diagnosis of HIV during pregnancy and after childbirth identified that strong, multi-level social support networks (e.g. intrapersonal, interpersonal, community, and health care system) facilitated the women's ability to overcome recurrent episodes of depression, or bring their infants to the pediatric HIV care clinic (Jerome et al., 2012; Wachira et al., 2013).

Summary. In sum, research on the health behaviors of pregnant women with HIV/AIDS in the U.S. has emphasized barriers to ART adherence, while neglecting contributors to prenatal self-care during pregnancy and infant care after delivery. Most quantitative and qualitative studies on pregnant women with HIV/AIDS emphasize risks for adverse pregnancy outcomes related to non-adherence to HIV ART, especially the risk of mother-to-child transmission of HIV infection. In contrast, few studies examine

adherence facilitators reported by HIV-infected pregnant women, such as adequate prenatal care, appraisal of the pregnancy as a "life transforming event," support from her sexual partner, and concerns about the fetus' or newborn's welfare. For example, Mellins et al. (2008) found that women were more likely to attribute their baby's state of health to their better ART during pregnancy than post-partum. D'Auria et al. (2006) noted that "the infant is an important source of support and hope for mothers with HIV infection, often becoming their reason to live and take better care of themselves" (p. 16). Researchers generally emphasize risk factors over protective factors—the latter limited to accessing prenatal care and adhering to ART regimens.

Maternal-Fetal Attachment in Women with HIV/AIDS

Ethier et al. (2002) measured levels of maternal-fetal attachment among HIV-infected pregnant women when they evaluated the implementation of Public Health Service guidelines regarding the prevention of perinatal HIV transmission, and assessed the psychosocial consequences of HIV infection among pregnant women. They observed that HIV-infected women scored significantly higher than their uninfected pregnant peers on the Maternal-Fetal Attachment Scale (MFAS; Cranley, 1981), and were more likely to report having been actively trying to prevent a pregnancy. Ethier et al. opined that although the HIV diagnosis preoccupied these pregnant women in terms of transmission, it might also give them extra motivation to practice safe sex and deepen attachment to their fetuses.

The unique relevance of maternal-fetal attachment. Whereas accessing adequate prenatal care and other specialty HIV, mental-health and/or substance abuse treatment may reduce the risk to the dyad of adverse pregnancy outcomes (e.g., low birth

weight, premature birth); it may not shield women and infants against poor maternal health behaviors and suboptimal infant care. Here, nurturing mother-infant relationship and skillful parenting count among the protective factors when the risk for child maltreatment is high (Counts et al., 2010; Warner et al., 2003). Maternal-fetal attachment describes "the extent to which women engages in behaviors that represent an affiliation and interaction with their unborn child" (Cranley, 1981, p. 282). Protection is also conceived as the overpowering emotion in maternal-fetal attachment: the fetus is perceived as belonging exclusively to the women, dependent on her for life itself (Sandbrook, & Adamson-Macedo, 2003). Thus, the protective attributes of caregiving towards the infant may stem from a strong maternal-fetal attachment (Counts et al.). As conceptualized in this study, maternal fetal attachment simultaneously relates to maternal caregiving and attachment relationships. It emphasizes that maternal caregiving and mother-infant attachment begin when the child is only a fetus (Ahern & Ruland, 2003; Smith, 2010).

The expression "maternal-fetal attachment" was coined by Cranley (1981) who created the Maternal-Fetal Attachment scale (MFAS) to measure this prenatal relationship. However, the concept has been used for decades in nursing research to describe this connection between a pregnant woman and her unborn child. For example, Rubin's (1967) research on the maternal developmental tasks of pregnancy includes the woman binding to her unknown child and learning to give of herself. Indeed, the original MFAS subscales correspond theoretically to Rubin's theory of maternal role attainment, measuring (a) differentiation of self from fetus, (b) interaction with fetus, (c) attributions of characteristics and intentions to the fetus, (d) giving of self and (e) maternal role taking

(Ahern & Ruland, 2003). Five items in the MFAS "address maternal behaviors ensuring the welfare of the developing fetus" (Grace, 1989, p. 231). Arguably, the maternal-fetal attachment is an adult attachment unique to pregnant women.

Bowlby and Ainsworth's attachment theory describes the mother-infant attachment relationship as instinctual, and organized by the infant's need for proximity to a caregiver who will provide ongoing safety and protection (Bowlby, 1969; Bretherton, 1992). Maternal-fetal attachment describes a unique adult attachment during pregnancy in which any maternal instinct or disposition to protect the fetus may promote behavioral changes to ensure a favorable intrauterine environment and eradicate threats to fetal wellbeing (Lewis, 2008; Sandbrook, & Adamson-Macedo, 2003). Maternal-fetal attachment is seen in this study as a prenatal protective relationship, most likely unfolding since the beginning of pregnancy, the possible precursor of maternal caregiving towards the end of pregnancy (Solomon & George, 1996).

In sum, the concept of maternal-fetal attachment examined in combination with HIV-infected pregnant women's health behaviors introduces an innovative relational, developmental approach to the study of the HIV-affected mother-infant dyad in its very beginning, and of available protective factors against poor maternal health behaviors and infant neglect in this population. This approach highlights maternal-fetal relationship as the predecessor of mother-infant attachment. Maternal-fetal attachment may be an already existing protective factor for these multi-risk mother-infant dyads that can be used to prevent child maltreatment (Shonkoff & Phillips, 2000). The socio-ecological and strengths-based approach of child development in this study explores the potential *protective* role of maternal-fetal attachment for mother-infant dyads coping with

HIV/AIDS, whose attachments are disrupted by this chronic illness and multiple other environmental risks. Maternal-fetal attachment also expands the inquiry on maternal health behaviors to the mother-infant *relationship*. Protection and relationship underscore the importance of the child's early years to shape future development.

Theoretical Link Between Maternal-Fetal Attachment and Health Behaviors

While theoretically linked, empirical tests of the interaction between maternal-fetal attachment and maternal health behaviors in populations other than women with HIV, or in homogeneous or low-risk samples, provide mixed results (Van den Bergh & Simons, 2009). Variations in measures of maternal-fetal attachment or maternal health behaviors, definitions of key concepts, timing of assessments during pregnancy, and number or type of predictor variables may explain the inconsistencies. Lindgren (2001, 2003) assessed that high levels of maternal-fetal attachment were associated with increased participation in high-quality health practices among low-risk, middle- aged pregnant woman. In contrast, other studies have found positive associations between maternal-fetal attachment and smoking and use of cocaine/heroin during pregnancy (Van den Bergh & Simons). Yet, four comprehensive reviews on maternal-fetal attachment (Alhussen, 2008; Cannella, 2005; Laxton-Kane & Slade, 2002; Van den Bergh & Simons) identify the relationship between this prenatal relationship and health practices during pregnancy as a critical knowledge gap and recommend exploring this association among vulnerable and culturally diverse populations of pregnant women.

As influential as maternal-fetal attachment may be on HIV-infected women's health behaviors, this prenatal attachment is expected to be influenced by the woman's family, community, and larger socio-ecological environment (Bronfenbrenner, 1979).

Among uninfected, predominantly white pregnant women, Lindgren (2001) found that higher levels of education, less children, and living with a partner predicted more high-quality health practices. Furthermore, the finding that lower levels of depression and higher levels of maternal-fetal attachment were significant predictors of positive health practices seems to support the argument of the present study. Lastly, Lindgren (2003) observed the association between high level of maternal-fetal attachment and better health practices only for participants from the inner city, not for those from small urban communities. Relevant to this study, Lindgren (2003) suggests that for inner city residents "strong maternal-fetal attachment… may be a powerful motivator, enabling her to overcome barriers to positive health practices" (p. 318).

Balance in risk and protection. The child maltreatment literature identifies several maternal and environmental risk factors among mother-newborn dyads during the perinatal period, which broadly comprises a year before and 18 to 24 months after the birth of a child (Hefner, 1987). Two major population studies concur on key risk variables in this developmental stage: infants whose mothers smoked during pregnancy, were unmarried, Medicaid beneficiaries, and had two or more children were more likely to be maltreated, as per definition of abuse and neglect in public child protective services records from Florida and Georgia states (Wu et al., 2004; Zhou et al., 2006).

More specific to this study, Nair et al (1997) examined risk factors for early disruption in primary caregiving among a cohort of drug using mothers in the Baltimore area. They found that infants of younger mothers who were heroin users, had two or more children, had other children in foster care, and reported depressive symptoms were more deprived of ongoing primary care than their population average (Nair et al., 1997).

Remarkably, several of the risk factors for infant maltreatment identified in these three studies coexist among HIV-infected pregnant women.

Research on what protects infants from maltreatment in relatively higher-risk contexts, though less prolific, is equally compelling. Most of it has investigated early care, education, and home-visitation programs that embrace the guidelines of the Strengthening Families Initiative work of the Center for the Study of Social Policy (Counts et al., 2010). McLeod and Nelson's (2000) meta-analysis reviewed 56 programs designed to promote family wellness and prevent child maltreatment. Proactive programs begin prenatally, at birth, or during early infancy, while reactive programs usually begin when the child enters school. The findings suggest that interventions with an empowerment, strength-based approach have superior results; the earlier the intervention the better; and proactive programs may trigger family life trajectories that break downward spirals of child maltreatment (McLeod & Nelson, 2000).

Additionally, Counts et al. (2010) identified five malleable protective factors against child maltreatment commonly addressed in these prevention programs (a) family functioning, (b) emotional support, (c) concrete support, (d) nurturing and attachment, and (d) knowledge of parenting and child development. Specific to the prevention of child neglect, DePanfilis & Dubowitz (2005) assessed promising outcomes for the Family Connections program to prevent child neglect by helping families maximize parenting attitudes, sense of competence, family functioning and social support (i.e., protective factors), and decrease caregiver depressive symptoms, parenting stress and everyday stress (i.e., risk factors). Maternal-fetal attachment—the immediately available relationship developing during pregnancy—may constitute an unexplored protective

factor against poor post-natal maternal health behaviors leading to infant medical neglect in the lives of HIV-infected women.

Clinical advances in the treatment of HIV mean that one should now look beyond reducing adverse pregnancy outcomes, to enhancing maternal wellbeing and promoting wholesome attachments and nurturing home environments. As HIV-affected families adapt successfully to both a new infant and a chronic illness, they can be expected to create "upward" spiral trajectories, free of disrupted caregiving, enhanced by desirable maternal health behaviors, strong attachments and competent caregiving. Yet, researchers are only starting to examine the optimal long-term mother-infant interaction trajectories for these families; unfortunately they focus only on maternal risk factors which may result in suboptimal infant outcomes, neglecting to study protective factors during this salient developmental stage (Oswalt & Biasini, 2010). Researchers must study the protective effects resulting from these women's maternal bonding during the perinatal period, which may balance well known risk factors.

Building an ecological model of infant neglect. Child neglect is the most commonly reported and substantiated type of child maltreatment, yet criteria to define it remain controversial (English et al., 2005). Legal definitions of child neglect emphasize specific parental omissions in adequate care and observable harm or risk for harm. Alternatively, English et al. conceptualize child neglect as the impact of omissions in caregiving on age-specific basic developmental needs of infants, toddlers and preschoolers (p. 194). English et al.'s developmental child-centered definition aligns with an ecological definition of child maltreatment and the theoretical framework employed in this study. In this model of child neglect, infants who lack nurturance and protection are

vulnerable to disturbances in attachment and future impaired social interactions; and parental blame for omissions in care is replaced by the consideration of individual, family, community and societal risk and protective circumstances that influence parental caregiving and contribute to reduce the risk of child neglect (Dubowitz et al., 1993).

Theoretical Framework of this Study

The intersection of pregnancy and HIV, two major life events, challenges women to respond with defeat or transformed adaptive abilities to either or both (Jones, 2008; Saleebey, 1992). HIV diagnosis *per se* is not associated with poor maternal attachment or disrupted self-care; rather, severe illness (AIDS), poverty, substance abuse, emotional distress or the lack of supports converge in the lives of HIV-affected families to place them at increased risk for poor maternal health behaviors and infant neglect (Fair, 2006; Long, 2009). Access to prenatal care and available social support from the pregnant women's mother and marital partner may counterbalance vulnerability and protect against risks.

Socio-ecological theory underscores the influence of social contexts on human development as surrounding adults in different family or community roles interact with the HIV-infected mother and her infant (Bronfenbrenner, 1992, cited in Olds et al., 1997). This approach views pregnancy and childbirth as an opportune time to prevent multiple adverse maternal, child, and family outcomes, including child maltreatment (Olds et al., 1997). For example, home visiting programs for low-income first time pregnant women and parents of young children emphasize parental development and parenting behaviors as the primary focus of the preventive intervention (Olds et al., 1997). They address risk and protective factors within the evolving mother-infant relationship and the multiple

contexts in which the family functions. Of particular relevance to this study, they highlight parents' health- and caregiving-behaviors as the most powerful and potentially alterable influence on developing infants (MacLeod & Nelson, 2000).

In the larger macro-structural context, pregnant women with HIV/AIDS are assumed to have control over the prenatal environment (i.e., maternal-fetal attachment, maternal health behaviors), the direct interaction with their infant postnatally (i.e., mother-infant attachment and caregiving behaviors), and to contribute to the home environment (Olds et al., 1997). However, the additional burden they bear in coping with a chronic and stigmatizing disease within their families and communities hinders their ability to exercise such control effectively (Watkins-Hayes et al., 2012). The biospychosocial model of maternal stress processes in pregnancy (Dunkel Schetter et al., 2011) conceptualizes maternal health behaviors within the continuum of psychosocial risk and resilience specific to pregnancy, and also points to current knowledge gaps in building models of resilience for pregnancy and birth (Dunkel Schetter et al., 2011).

Protection in maternal-fetal attachment and maternal health behaviors. The logic connecting the perinatal period with protection for the mother-infant dyad starts with framing at once maternal-fetal attachment, maternal health behaviors, and optimal infant care within a socio-ecological model of child development (Bronfenbrenner, 1979; English et al. 2005; Shonkoff & Phillips, 2000). In this framework, the prevention of something negative (less protective maternal health behaviors and sub-optimal infant outcomes) requires the prior enhancement of something positive (strong maternal-fetal and mother-infant attachments; Helfer, 1987). Enhanced maternal-fetal attachment and strengthen mother-infant relationship may help prevent less protective maternal health

behaviors, including disruptions in care for the physical health and safety, emotional security, and social integration of infants (English et al.; Helfer).

Protection of the fetus is the core emotion and altruistic function in several definitions of maternal-fetal attachment as a relational construct that marks the beginning of the mother-child relationship (Sandbrook & Adamson-Macedo, 2003; Yarcheski et al., 2009). According to this reasoning, as pregnant women transform into mothers, they shift from seeking to be protected (attachment behavioral system) to striving to protect the infant (caregiving behavioral system) (Solomon & George, 1996). In this prenatal relationship, a protective "instinct" motivates changes in the mother's health behaviors to secure a nourishing intrauterine environment, reducing threats to the unborn child's wellbeing. Thus, theoretically, during the perinatal period, maternal-fetal attachment blends with known protective factors against infant neglect: adequate prenatal care, nurturing parental attachment behaviors, and responsively sensitive parenting (Shonkoff & Phillips, 2000).

To delay disease progression in the mother and prevent mother-to-fetus HIV transmission, these women must receive concurrent prenatal and HIV care, including physical examinations and laboratory monitoring (Lachat et al., 2006). Nonetheless, research reveals inconsistent and problematic health behaviors in pregnant women with HIV, especially during the postnatal period when the family, medical and community attention extant in the prenatal period has ceased or diminished (Bardeguez et al., 2008; Ickovics et al., 2002; Wood et al., 2004). An unsteady transition to the postnatal stage places the HIV-infected mother at risk for postpartum depression, HIV-related

posttraumatic stress, domestic violence or relapse in substance abuse, all of which disrupt the parental caregiving role and mother-infant relationship.

Conversely, research findings on pregnant women living with HIV/AIDS reveal that they adhere better to medication, are less depressed, and function at a higher level than HIV-infected women who are not pregnant (Bardeguez et al., 2008; Mellins et al., 2008; Swartz et al., 1998). When compared to their uninfected counterparts, they report significantly lower rates of recent and current use of hard drugs, higher levels of MFA, and safer sex practices after childbirth (Ethier et al., 2002; Smith et al., 2001). Pregnancy affords a woman the opportunity to reappraise pre-pregnancy and HIV-related stressors and practice more adaptive coping, possibly explaining the apparent advantages for HIV-infected pregnant women. Alternatively, for them pregnancy may demand different coping responses, which in turn positively impact coping outcomes (i.e., health behaviors). The proposed study examines the protective influence maternal-fetal attachment may exert on HIV-, pregnancy-, and infant-related health behaviors among pregnant women living with HIV/AIDS. The desire to protect their fetuses from the threat of transmission might motivate these women to improve ART adherence specifically, and pregnancy-related health behaviors generally (Ciambrone et al., 2007; Mellins et al., 2008).

Definitions of Key Constructs Used in this Study

Maternal-fetal attachment (MFA). This construct defines the affectionate relationship that pregnant women develop for their unborn child, manifested through behaviors, thoughts and feelings showing care and commitment to the fetus. The woman's ability to see her fetus by ultrasonographic techniques and to perceive fetal

movement (i.e., "quickening"), in the second trimester of pregnancy (i.e., 14 to 27 weeks), deepens maternal-fetal attachment (Cohen & Slade, 2000; Canella, 2005). This prenatal attachment therefore appears as a key developmental task in pregnancy and the transition to motherhood. The pregnant woman evolves to see herself as someone who can nurture and comfort her child and provide a secure base for her child (Cohen & Slade; Laxton-Kane, 2002). Conceptually, maternal-fetal attachment includes: a) the desire to know the unborn child, b) the pleasure related to interactions with the unborn child, and c) the desire to protect the fetus (Yarcheski et al., 2009). An HIV-infected pregnant woman may derive pleasure from interacting with her unborn child, may wish to know it and may protect it by staying healthy.

Social work researchers Lewis (2008) and Feldman (2007) extend the study of maternal-fetal attachment to different high-risk populations of poor and ethnically diverse women; pregnant women who consumed alcohol and pregnant adolescents, respectively. Their findings emphasize the role of the environment, and maternal or fetus characteristics in the intensification of maternal-fetal attachment. Ahern and Ruland (2003) performed comparative analyses of maternal-fetal attachment scores for African American and Hispanic pregnant women, two culturally distinct groups. While they found differences in the Giving of Self and Attributing Characteristics to Fetus subscales of the MFAS (Cranley, 1981), socio-demographics rather than culture may account for the findings. The impact of culture on maternal-fetal attachment remains unknown and needs further research.

In sum: a) the core experience of maternal-fetal attachment is the desire to protect the fetus from harm; and b) consequently, women develop motivation throughout the

pregnancy to adhere to all necessary maternal prenatal health behaviors (Sandbrook & Adamson-Macedo, 2004). Moreover, when assessing maternal-fetal attachment predictors diverse factors may show different priorities, contingent to the demographic and contextual characteristics of the population under study.

Pregnancy health behaviors (i.e., pregnancy care). Pregnancy care describes the actions a pregnant woman takes that may positively influence health and pregnancy outcomes (Lindgren, 2003). Abstaining from tobacco, alcohol and illegal drugs, obtaining prenatal care, eating nutritiously and gaining the appropriate amount of weight, getting regular exercise, and learning about pregnancy and childbirth are examples of high-quality health behaviors.

HIV-related health behaviors (i.e., prenatal ART and infant care adherence). These behaviors consist of adherence to ART for maternal health, and for prevention of HIV mother-to-child transmission during pregnancy; and after childbirth, adherence to infant screening clinic appointment schedules for pediatric HIV care.

Research Hypothesis

Maternal-fetal attachment, history of substance use, marital relationship status, planned pregnancy status, and timing of HIV diagnosis will independently predict three maternal health behaviors in pregnant women with HIV: pregnancy care, prenatal ART adherence, and infant care adherence.

CHAPTER III: METHODOLOGY

Study Design

This study employed a 17-month prospective observational design to examine relationships between maternal-fetal attachment and pre- and post-natal health behaviors in HIV-infected pregnant women, while taking into account four other potential theory-based predictors of health behavior: history of drug use, marital relationship status, planned pregnancy status, and timing of HIV diagnosis.

Study Setting

PRIM and Screening clinics. This project took place in the Miami Family Care Program's Prenatal Immunology (MFCP's PRIM) clinic of the OB/GYN Department, and the infant screening (Screening) clinic of the Pediatrics Department, both located at the University of Miami's Miller School of Medicine. Most family practice providers, obstetricians, federally-qualified health centers, public health clinics and other perinatal programs throughout Miami Dade County in Florida identify and refer HIV-infected pregnant women directly to the PRIM clinic for concurrent prenatal and HIV care. The PRIM perinatal health care team offers prenatal care and ART management following standard of care recommendations from the U.S. Department of Health and Human Services Panel on Treatment of HIV-infected Pregnant Women and Prevention of Perinatal Transmission (US DHHS Panel on treatment of HIV-infected Pregnant Women and Prevention on Perinatal Transmission, 2011). Women also receive ART adherence counseling, mental health assessments and behavioral management sessions on stress reduction and partner disclosure strategies.

After delivery, all mothers attending the PRIM clinic are instructed to enroll their newborn infants in the MFCP Screening Clinic, and bring them to all scheduled clinic visits for monitoring of the mother-to-child transmission of HIV. The pediatric screening team coordinates the care for the HIV-affected family by conducting psychosocial assessments, mental health interventions, and HIV counseling and testing for additional family members, as needed. Infants lacking health insurance also receive interim primary care services until they are linked to a primary care pediatrician. A non-breastfed infant is discharged from screening clinic after establishing definitive exclusion of HIV diagnosis based on two negative virological tests at age ≥ 1 month and ≥ 4 months. The Screening clinic completes the pediatric end of the standard protocol to reduce the mother-to-child HIV transmission risk (US DHHS Panel on Treatment of HIV-infected Pregnant Women and Prevention of Perinatal Transmission, 2011).

PRIM and Screening clinic protocols. Routine prenatal care checkup visits occur once a month for weeks 4 through 28, every two weeks between weeks 28 to 36, and once a week from 36 weeks until delivery (Figure 1). However, participants may attend additional prenatal care visits to monitor their HIV viral load (one measurable outcome of medication adherence behavior after resolving viral resistance to ART), other medical conditions, or drug use. Specifically, according to the Panel on Treatment of HIV-infected Pregnant Women and Prevention of Perinatal Transmission (2011), HIV viral load should be monitored in this population at the initial prenatal visit, 2 to 4 weeks after starting or changing antiretroviral medication regimen, monthly until viral load levels are undetectable, at least every three months thereafter during pregnancy, and close to delivery at 34 to 36 weeks.

The HIV viral load accurately reflects burden of infection and the extent of viral replication; and once the woman starts antiretroviral medication, viral load is used to monitor the response to medication therapy because achieving a viral load below the level of detection (e.g., <40 copies/mL) is the main goal of this therapy to effectively prevent the transmission of HIV from mother to child (AETC, 2011).

The screening clinic protocol consists of four clinic visits with infants at 2, 4, 6 weeks, and 4 months of age (Figure 1). Specifically, virologic tests should be performed on infants born to HIV-infected women in the first two visits (2 and 4 weeks old), and the fourth visit (4 months old) to establish presumptive and definite HIV diagnosis exclusion, respectively (Panel on Treatment of HIV-infected Pregnant Women and Prevention of Perinatal Transmission, 2011). During the third visit (i.e., 6 weeks old), the infant's ART prescribed at birth is discontinued and the parent is counseled on previous virologic test results. The screening clinic social workers are legally mandated to report to the local Department of Children and Families non-attendance of the infant to any screening appointment, and the information is recorded in the infant's medical record.

Participants

Study participants were recruited from the women who attended the PRIM clinic between June 2012 and November 2013. Participants in this study were racially and ethnically diverse (67% Black or African-American, 33% White; 66% non Hispanic, and 34% Hispanic), English- and Spanish-speaking pregnant women, at gestational age ≥ 24 weeks (end of the second and beginning of the third trimester) who received prenatal care from the PRIM clinic while diagnosed with HIV, either during or before the index pregnancy. In 2012, at least 135 infants born in Miami-Dade County were determined to

have been exposed to HIV prenatally (PRIM/Screening, 2013). Of these infants, 114 (84%) were born to women who attended the PRIM clinic until delivery, 16 (12%) received prenatal care in a different community obstetric clinic, and 5 (4%) received no prenatal care (PRIM/Screening). In 2012, an average of 9.5 births per month in the PRIM clinic; assuming each woman gave birth to one child and a similar rate would occur in 2013. Then, during the study period 161.5 exposed children would have been born in PRIM clinic to 161.5 mothers, and the present study would have recruited 82 (51%) of them. Extending this extrapolation to Miami-Dade County, 191.25 exposed children were born in Miami-Dade County, and the present study recruited 82 of them (43%).

Inclusion/exclusion criteria. English- and Spanish-speaking women and adolescents of at least 24 weeks of pregnancy followed for pregnancy and HIV care, who delivered in PRIM, were eligible to participate in the study. Women were excluded from participation if monolingual in Creole because instruments were not translated into this language. This was estimated to affect approximately 6 women (PRIM, 2010). Women in whom the possibility of viral resistance to any of the medications in their ART regimen remained unresolved were also excluded from the study.

Recruitment of participants. Following approval by the Florida International University and University of Miami Institutional Review Boards, pregnant women with HIV who met inclusion criteria were approached for recruitment by the principal investigator (PI) between July 2012 and November 2013. Weekly on Mondays, prior to the PRIM clinic on Thursdays, the PI joined the medical team pre-clinic meetings to access the clinic census and identify which women scheduled to attend in a given week met study inclusion criteria.

During this 17-month period straddling two consecutive years (a total of 68 Thursdays), 110 eligible pregnant women arriving for their appointment were invited to participate in the study, following HIPAA and other medical care protocols practiced in the PRIM clinic. For example, any researchers recruiting from the PRIM clinic do not approach any woman during her first prenatal care visit, especially those newly diagnosed, because they may need confirmation of the HIV diagnosis, proper post-diagnosis counseling, or psychological intervention to address the emotional turmoil that might have been prompted by the HIV diagnosis. The PRIM clinic database (2014) reported that 80 and 77 women received prenatal care and delivered their newborns in their facilities in the years 2012 and 2013, respectively. Of a total 157 women who attended PRIM clinic during the study period, 110 (70%) women were invited to participate, 28 declined and 82 were recruited. The numbers of participants across data collection Times 1, 2, and 3 (see ahead) were respectively 76, 65, and 53 (Figure 1 flowchart). These numbers represent the participants included in the statistical analyses at each data point.

Women who declined participation reported as reasons concerns about the privacy of their medical diagnosis, being reported to child protection authorities, and/or needing to consult the father of the unborn child. In addition, the emotional distress in newly-diagnosed women, preference to participate in research studies with greater financial incentive than this one, cognitive limitations to understanding the information about the study, or tentativeness about proceeding with the pregnancy were inferred from observations of PI as possible reasons for declining participation.

Figure 1. Sample flow chart for recruitment, enrollment, and subsample sizes.

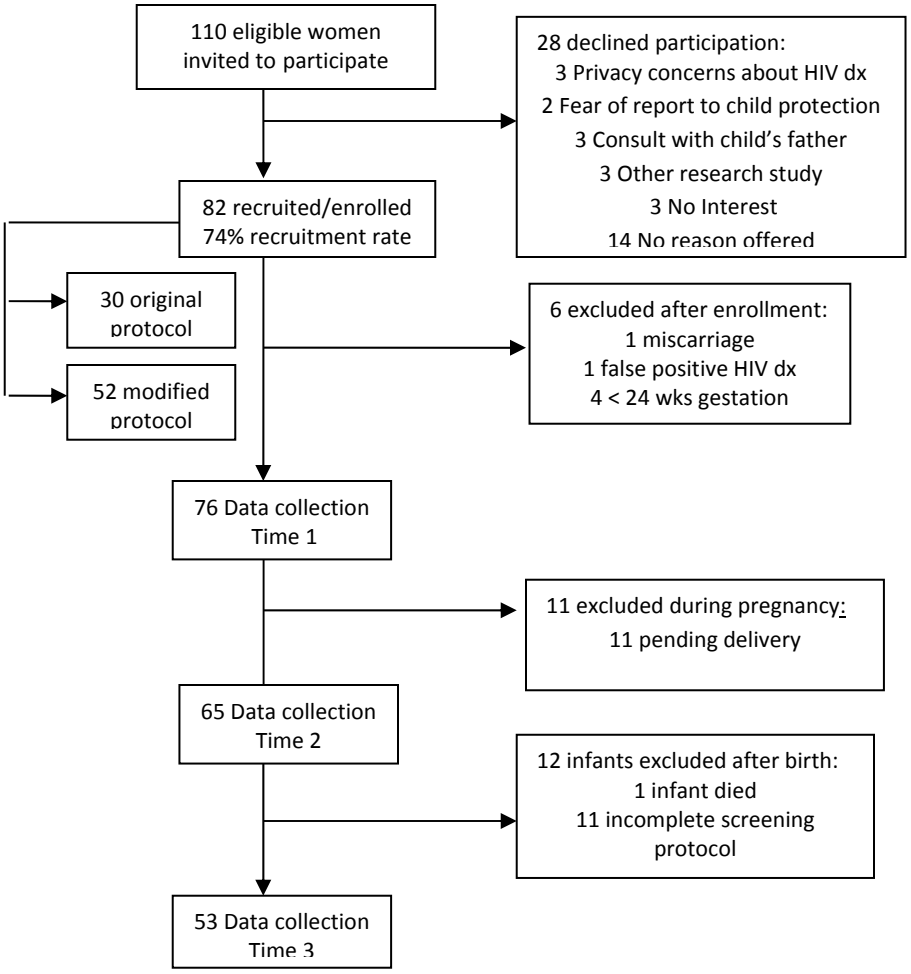

Figure 2. Study design, measures and clinics protocol

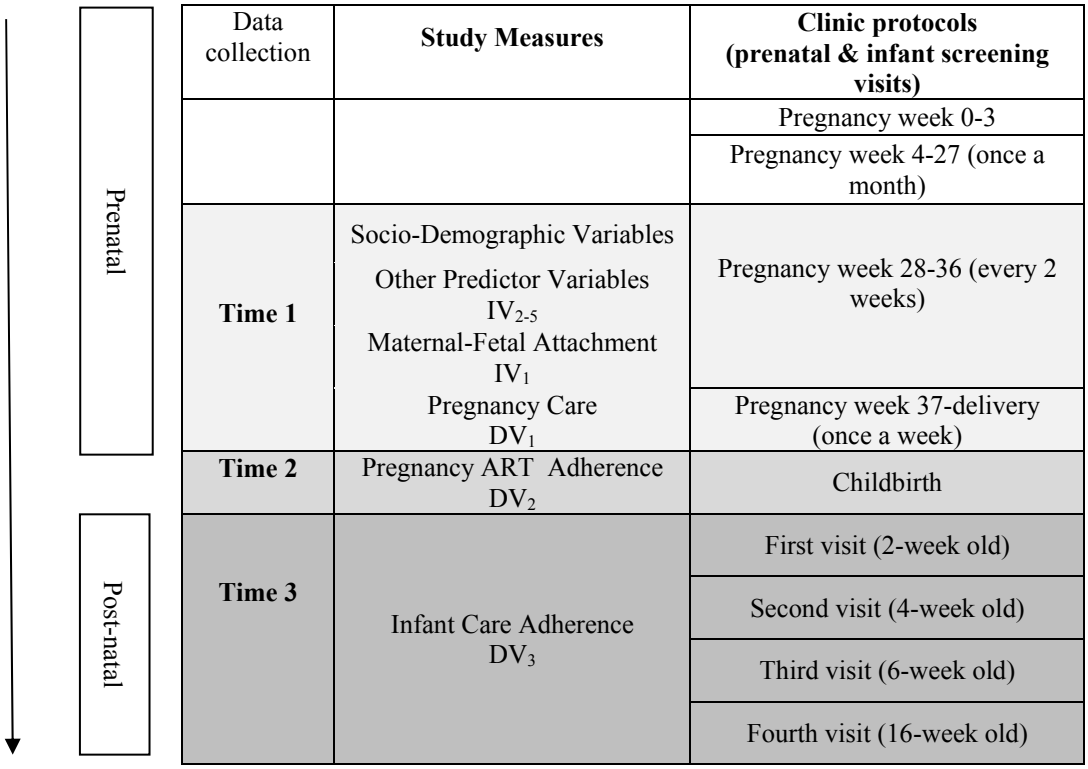

Figure 2. Prospective study design across data collection Times, study measures applied to each Time and clinic visits scheduled for participants by the Prenatal Immunology and Pediatric Screening clinics, following standard protocols for the prevention of HIV mother-to-child transmission. IV = independent variable; DV = dependent variable.

Eight months after the start of the study, in February 2013, the recruitment protocol was slightly modified by the PI, in coordination with the PRIM clinic team, as follows: eligible women pregnant for less than 24 weeks were invited only to consent to future participation in the study. Those who agreed were approached again by the PI at 24 weeks' gestation or more to complete the collection of Time 1 data (Figure 2).

The PI developed an Excel document to log enrolled participants, avoid enrollment duplication, track participants pending collection of Time 1 and/or Time 2 measurement, and ensure matching of Time 1 and Time 2 data (Figure 2). Extended recruitment efforts and modified recruitment protocol maximized enrollment of participants.

Sample size calculation. The sample size was calculated to test the hypothesis that those participants with strong maternal-fetal attachment would be at least twice as likely ($\leq$90%) to have optimal outcomes on the most important indicator of protective behavior in this population (optimal ART adherence) compared to participants with poor maternal-fetal attachment ($\leq$45%). For 80% power to detect a statistically significant difference (at $p<.05$ level, 95% confidence interval) between participants that demonstrated strong maternal-fetal attachment (estimated at 50% of the population) compared to participants that demonstrated poorer maternal-fetal attachment, a minimum of 90 participants (50% with strong MFA indicators) would be required (Dean et al., 2012; Fleiss, 1981; Kelsey et al., 1996). According to PRIM statistics, approximately 99-110 women per year receive prenatal care at this clinic. It was anticipated that 90 or more participants would be recruited.

Data Collection

Once a woman agreed to participate in the study, the PI obtained all necessary informed written consents and enrolled her on site immediately, later during that clinic visit, or at a later clinic visit. Timing of enrollment depended on priorities related to her medical care and the gestational age at the time of consent. Every participant reaching 24 or more weeks of pregnancy completed the socio-demographic self-report, the MFAS, and the HPQ-II in one interview session in a quiet and private clinic office. Participants took 25 to 35 minutes to complete Time 1 study instruments, depending on their ability to read the survey items, their level of comfort to ask questions about themselves or the study instruments, and the assistance each required from the interviewer (Figure 2). For those women completing the informed consenting process, and the Time 1 study instruments during the same clinic visit; this one-time interview lasted 40 minutes or less. The PI administered study instruments to reduce occurrence of missing data. PI is experienced in conducting clinical and research interviews in English and Spanish, and had obtained a Responsible Conduct of Research training certificate. PI also obtained a Certificate of Confidentiality from the National Institutes of Health to provide additional privacy protection for participants in this study. Participants received $20 to complete Time 1 measures. Consent included permission for PI to retrospectively, immediately after delivery, access participants' obstetric medical record, using the Maternal Chart Review form (Appendix A), in order to abstract the following laboratory/patient's history data: date and reading of HIV viral load at last pre-delivery clinic visit, HIV disease stage classification, maternal age at delivery, and trimester in which participant entered prenatal care. (Time 2: pregnancy ART adherence measure; Figure 2).

Similarly, participants authorized PI to access, four to five months after birth, the pediatric screening clinic medical record of their infant, using the Infant Chart Review form (Appendix B), to abstract information on attendance to the HIV screening clinic (Time 3: infant care adherence measures; Figure 2). For 12 of the 65 (18 %) women who delivered preterm (< 37 weeks), and whose infants required additional hospital stay in the neonatal unit; Time 3 data collection included the HIV screening tests done while receiving neonatal inpatient care.

Measures

English-Spanish back translation of the study survey and scales by two different translators, one for the forward-translation and another for the back-translation, was undertaken to preserve the intent of the wording and conceptual equivalence of the instruments across cultures and languages. Each translator followed FIU IRB linguistic qualifications requirements and signed necessary Translation Affirmation forms. Translated instruments were administered to the 10 monolingual Spanish-speaking women consenting to participate in the study. The English and Spanish versions of the instruments were pretested with a small sample of pregnant women to identify any problems before employing them in the actual study. All instruments used in this study are appended to this dissertation.

Maternal-fetal attachment. (MFA, independent variable) was assessed at study entry, during at least 24 weeks of pregnancy (Time 1, ≥24 week; Figure 3), with the *Maternal Fetal Attachment Scale* (MFAS, Appendix F). The MFAS is the best validated self-report instrument available (Cranley 1981), containing 24 items (each scored from 1-5). Content validity was assessed by an expert panel and pregnant women during the

scale's development and convergent validity was supported by its correlation (r=.72) with the *Prenatal Attachment Inventory* (Lindgren, 2001). Lindgren (2001) also reported a .85 internal reliability coefficient for the MFAS in a sample of 252 mostly White, pregnant women of diverse socio-economic status living in two Midwestern urban settings. This instrument has been used extensively in nursing research with women of diverse racial, ethnic, and socioeconomic status. Reported Cronbach alphas for the total MFAS score in previous studies range between .76 and .92; however, clinical norms have not been published (Van den Bergh & Simons, 2009). Total possible score for this continuous ordinal scale ranges from 24 to 120; higher total scores indicate higher levels of maternal-fetal attachment. Cronbach alphas reported for three of the original subscales were below .69; thus, this study only analyzes the total scores of the MFAS (Van den Bergh & Simons). The Maternal Antenatal Attachment Scale (MAAS) and the Prenatal Attachment Inventory (PAI) are among the other best known scales measuring maternal-fetal attachment. However, data to judge the psychometric properties of MAAS are scarce and further research is needed to examine the dimensions of maternal-fetal attachment measured by the PAI (Van den Bergh & Simons).

Pregnancy care (dependent variable 1): This is defined as the actions a pregnant woman takes that may influence her health, the health of the fetus or pregnancy outcomes. It was measured at enrollment (Time 1, ≥ 24 weeks) by the abbreviated (20 items) *Health Practices Questionnaire-II* (Appendix G, HPQ-II; Lindgren 2005) containing items related to drug use, safe sex practices, diet, rest and exercise, and childrearing knowledge. Each item has 5 optional responses, ranging from 1 (never) to 5 which indicates the highest possible frequency for that activity (e.g., always, daily). Total

possible scores for this continuous variable range from 20 to 100, higher scores indicating higher frequency or quality of health practices. Content validity was established by a satisfactory content validity index (.83), and reviews from clinical experts and pregnant women (Lindgren, 2005). Construct validity was supported by statistically significant correlations with three theoretically related measures (Lindgren, 2005). The internal consistency reliability of the original HPQ-II is .81 in a sample of 312 mostly White, adult pregnant women of high socioeconomic status (Lindgren). This scale needs further validation with women from diverse ethnic, racial and socioeconomic backgrounds.

Pregnancy ART adherence. (dependent variable 2): This is defined as the participant's behavior of taking her ART as directed by the physician without missing doses, or taking lower doses than prescribed (Mellins et al. 2008). It is indirectly measured in this study by laboratory blood results of an HIV RNA PCR (an HIV viral load) extracted retrospectively from participants' obstetric medical record of the last prenatal visit before delivery (Maternal Chart Review; Appendix A). This particular reading probably represents the most valid viral load measure after monitoring response to ART, and confirming absence of viral resistance to the ART regimen medications, and it has been correlated to long-term HIV medication adherence during pregnancy (Bartley et al., 2012; Cohn, 2008). In addition, when preparing for the delivery of an HIV-exposed infant, the obstetrician considers the biological measures of maternal treatment outcome taken at 36 weeks gestation, because this last viral load is the principal predictor of mother-to-child transmission (S. Yasin, personal communication, October 9, 2012; PRIM chief obstetrician and medical director).

The viral load is expressed as the number of copies of HIV-1 RNA per milliliter of plasma, where <20 or <50 copies/mL indicates an "undetectable HIV viral load," and >20 or >50 copies/mL indicates "detectable HIV viral load." The two cut-off points to measure detectable viral load relates to the different sensitivity of the HIV tests used to detect and quantify the HIV viral load (< 50 v. < 20; Cobbs et al., 2011). This cut off range of viral load detection was used to categorize this dependent variable into perfect (< 20 or < 50), high (< 1,000), medium (1,000-10,000) and low (≥10,000) medication adherence (AETC, 2011; Mellins et al. 2008; S. Yasin, personal communication, October 14, 2012). Dummy coding for the pregnancy ART adherence variable was used as follows: perfect adherence = 1, high adherence = 2, medium adherence = 3 and low adherence = 4. Categorizing this dependent variable and collecting information on viral resistance testing from the women's medical record allowed for a more accurate measure of ART adherence. In determining eligibility, women with a known record of persistent unresolved possibility of antiretroviral resistance were excluded from the study.

Infant care adherence (dependent variable 3): Information on attendance to all four screening clinic visits by each mother-infant dyad (i.e., completion of HIV screening protocol) was extracted from pediatric records four to five months after childbirth (Infant Chart Review; Appendix B). Attendance to infant's screening clinic visits was counted on a ratio scale (0, 1, 2, 3, or 4 attendances) and treated as a continuous variable.

Predictor variables. Participants were surveyed at study entry on the following personal characteristics: *marital partner* or not status*, history of drug use* or not, *actively planned* or unplanned pregnancy (includes actively preventing), and *HIV diagnosis during or before index pregnancy* (Socio-Demographic Survey– four items indicated by

*; Appendix C). For the data analyses, discrete predictor variables were dummy coded using "1" for the response group and "0" for the reference group as follows: history of drug use = 1 and no history of drug use = 0, with partner= 1 and without partner= 0, planned=1 and unplanned= 0, HIV diagnosis during pregnancy = 1 and before pregnancy=2. "Problems with partner" variable was measured by a single question requiring a "yes" (yes=1) or "no" (no=0) answer, and those participants responding "living with partner" were coded as with partner, regardless of the response to the marital partner status (i.e., single or married) and the problems with partner (i.e., problem or not) variables.

Sociodemographic variables. In addition, maternal age, level of education, annual household income, race, ethnicity, gestational age, number of previous pregnancies, and number of live births, were recorded in a brief self-report form at study entry (Socio-Demographic Survey; Appendix C). Trimester of entry into prenatal care, maternal age at delivery, CDC classification of HIV disease stage (HIV infection or AIDS), and number of years since HIV diagnosis were abstracted from the participant's medical record after delivery (Maternal Chart Review, Appendix A).

Data preparation. At enrollment, each participant was assigned a unique personal number (PID) to anonymize all self-reported and medical record abstracted data. The PID number was written on each of the following: Socio-Demographic Survey, MFAS, HPQ-II, Maternal and Infant Chart Review forms. The PI's tracking Excel document contained the participants' name and corresponding PID. This list and signed consent forms were kept under lock and key in the PI's office at UM Mailman Center for Child Development. Study forms containing self-reported and medical record abstracted

information will be kept secured in separate locked file cabinets located in the PI's office for at least three years after completion of the study, and will be afterward destroyed. The anonymized data from interviews and chart review forms were entered for computerized analyses into a desktop computer in PI's office. This computer is password protected, and only the PI had access to the raw data.

Data Analysis

Analysis proceeded in three steps using the Predictive Analytic Software (PASW) Statistics for Windows, Version 18.0 (SPSS Inc, 2009) to compute bivariate and multivariate statistical analyses. First, data screening procedures and preliminary analyses were performed to examine accuracy of data entry, fit between distribution of variables and assumptions of multivariate analyses, missing data, and outliers. Second, descriptive statistics were used to depict the full sample's characteristics on the main demographic, predictor, and outcome variables in the study. Third, three multiple standard regression analyses were performed to assess the three separate study sub-hypotheses, as described ahead. Frequency tables and visual scanning indicated that data for all variables were entered accurately at each prospective data collection point.

Missing and miscoded data. Frequency tables and visual scanning revealed no missing data in self-reported information by participants and minimal missing data in the data abstracted from medical records. As anticipated, the likelihood of substantial missing data was very low given the combined use of few, short self-reported instruments with chart abstraction strategies, and data collection undertaken in a comfortable and engaging clinic setting for this population of highly vulnerable pregnant women. Participants were cautioned during the consenting process to alert the PI if any item asked

in the interview created discomfort for them, but no pattern of missing values emerged suggesting that participants perceived some items as unusually sensitive. On the contrary, they seemed to welcome the opportunity to talk about their affiliation with their unborn children, their health practices during pregnancy, and their sometimes unfortunate social, personal, and economic circumstances.

Most of the missing data related to information abstracted from the maternal medical records of participants who delivered during the study period. These absences reflected unknown or unreported information by the PRIM health practitioners. However, this unknown or unreported data referred to variables not included in the main analyses of this study, except for the outcome variable that measured the "last HIV viral load before delivery (medication adherence)." Inspection of all data corresponding to the 49 infants who completed the screening protocol showed no missing values.

Descriptive statistics showed one missing and two miscoded values in the medication adherence measured in actual viral load amount and the classification of actual viral load amounts into categories of medication adherence, respectively. The latter entries were corrected after examining the original data collected from the participants' records. The single missing value in the medication adherence variable belonged to PID 65, who attended her first prenatal care visit at 37 weeks gestation and delivered the next day. The routine last viral load before delivery was unknown to the health providers, as they could not order it from the lab due to lack of time. This case was excluded from the statistical analyses of this outcome variable (n=64).

Descriptive statistics. Demographic and clinical variables, continuous and categorical, were organized in three types: socio-demographic, pregnancy-related, and

HIV-related. Preliminary analysis included the calculation of mean scores, standard deviation, skewness, and kurtosis of continuous demographic, predictor, and outcome variables to characterize the entire sample. Frequencies and percentages were tabulated for demographic categorical variables to observe the main tendencies for the entire sample. The assumptions of standard multiple regressions were tested using Pearson correlations, collinearity diagnostics, residuals analyses, and other necessary statistical procedures.

Standard multiple regressions. Third, three multivariate analyses were performed to assess the each study sub-hypotheses. A standard multiple regression analysis examined a maternal-fetal attachment model and the unique independent contribution of MFA scores, history of drug use, marital partner status, planned pregnancy status, and timing of HIV diagnosis in predicting three continuous outcome variables: (1) HPQ-II scores measuring pregnancy care health behaviors, (2) HIV-1 viral load values measuring adherence to antiretroviral therapy (ART) during pregnancy, and (3) total number of postnatal screening visits by mother-and-child to the pediatric HIV clinic visits for infant care.

This method assessed how much variance in each outcome variable is explained by the block of five hypothesized predictors. It also estimated the unique predictive power of each predictor variable, as if each entered the equation last. Standard rather than sequential multiple regression was selected because the study hypothesis does not specify a predetermined order of entry in the equation to control for the predictors entered first. Finally, stepwise regression is more appropriate for studies, unlike this one, aiming to

build a model rather than test a model by removing or including predictors from the model "under construction" based solely on statistical criteria (Pallant, 2010).

Summary. This study was designed to test, as conceptualized from a strength approach and a socio-ecological framework, whether a relationship exists between the construct of maternal-fetal attachment and specific health behaviors of women living with HIV/AIDS during the period surrounding childbirth. A total of 82 women were recruited into the study, and data were collected from interviews with 76 of these women, and abstractions of maternal and newborn infants' medical records. Relevant health behaviors of these participants were prospectively assessed at three time periods: 24 weeks gestation, childbirth, and 16 weeks after childbirth. Participation in this study varied from 16 to 32 weeks. Strategies for data analyses included: (a) description of participants' socio-demographic, pregnancy- and HIV-related characteristics; (b) examination of the distributions of participants' scores on a maternal-fetal attachment scale, and on variables measuring their health behaviors; (c) examination of bivariate correlations between predictors and outcome variables; and (d) multiple standard regression analyses to examine the predictive power of a model of maternal-fetal attachment on three perinatal health behaviors, and to determine the unique contribution of each predictor to each health behaviors in the model. Results of these analyses are presented in the next chapter.

CHAPTER IV: RESULTS

Descriptive Statistics

Socio-demographics. A sample of 82 pregnant women with HIV/AIDS was enrolled in the study over a 17-month period (July 2012- November 2013). One woman miscarried soon after enrolling, one tested negative in the HIV-1 RNA test performed around mid-pregnancy (considered a false-positive case), and four did not complete study measures because their gestational age was under 24 weeks by November 2013 (Figure 1). Table 1 presents the socio-demographic characteristics of the remaining 76 study participants. These were mostly Black or African American (67%) and Hispanic (34%), single (92%) and poor (88%). Regardless of marital status, over half (60.5 %) reported not living with their marital partner, and over third (37%) disclosed a history of using cigarettes, alcohol, marihuana and/or cocaine. Almost half of the participants (45%) had a High School or General Equivalency (GED) diploma. Maternal age at childbirth ranged from 17 to 43 years old (M = 27.7, SD = 6.19).

Pregnancy-related characteristics. Table 2 displays the pregnancy-related clinical characteristics of the study group. The majority of participants (68%) reported not planning this pregnancy, and over half (54%) of these women reported no attempts at prevention. Most women (74%) reported two or more previous pregnancies, and 82% one or more live births. Over a third (37%) and more than half (54%) began prenatal care in the first and the second trimester, respectively. They attended between 1 and 16 prenatal visits to monitor the pregnancy and HIV disease (M = 9.5, SD = 3.29). Sixty five participants delivered during the study enrollment period, vaginally (32%) or by cesarean

Table 1

Sociodemographic Characteristics of the Sample (n=76)

Variable	Frequency N	%	M	SD	Median	Range
Age at delivery in years			27.7	6.19	27	17-43
≤ 27	34	52				
28 or more	31	48				
Pending delivery	11					
Race						
African-American	42	55				
Haitian-American	6	8				
Caribbean-American	3	4				
White	25	33				
Ethnicity						
Hispanic	26	34				
Non-Hispanic	50	66				
Education						
No HS diploma	24	31				
HS/GED	34	45				
Some college/degree	18	24				
Income per year						
Less than $10,000	67	88				
$10,000-$30,000	6	8				
More than $30,000	3	4				
Housing						
Own or rent	43	57				
Stay with relatives or friends	29	38				
Homeless/shelter	4	5				
Living with a partner	30	39.5				
Not living with a partner	46	60.5				
Problem w/ partner	12	16				
No problem w/ partner	63	84				
Hx of substance use	28	37				
No Hx of substance use	48	63				

Table 2

Pregnancy-related Characteristics of the Sample

Variable	Frequencies N	%	M	SD	Range
Planned pregnancy	24	32			
Unplanned pregnancy	52	68			
Previous pregnancies			2.61	1.81	0-9
None	9	12			
One	11	14			
Two or more	56	74			
Number of Children			1.74	1.57	0-8
None	14	18			
One	24	32			
Two or more	38	50			
Entry to prenatal care			16.8	7.3	7-37
First trimester	24	37			
Second trimester	35	54			
Third trimester	6	9			
Total prenatal care visits			9.54	3.29	1-16
Gestational Age at delivery			37.35	1.58	32-40
Premature	12	18			
Full term	53	82			
Delivery Type					
C section	44	68			
Vaginal	21	32			
Birth weight < 2500 grams	11	17			
Birth weight > 2500 grams	54	83			

section (68%). Only 18% infants were born preterm and 17% classified as having low birth weight. Only one (1.5 %) out of the 65 participants who gave birth transmitted HIV to her infant. Fifty four of the 65 HIV-exposed infants were scheduled to complete the 16-week post birth screening protocol during the study enrollment and data collection period; however, one infant died of cardiac arrest 13 days after birth (Figure 1).

HIV-related characteristics. Most participants (80%) were diagnosed with HIV before this pregnancy, including four who acquired HIV perinatally from their mothers. The majority (69%) had an undetectable last viral load count (< 20 or <50) before delivery. About half of the women in this sample have lived with HIV for more than four and a half years, and only 11% were known to have AIDS (Table 3). They reported 0 to 21 years since HIV diagnosis (M = 5.59, SD = 5.11). Slightly over three fourths of the infants (77 %) were brought by their mothers to three (32%) or all four (45%) of the scheduled screening clinic visits. Additional HIV-related clinical characteristics for the total sample are presented in Table 3.

Reliability of study instruments. Eleven of the 76 protocols administered in this study used the Spanish version of the Maternal-Fetal Attachment Scale (MFAS) and the Health Practices Questionnaire (HPQ-II) developed by Ahern & Ruland (2003) and Lindgren (2005), respectively. First, Cronbach's alpha was calculated for each of these scales to assess reliability of the total scales in measuring maternal-fetal attachment and health behaviors during pregnancy, respectively, in this study. Second, separate reliability was assessed for the English and Spanish version of each instrument to explore possible changes in comparison to the total reliability. Finally, reliability of each MFAS subscale

Table 3

HIV-related Characteristics of the Sample

Variable	Frequency N	%	M	SD	Range
Last HIV VL before delivery					
Detectable	20	31			
Undetectable	44	69			
Last CD4 count before delivery			506.36	294.38	3-1374
Last CD4 % before delivery			28	10.66	1-49
Pregnancies after HIV Dx			.92	.92	0-5
None	22	35			
One	28	44			
Two or more	13	21			
Timing of HIV Dx					
Before pregnancy	61	80			
During pregnancy	15	20			
HIV disease stage					
Not AIDS	54	83			
AIDS	7	11			
Unknown	4	6			
Resistance test	23	35			
No resistance test	31	48			
Unknown	11	17			
Years since HIV diagnosis			5.6	5.12	0-21
≤ 4.5	32	50.7			
More than 4.5	31	49			
Total infant screening visits					
None	1	2			
One	2	4			
Two	9	17			
Three	17	32			
Four	24	45			

was calculated for comparison with previous research on the subscale structure of this instrument (Muller & Ferketich, 1993).

The internal consistency of the MFAS in this study was .84, probably indicating good reliability for this instrument. This Cronbach's alpha value for the total scale concurs with previous reports in the literature (Lindgren, 2005; Muller & Ferketich, 1993; Van den Bergh & Simons, 2009). Nineteen of the 24 items in the MFAS related very well to the total scale, correlation values ranged between r = .32 and r = .66. Four items (i.e., number 10, 13, 22, and 24) related to maternal perception of her body, naming the child and grabbing the fetus foot showed low correlations to the total scale, $r \leq .19$. The retention of three of these four items (number 10, 13, and 24) should be revised because their deletion from the scale would have improved the internal consistency of this instrument, in this application. The reliability coefficient for the 20-item HPQ-II used in this study was .66, which indicates acceptable internal consistency for this instrument. However, this Cronbach's alpha value falls below those reported in the literature (. 81, and .74; Lindgren, 2001, 2005). In this study, the abbreviation of this scale from 34 to 20 items, and the inclusion of 10 reversed scored items may have lowered the reliability of this instrument. Six items (i.e., life style, sleep, food labels, prenatal visits, missed appointments, and support from friends or family) showed correlations over .30 to the total scale. Seven items (i.e., caffeine, marijuana, cigarettes, alcohol, prenatal care entry, weight, and childbirth classes) showed correlations of .15 or less to the total scale. In this application, the deletion of those items inquiring about weight gain and intention to enroll in childbirth classes from the abbreviated HPQ-II scale would slightly improve the reliability of this instrument.

In this study, the internal consistency reliability of the English and the Spanish language versions of the MFAS was .844 and .782, the former slightly higher and the latter slightly lower than the alpha coefficient calculated for both combined (. 837). The internal consistency reliability for the abbreviated HPQ-II in the English (n = 65) and Spanish (n = 11) language used in this study were .650 and .618, respectively. Both of these values fell below the alpha coefficient calculated for the English and Spanish versions of this instrument combined (.66). The analysis of Chronbach's alpha coefficients of internal consistency performed on the five subscales of the MFAS revealed that the most reliable subscales were those measuring maternal role taking (.79) and attributing characteristics and intentions to the fetus (.71). The least reliable subscale was the one measuring differentiation of self from the fetus (-.13).

Analyses of main study variables. Means, standard deviations, skewness and kurtosis for maternal-fetal attachment total scores and variables measuring the health behaviors practiced by study participants are shown in Table 4. This analysis includes the absolute number, (log of) copies of viral RNA ("viral loads"), the original and the recoded total infant screening visits variables. The (log of) and recoded variables were introduced after data screening and preliminary analyses procedures. The rationale and procedures leading to the new two variables are explained ahead. The mean for maternal-fetal attachment (M = 90.37) is comparable to the means reported by Lindgren (2001) in a study with predominately White, highly educated, married women; and Ahner (2003) in a pilot study with a small subgroup of High School educated, and single African-American women (M = 90.62 and M = 89.7, and SD = 10.99 and 13.9, respectively). In contrast, the mean for MFA from this study is higher than the means reported by Ethier et

Table 4

Descriptive Statistics of Main Study Variables

Variable	N	Mean	SD	Range	Skewness	Kurtosis
Maternal-fetal Attachment	76	90.37	10.40	64-112	-.04	-.51
Pregnancy health behaviors	76	82.99	7.07	58-95	-.93	1.25
ART medication adherence (viral load)	64	2102	10327	20-68351	5.71	32.94
ART medication adherence (log) (viral load)	62	1.54	.95	1.02-4.83	1.98	3.32
Total infant screening visits	53	2.75	1.31	0-4	-.846	-.388
Total infant screening visits (recoded)	53	3.15	.969	0-4	-1.105	.978

al. (2002) in a large multisite sample of HIV-infected ethnically minority women with low levels of education and income (M = 53, SD not reported). The use of a modified shorter version of HPQII scale prevents comparisons of the mean assessed in this study with previous research studies. The percentage of self-reported complete or optimal adherence to ART (69 %) by the participants in this study is higher than the percentage reported by Mellins et al. (2008) from a large group of women (61%) similar to the sample from this study, and lower than Nechega et al. (2012) findings (73.5%) in a meta-analysis of studies reporting ART adherence rates during pregnancy. The lack of studies in the research literature measuring health behaviors for infant care among HIV-infected mothers in the U.S. precludes comparison of the attendance rates found in this study to those in previous research findings.

The procedure to code the maternal health behaviors for infant care variable was revised during data screening and preliminary analyses to account for those mothers who did not attend the screening clinic visits scheduled for their infants, but coordinated with the screening clinic nurse to have the indicated HIV PCR tests performed in a timely fashion by the infant's pediatrician. The same applied for those premature infants whose mothers did not attend the screening clinic but the infants received the HIV PCR tests while inpatient in the neonatal intensive care unit. Thus, attendance to infant's screening clinic visits or receipt of the HIV PCR test was counted on a ratio scale (0, 1, 2, 3, or 4 attendances/test performed timely) and treated as a continuous variable. The recoded maternal health behaviors for infant care variable, TOTLVSTS_1 (recoded), replaced the original variable (TOTLVSTS).

Bivariate correlations between predictors and outcomes were calculated to further explore the study data set for unusual or anticipated correlations (Table 5). Maternal-fetal attachment strongly correlated with health behaviors for pregnancy care (r = .47). There was a medium strength positive correlation between planned pregnancy and optimal health behaviors for pregnancy care (r = .27). Finally there was a medium inverse correlation between history of substance use and (recoded) total postnatal infant care visits (r = -.29). The correlations among these variables follow the direction hypothesized in this study.

Assumptions for Standard Multiple Regression Analysis.

Sample size. The subsamples utilized for the regression analysis performed on each of the three outcome variables included 76, 65, and 53 cases for the health behaviors for pregnancy care, medication adherence and infant care, respectively. Data screening and preliminary analysis procedures conducted on the medication adherence variable, further reduced the size of the subsample computed in the regression analysis for the (log of) medication adherence variable to 62. None of these subsamples met the required sample size calculated a priori for a five-predictor multiple regression; however, the subsample for the pregnancy care variable met the criterion of 15 participants per predictor (15 x 5 = 75) typically recommended for social science research (Pallant, 2010). Whereas the lack of random sampling of participants in this study aggravates the violation of this assumption, it also reiterates the design of a hypothesis-testing study, such as this one, which aims to examine effect sizes in the data at hand, rather than relative values of population parameters (Hunter & May, 1993).

Table 5

Bivariate Correlations Between Predictor and Outcome Variables

Variable	TOTALHPQ	TOTLVSTS	TOTLVSTS (recoded)	HIVVLIII (log)	HIVVL_III
MFATOTAL	.47**	.16	.13	-.07	-.01
LIVING	-.21	-.13	-.14	-.06	-.14
PLANNED	.27*	.07	.09	-.22	-.12
DRUGS	-.19	-.24	-.29*	-.01	-.12
MATHIV	.07	.17	.07	.08	.12
HIVVLIII(log)	-.31*	-.43**	-.31**	1	–
HIVVL_III	-.18	-.20	.15	.67**	1
TOTLVSTS	.25	1	.62**	_	_
TOTLVSTS (recode)	.04	_	1	_	_

Note. All correlations are 2-tailed

*$p < .05$. ** $p < .01$.

Multicollinearity. Bivariate correlation analyses among predictor variables were used to assess this assumption. The highest bivariate correlation among predictor variables was .213, and none reached significance level (Table 6). The repeated default values for collinearity statistics (Tolerance below .1 and VIF above 10) in each of the regression analyses conducted in this study (Tables 8, 10, and 12 ahead) further confirmed the lack of collinearity among predictors.

Univariate Outliers. Frequencies, distributions and plots of ungrouped data were inspected to detect univariate outliers (Tabachnick & Fidell, 2001). Outliers and extreme outliers were identified in the box plots for the variables measuring total scores for the Health Practices Questionnaire or HIV viral load before delivery. None of the identified outliers resulted from data entry mistakes. The cases corresponding to the three univariate outliers observed in each of the boxplots for the pregnancy care and the infant care (recoded) variables were retained in subsequent analyses after evaluation of other indicators of normality in the distribution of these variables. However, the multiple extreme outliers observed in the distribution of the medication adherence variable seriously violated the assumption of normality for this variable. Thus, the appropriateness of data transformation strategies for that variable is described next.

Normality in the distribution of variables. Skewness and kurtosis analyses were performed to further examine the distributional properties of predictor and outcome variables in preparation for regression analyses (Table 4). A kurtosis less than the absolute value of 2 indicated normal distribution for the variables measuring maternal-fetal attachment (MFATOTAL), health practices during pregnancy (TOTALHPQ) , and attendance to the postnatal screening clinic visits for their infants (TOTLVSTS_1). In

Table 6

Bivariate Correlations Among Predictors

Variable	MFATOTAL	LIVING	PLANNED	DRUGS	MATHIV
MFATOTAL	1				
LIVING	.213	1			
PLANNED	.063	-.027	1		
DRUGS	-.125	.109	.009	1	
MATHIV	.014	.005	.161	.101	1

addition, the negatively skewed distribution of these variables showed that most women in this study reported being strongly attached to their unborn children, frequently practicing prescribed health behaviors during pregnancy, and were observed to attend or performed the corresponding lab for 3 or 4 of the scheduled postnatal screening visits for their infants. The examination of histograms and Normal Q-Q plots for these variables revealed a fairly normal distribution for the MFATOTAL variable and only some deviations from normality for the TOTALHPQ and the TOTLVSTS (recoded) variables. Finally, a positive kurtosis indicated a peaked distribution for the TOTALHPQ and the TOTLVSTS (recoded) variables.

In contrast, a positive kurtosis much greater than 2 (32.94) revealed severe deviation from normality, and clear peakedness in the distribution of the variable measuring medication adherence (HIVVL_III or the last viral load before delivery). This distribution was positively skewed, showing most women attained perfect adherence and virologic response to ART (i.e., low viral load values in the undetectable range). This

pattern of distribution is commonly observed by medical researchers who use quantitative HIV viral loads values to assess efficacy of ART (Farzadegan et al., 1998; Moulton, Curriero, & Barroso, 2002). As a result, these researchers have used the logarithm with base 10 strategy to transform the HIV-1 viral load values and satisfy the assumption of normality for parametric tests. The Log_{10} transformation strategy makes statistical and clinical sense when applied to viral load values. Statistically, Log_{10} transformation makes sense because it pulls in extreme ranged values more drastically than other lower bases. It also transforms positive skewed distributions by effectively compressing the right side of the distribution (Osborne, 2002). This application makes practical sense in clinical and possibly data interpretation because log transformed HIV viral load values are already routinely used in monitoring and comparing significant changes in viral load to assess treatment efficacy (e.g., 1.0 log viral load reduction is expected after perfect adherence to antiretroviral therapy for 8 weeks, Cobb, Vaks, Do, & Vilchez, 2011; Kalichman, Rompa, & Cage, 2000). This variable was transformed before searching for any multivariable outliers in its distribution.

This study employed the specific Log_{10} transformation recommended by Farzadegan et al. (1998) in preparation for regression analyses as follows: (a) lower detection limit was identified (21) and half of its value was calculated (10.5), (b) 10.5 replaced all undetectable values abstracted from the medical records, and (c) the recalculated viral load values were then log_{10} transformed. However, two out of the 64 cases at data point 2 were excluded from this transformation procedure because the HIV viral load assays used in these cases had different sensitivities for detection and quantification of the HIV viral load (< 50 v. < 20 copies m/L; Cobbs et al., 2011). Instead

of arbitrarily altering the viral load value abstracted from the medical record, these cases appeared as missing from this procedure (n = 62).

The application of the $\log_{10}$ transformation procedure reduced skewness from 5.71 to 1.98 and kurtosis from 32.94 to 3.32 for the log_HIVVL3 variable; and visibly improved normality in the distribution of the new variable compared to the original, as displayed in the SPSS-generated histograms and plots (Tabachnick & Fidell, 2001). The number of extreme univariate outliers was reduced compared to the original untransformed distribution (Tabachnick & Fidell). The moderate correlation between the original and the new "viral load" medication adherence variable and weak correlations between the transformed and the predictor variables pointed to the appropriateness of this data transformation process (Table 5; Heppner & Heppner, 2004). Thus, the (log of) medication adherence variable replaced the original viral load medication adherence variable in subsequent statistical analyses.

Multivariate outliers. The 62 cases, with transformation applied to the (log of) viral load variable, were screened for multivariate outliers through regression using the Malahonis distance analysis, and two other study variables (i.e., MFA scores, and pregnancy care). In this analysis, all 62 cases showed Mahal distance under the critical value criterion (critical χ^2 at α = .001 for 3 df is 16.27; Pallant, 2010). The identified extreme univariate outliers remaining after transformation were not multivariate outliers; they were probably a proper part of the sampled population (Tabachnick & Fidell, 2001). They are still on the tail of the transformed distribution; however, their influence has probably been reduced by the transformation. Then, all 62 cases were retained for analysis of the transformed variable because no multivariate outliers were identified in

the preliminary analysis (Tabachnick & Fidell). The 53 cases in the distribution of the infant care variable (recoded) were screened for multivariate outliers through regression using the Malahonis distance analysis, and three other study variables –i.e., MFA scores, (log of) medication adherence, and pregnancy care. In this analysis, only one case (PID 36 = 18.48) is very slightly outside the Mahal distance value criterion (critical χ^2 at α = .001 for 4 df is 18.47; Pallant, 2010). This case was retained in the analysis of the health behavior for infant care variable.

Primary Analyses

All three standard regressions tested the same model as stated in the study hypothesis, and all independent variables were entered into the equation simultaneously. A separate regression analysis was conducted for each of the three dependent or outcome variables. All primary analyses tested the main study hypothesis using SPSS REGRESSION and evaluated assumptions using SPSS FREQUENCIES.

Pregnancy care. A standard multiple regression was performed between health behaviors for pregnancy care (TOTALHPQ), as the outcome variable and maternal-fetal attachment (MFATOTAL), living marital status (LIVING), planned pregnancy status (PLANNED), history of substance use (DRUGS) and timing of HIV diagnosis (MATHIV) as the predictor variables. This study hypothesized that these five independents variables will predict health behaviors for pregnancy care, the first outcome variable of the study hypothesis. The standard regression analysis assessed the predictive ability of the hypothesized model and the unique contribution of each predictor.

The assumptions in this regression analysis were evaluated using the criteria recommended by Tabachnick and Fidell (2001). The plot of the distribution of residuals

suggested no major violations of normality. Outliers were evaluated using the Mahalonis distance (critical χ^2 at α = .001 for 5 df is 20.52), and no outliers were identified. The model in this solution missed to predict the health behaviors for one case (PID 65); however, its corresponding value for the Cook's distance statistic indicated that this case was not unduly influencing the results for the model as a whole. All the predictors show some relationship with the health behaviors for pregnancy care variable, and three of these correlations reach statistical significance (Table 7). The highest correlation among them was .469. Maternal-fetal attachment and planned pregnancy status correlate

Table 7

Correlation Matrix for the predictors of Pregnancy Care

Variable	1	2	3	4	5	6
1 Pregnancy care	–					
2 Maternal-fetal Attachment	.47***	–				
3 Living marital status	-.19	.21*	–			
4 Planned pregnancy	.27**	.06	-.03	–		
5 History of Substance Use	-.19*	-.13	.11	.01	–	
6 Timing of HIV Diagnosis	.07	.01	.01	.16	.10	–

*$p < .05$. ** $p < .01$. *** $p < .001$.

substantially with maternal health behaviors for pregnancy care (.47 and .27, respectively). Further, all variables entered the equation without violating the default value for tolerance and VIF (Tolerance $\geq$ .93 and VIF $\leq$ 1.08).

The independent variables (MFATOTAL, LIVING, PLANNED, DRUGS, and MATHIV) were entered simultaneous into a regression model predicting health behaviors for pregnancy care (TOTALHPQ). The results displayed in Table 8 indicated that the predictors explained 37% of the variance in maternal health behaviors for pregnancy care ($R^2 = .37$). Maternal-fetal attachment, living marital status and planned pregnancy status were found to be significant predictors of health behaviors for pregnancy care. Maternal-fetal attachment made the largest unique contribution ($\beta = .50$), followed by living marital status ($\beta = -.275$), and planned pregnancy status ($\beta = .227$). Maternal-fetal attachment and planned pregnancy status are positively related to health behaviors for pregnancy care, whereas living marital status has an inverse relationship with this maternal health behavior. The regression model supports the research hypothesis that maternal-fetal attachment, history of drug use, marital relationship status, planned pregnancy status, and timing of HIV diagnosis will independently predict pregnancy care among women living with HIV/AIDS. For this outcome variable, the null hypothesis is rejected in favor of the alternative hypothesis.

ART adherence. A standard multiple regression was used to assess the ability of maternal-fetal attachment (MFATOTAL), living marital status (LIVING), planned pregnancy status (PLANNED), history of substance use (DRUGS) and timing of HIV diagnosis (MATHIV) to predict the health behavior of ART adherence during pregnancy (HIVVL_III). This study hypothesized these five independents variables will predict

Table 8

Predictors of Health Behaviors for Pregnancy Care

Variable	Pregnancy Care			
	B	SE B	β	*t*
Maternal-fetal Attachment	0.34	0.07	0.50	5.07***
Living marital status	-3.96	1.41	-0.28	-2.81**
Planned pregnancy status	3.44	1.46	0.23	2.36*
History of Substance Use	-1.55	1.41	-0.11	-1.09
Timing of HIV Diagnosis	0.62	1.71	0.04	0.37
$R^2 = .370$				
Adjusted $R^2 = .325$				
F = 8.226 ***				

Note. N = 76

* $p < .05$. ** $p < .01$. *** $p < .001$.

ART adherence—the second outcome variable of the study hypothesis—during pregnancy and each will contribute uniquely to this prediction.

The evaluation of assumptions prior to this analysis led to the transformation of the original outcome variable (HIVVL_III) into a new ART medication adherence and virologic response variable (log_HIVVL3), which effectively reduced skewness and kurtosis, and improved the fit between the distribution of this variable and the assumptions of multivariate regression analysis. The criteria recommended by Tabachnick and Fidell (2001) were used to evaluate assumptions in the regression analysis of the (log of) viral load (ART adherence) variable. The histogram for (log of) viral load (ART adherence) improved further into a normal distribution when assessed in the regression analysis. The residuals scatterplot approximated a rectangular shape and the normal probability plot moved towards the diagonal line, both suggested no major violations of normality. In addition, the value for Durbin-Watson statistics (2.1) calculated in this regression analysis further indicated the non-correlation of residuals. None of the cases had a value in excess of the Mahalonis distance critical value (critical χ^2 at α = .001 for 5 df is 20.52); therefore, no multivariate outliers were identified in this regression analysis. The hypothesized model in this solution missed to predict the medication adherence measure for one case (PID 55); however, the maximum value for the observed Cook's distance statistic indicated this case did not unduly influence the results for the model as a whole (Pallant, 2010). All the predictors show weak relationship with the (log of) viral load (ART adherence) variable, the highest correlation among them was .22. Nevertheless two of these correlations reached statistical significance (Table 9). All variables entered the equation without violating the default

Table 9

Correlation Matrix for Predictors of (log of) viral load (ART Adherence)

Variable	1	2	3	4	5	6
1 Medication Adherence	–					
2 Maternal-fetal Attachment	-.07	–				
3 Marital partner status	-.06	.23*	–			
4 Planned pregnancy status	-.22*	-.07	.04	–		
5 History of Substance Use	-.01	-.01	.13	.05	–	
6 Timing of HIV Diagnosis	.08	.03	-.03	.12	.12	–

*p < .05.

value for tolerance and VIF (Tolerance ≥ .93 and VIF ≤ 1.08), further indicating absence of multicollinearity among the variables.

As shown in Table 10, the model tested in this regression analysis failed to predict (log of) viral load (ART adherence); however it revealed a medium effect size in the association between the maternal-fetal attachment model and this measure of ART adherence (R^2 = .067). The regression model was not consistent with the research hypothesis that maternal-fetal attachment, history of substance use, marital relationship status, planned pregnancy status, and timing of HIV diagnosis will independently predict undetectable viral load among pregnant women living with HIV/AIDS. Thus, the null hypothesis cannot be rejected for the second outcome variable.

Total infant screening clinic visits. A standard regression tested the alternative hypothesis that maternal-fetal attachment (MFATOTAL), living marital status (LIVING), planned pregnancy status (PLANNED), history of substance use (DRUGS) and timing of HIV diagnosis (MATHIV) will predict the health behavior of attendance to the infant HIV screening clinic visits after birth (TOTLVSTS_1). This maternal health behavior is the third outcome variable of the study hypothesis.

The evaluation of assumptions in this regression analysis used the criteria recommended by Tabachnick and Fidell (2001) and results revealed no cause for concern. The plot of the distribution of residuals suggested no major violations of normality. Outliers were evaluated using the Mahalonis distance (critical χ^2 at α = .001 for 5 df is 20.52), and no outliers exerted undue influence in the results of this analysis. All the predictors show some relationship with the TOTALVSTS_1 variable, and the

Table 10

Predictors of Health Behaviors for (log of) viral load (ART Adherence)

Variable	(log of) Medication Adherence			
	B	SE B	β	*t*
Maternal-fetal Attachment	-.007	.012	-.076	-.568
Marital partner status	-.047	.255	-.025	-.184
Planned pregnancy status	-.497	.276	-.236	-.1.80
History of Substance Use	-.010	.256	-.005	-.040
Timing of HIV Diagnosis	.277	.336	.108	.825

R^2 = .067

Adjusted R^2 = -.017

F = .801

Note. N = 62

correlation between history of substance use and this outcome variable revealed a small to medium inverse correlation (Table 11; r = -.29). This correlation was also the highest one among predictors in this regression analysis. Further, the presence of multicollinearity was ruled out because all variables entered the equation without violating the default value for tolerance and VIF (Tolerance ≥ .91 and VIF ≤ 1.1).

As shown in Table 12, the model tested in this regression failed to predict attendance to the screening visits for infant care; however this relationship showed a medium to large effect size (R^2 = .128). The regression model was not consistent with the research hypothesis that maternal-fetal attachment, history of drug use, marital partner status, planned pregnancy status, and timing of HIV diagnosis will independently predict postnatal infant care among pregnant women living with HIV/AIDS. Thus, the null hypothesis cannot be rejected for the third outcome variable.

Exploratory analyses

A last set of post-hoc analyses explored correlations on the outcome variables across selected descriptive variables, beyond the initial hypothesis. Given the mixed results in the main analyses, these analyses aimed to identify hints for potential analyses in future studies. In addition, it explored differences between Hispanic and non Hispanic participants among predictor and outcome variables. Exploratory findings are presented in Tables 13, 14, and 15. The findings of post-hoc analyses are discussed in Chapter VI.

Table 11

Correlation Matrix for Predictors of Attendance/Test to Postnatal Care Visits

Variable	1	2	3	4	5	6
1 Total infant care visits	–					
2 Maternal-fetal Attachment	.13	–				
3 Marital partner status	-.14	.14	–			
4 Planned pregnancy status	.09	-.06	.03	–		
5 History of Substance Use	-.29*	-.13	.18	.10	–	
6 Timing of HIV Diagnosis	.07	-.01	.02	.14	.18	–

*p < .05.

Table 12

Predictors of Health Behaviors for Postnatal Care Visits

Variable	Attendance to Infant Care Visits			
	B	SE B	β	*t*
Maternal-fetal attachment	.012	.01	.12	.87
Marital partner status	-.21	.27	-.11	-.78
Planned pregnancy	.26	.31	.12	.84
History of Substance Use	-.55	.28	-.28	-1.96
Timing of HIV Diagnosis	.27	.33	.11	.80

$R^2 = .128$

Adjusted $R^2 = .035$

$F = 1.38$

Note. N = 53

Table 13

Correlations between outcome and other selected variables

Variable	1	2	3	4	5	6	7	8	9
1 Pregnancy Care	–								
2 (Log) Med Adherence	-.31*	–							
3 Total Infant Visits	.22	-.31*	–						
4 Ethnicity	.20	-.34**	.13	–					
5 PNC Entry	-.14	.42**	-.14	-.06	–				
6 MFA	.47**	-.07	.13	.09	-.22	–			
7 Stage of HIV disease	-.23	.01	-.03	.04	.26*	-.05	–		
8 Years of Diagnosis	-.11	.00	-.03	.02	-.27*	-.01	-.08	–	
9 Total PNC visits	.36**	-.57**	.18	.29*	-.75**	.31*	-.32**	.04	–

Note. All correlations are 2-tailed

*$p < .05$. ** $p < .01$.

Table 14

Comparison of maternal-fetal attachment and outcome variables by ethnicity

	Hispanic		Non-Hispanic			
Variable	M	SD	M	SD	*t*	D
Maternal-fetal attachment	91.69	9.7	89.68	10.8	.79	.19
Pregnancy Care	84.92	6.1	81.98	7.4	1.74	.40
Medication adherence	1.10	.33	1.77	1.09	-3.6***	-1.01
Infant Care	3.32	.82	3.06	1.04	.92	.26

*** $p = .001$

Table 15

Comparison of predictor variables by ethnicity

Variable	Hispanic % (n = 26)	Non Hispanic % (n = 50)	Total % (N = 76)	χ^2	Phi
Marital partner status				1.83	.16
Yes	50 (13)	34 (17)	39.5 (30)		
No	50 (13)	66 (33)	60.5 (46)		
Hx of substance use				4.91*	.25
Yes	53.8 (14)	28 (14)	37 (28)		
No	46.2 (12)	72 (36)	63 (48)		
Timing of HIV dx				.28	.6
Before pregnancy	77 (20)	82 (41)	80 (61)		
During pregnancy	23 (6)	18 (9)	20 (15)		
Planned pregnancy status				2.11	.15
Yes	42 (11)	26 (13)	32 (24)		
No	58 (15)	74 (37)	68 (52)		

*$p < .05$

CHAPTER V: LIMITATIONS

This study contains important limitations and strengths. The key limitations are summarized in this section, and in the next chapter, some of them are discussed further in relation to the literature. The lack of random sampling of participants is an overarching limitation of this study; however, the choice of a non random sample may be appropriate given the population of interest and the theoretically conceived hypothesis of this study (Kam, Wilking, & Zechmeister, 2007). Therefore, the statistical analyses performed in this investigation aim to provide estimate of effect sizes rather than inferences of population parameters (Hunter & May, 1993; Smith M., 2009). The interpretation of findings discusses effect sizes rather than the statistical significance of the tests. Although participants were not randomly sampled, they represent 50% and 43% of the population of pregnant women in the PRIM clinic and Miami Dade County, respectively. Nonetheless, the potential biases in the sample investigated here are discussed ahead.

The presence of social desirability bias in the administration of instruments assessing self-reported maternal-fetal attachment and health behaviors during pregnancy is another important limitation in this study. Given the high scores observed for most of the women in the scales measuring these variables, women may have responded as they thought it was socially expected of them. However, their actual maternal-fetal attachment or health behaviors may not conform to these responses to the interview questions. This discrepancy may have affected the measurement of these predictor or outcome, and could explain why the data would only partially support a reasonable study hypothesis of a prospective relationship between maternal-fetal attachment and maternal health behaviors for medication adherence and infant care.

The conflating of ART adherence and virologic response is another limitation of this study. Adherence to ART is a highly complex combination of behaviors, and 100% adherence (or >90%-95% doses consumed) is neither necessary nor sufficient to achieve an undetectable viral load, even when resistance to antiretroviral agents is excluded (C. Beck-Sague, personal communication, February 7, 2014). Undetectable viral load depends to a considerable degree on regimen (e.g., lopinavir/ritonavir containing regimens more often result in undetectable viral loads, and are far more "forgiving" of missed doses than nevirapine containing regimens) (C. Beck-Sague, personal communication, February 7, 2014). The operational definition of the medication adherence variable to only this one indirect measure, instead of studying and reporting the association of maternal-fetal attachment with pill-count adherence measures and maternal report (both of which could have given a more multifaceted and direct view of adherence), limits the ability to detect an association.

The inclusion of only those pregnant women with HIV who attended the PRIM clinic, and the exclusion of those attendees who spoke only Creole may have excluded some potential participants of higher socioeconomic status or of various ethnic or racial background, especially Haitian-American. However, unexpectedly, the high mean MFA score found in this sample correspond more to findings from samples of uninfected pregnant women belonging to higher socioeconomic status, than to a multi-site sample of similar HIV infected pregnant women matched on demographic characteristics to their uninfected peers (Ethier et al. 2002; Lindgren, 2001). These inclusion and exclusion criteria may have added inaccuracies to the description of the HIV-infected pregnant women portrait in this sample.

The subsamples used in the analyses attempting to predict pregnancy-related health behaviors, ART medication adherence, and attendance to postnatal infant care visits decreased in size across time from 76 at data point Time1 to 53 participants at data point Time 3. Whereas the lack of random sampling voids the issue of sample size related to adequate power, several actions were taken in this study to prevent sample attrition across the data collection points of this prospective study and assess effects under optimal circumstances (Hansen & Collins). Finally, a study, such as this one, focused on assessing effect sizes in a nonrandom small sample of pregnant women with HIV/AIDS may be valuable in the early stages of researching the association between maternal-fetal attachment and maternal health behaviors among these women (Kam et al., 2007; Slavin and Smith, 2009).

Some of the study instruments or measures used in this study may not have been as valid or reliable as anticipated. Whereas the recoding of the variable measuring attendance to postnatal screening visits for infant care may have captured some of the nuances in measuring this maternal health behavior, the over-simplicity of this measurement counts among the limitations in this study. Whereas the total maternal-fetal attachment scale (MFAS) appeared reliable in this study, the dimensionality of maternal-fetal attachment as conceptualized in the MFAS may need revision (Muller and Ferketich, 1993). The MFAS may include too many items related to the pregnancy state and the motherhood role instead of attachment to the fetus (Van den Bergh & Simons, 2009). The composition of items in the MFAS could have diminished the ability of this instrument to actually measure relevant dimensions of maternal-fetal attachment among participants (Van den Bergh & Simons). The modified 20-item HPQ-II scale used in this

study to measure maternal health behaviors for pregnancy care showed less reliability than the full 34-item HPQ-II scale. Although the 20 items included in the shorter version were carefully selected based on reliability analyses conducted by Lindgren (2005) for the full HPQ-II scale, and cultural competency considerations; the abbreviated HPQ-II scale may need revision to improve its reliability for use in future research with women from diverse ethnic, racial and socio-economic backgrounds.

Finally, the fact that a single investigator conducted all the stages of this prospective study and monitored the quality of its implementation may have created unrealistic conditions that could never be replicated on a large scale study. Slavin & Smith (2009) opines that this phenomenon of "superrealization" often affects the external validity of small studies, and may limit its reproducibility.

CHAPTER VI: DISCUSSION

This study was conducted in an effort to fill gaps in the existing literature regarding the examination of an association between a maternal-fetal attachment model and health behaviors and response to ART during pregnancy and childbirth among women living with HIV/AIDS. The integration of the developmental concept of maternal-fetal attachment to examine its role in predicting health behaviors from a strength-based and a socioecological perspective has not been explored in the relevant literature; therefore, results of this study offer a meaningful contribution to the knowledge base. Also, the understanding of a comprehensive socioecological maternal-fetal attachment model with respect to the health behaviors of women with HIV/AIDS has begun to take shape. This understanding, alternative or complementary to the medical model, may open additional opportunities for assessment and intervention of health behaviors in these women.

This chapter interprets and discusses the findings of this study. First, some general issues related to the recruitment, data gathering and the clinic setting of the present study are discussed aiming for transparency in the interpretation of findings and reproducibility of the analyses (Smith, 2009). Second, main descriptive findings are summarized and compared to previous research of pregnant women with HIV/AIDS or, in some instances, to normative populations in the U.S. Third, findings regarding the tri-fold research question are examined in light of the current HIV and maternal-fetal attachment research literature, and the contrast between a maternal-fetal attachment model and a prevalent medical model of prenatal and postnatal care, particularly in high risk pregnancies.

The Clinic Settings and the Recruitment Process

The task of recruiting a sample of HIV-infected pregnant women and their newborns from the local obstetric and pediatric clinic population was at least as challenging as anticipated during the preparatory stages of this research study, even for a PI who is affiliated, directly or indirectly, to these clinics. The first challenge was the recruitment of participants from an already limited pool of potential eligible women to ascertain a large enough sample. At the conclusion of the study, 110 (70%) of the approximately 157 women who attended the obstetric clinic from January 2012 to December 2013, were invited to participate because they met eligibility criteria, and 82 (75%) of the 110 were recruited. These relatively high recruitment rates could be attributed to decisions by the PI to extend the recruitment process by 5 months and separate the consenting process from the actual enrollment in the study at 24 weeks or longer gestation. Despite the relatively high recruitment rates, it remains unknown how many of the 47 women who attended the PRIM clinic and were not invited to participate met eligibility criteria. Secondly, this study underestimated the refusal rate (25%, 28/110) among the invited potential participants. Although some of the 28 women expressed reasons for declining participation (Figure 1), the reasons for many of them remain unknown because they did not verbalize them. In interpreting the findings, it would have been helpful to know in what ways the women who declined participation differed from those who volunteered to participate, along descriptive and study variables characteristics. Third, in several occasions the PRIM clinic also functioned as an HIV counseling resource for women diagnosed with HIV during pregnancy. In these cases, the PI was asked to coordinate with the health practitioners and postpone recruitment until

confirmation of an HIV diagnosis through laboratory results. If unconfirmed, these women were ineligible for the study; if confirmed the recruitment may have been postponed even longer until the woman is properly counseled on her HIV diagnosis and all necessary medical or psychological procedures were completed. This additional step in the recruitment of women diagnosed with HIV during pregnancy may explain the unexpected low percentage of newly diagnosed participants in this study.

Considering the exclusion criteria in this study, one could assume that most of the ineligible women only spoke Creole and were of a Haitian ethnic or cultural background. Whereas the inclusion of these women in this study could have described the sample of HIV-infected pregnant women more accurately, the added cultural and ethnic or disease trajectory heterogeneity to an already diverse sample could have reduced the effect size of some of the analyses performed in this study (Hansen & Collins, 1994). Some monolingual Haitian-American women may face similar and different life circumstances impacting the trajectory of their pregnancies and HIV disease than those faced by the African-American, Hispanic-American, and bilingual Haitian-American who participated in this study. For example, similar to Hispanic-American women, they may face language and immigration status barriers in accessing prenatal or HIV care on a timely basis.

The reasons expressed by some women to decline participation and other relevant observations from the PI were logged in the study notebook. Were some of these women who declined study participation because of the low monetary incentive for participation of higher socio-economic status than those who participated? Others may have declined because they chose to keep private issues of substance use, investigation from child protection, domestic violence, or tentativeness or ambivalence about their pregnancy.

Had they been included in the study, would some or all of these issues possibly change the results reported here? Even the ethnicity of the PI may explain the low rate of decline participation among Hispanic-Americans compared to African- and Haitian-Americans. Finally, the differing clinic setting and the contrasting circumstances of the newly and previously diagnosed women may have precluded the recruitment of the newly diagnosed woman in favor of the previously diagnosed ones; possibly explaining a bias in this direction.

During this study period, an estimated 53 infants were born to HIV-infected mothers in Miami Dade County who did not attend the PRIM clinic but received prenatal care somewhere else, or who did not receive prenatal care anywhere else (PRIM/Screening, 2013). These mothers also pose challenging questions in interpreting the findings in this study. One can only speculate that these women may belong to the two extremes of the socioeconomic status spectrum. On the one hand, some with higher incomes may have used private or public health insurance to access private obstetric clinics in their communities for prenatal care. On the other hand, some with lower incomes or simply uninsured women may have experienced these or other psychosocial barriers precluding access to any prenatal care. One can only wonder how else these women would have differed from the participants in this study on the measures taken to describe the sample or run the hypothesis-testing analyses; and how, if included, they would have changed the findings of this study.

Prior to interpreting the findings related to the maternal attendance to the screening clinic visits for infant care, the screening protocol process itself deserves some discussion. A mother who regularly brings her infant to the appointments scheduled in

the screening clinic for the prevention of HIV transmission demonstrates optimal maternal health behavior, even maternal caregiving. However, circumstances beyond her volition could have explained irregular or no-attendance at her infant's HIV-related medical appointments (E. Santana, personal communication, December 31, 2013). Financial factors commonly reported by participants and recorded in the infant medical records included: (a) lack of health insurance coverage for the visit itself or the HIV PCR laboratory test for the infant; (b) delays in accessing health coverage for the infant; (c) conflicts in health insurance coverage between services provided by the regular pediatrician and the specialized HIV pediatric care; and (d) transportation to the clinic site. Other women reported adverse life circumstances that interfered with the time sensitive screening protocol including: (a) hospitalization or other medical complications involving mother or infant, (b) feared or actual intervention from child welfare authorities, (c) maternal drug-related foster care placement for the infant and (d) maternal incarceration. Other less tangible but equally troublesome factors that disrupted the maternal care of the women in this sample were lack of family support and the stigma related to a maternal HIV diagnosis. For example, some mothers coped with the perceived stigma by taking the infant to the screening clinic because they preferred to keep the HIV diagnosis private from the pediatrician or their own families. Other mothers, perhaps those with experience from a previous pregnancy, do not attend the scheduled screening clinic visits; however, they coordinated with the nurse from the screening clinic to complete the sequence of HIV PCR tests in a timely manner at the office of the regular pediatrician selected by or assigned to the mother. Finally certain mothers neither attend the scheduled screening visits nor coordinate for the pediatrician

to perform the tests; in these instances the screening clinic social worker calls the local child protection program to report the mother for medical neglect. Furthermore, some of the pediatricians practicing in the community refuse to perform or monitor the HIV screening protocol for their patients, and instead they prefer that these patients attend the screening clinic. An international qualitative study in Kenya analyzed the thematic content related to routinely taking children to HIV care (Wachira et al., 2013). They found that this decision involved multiple levels of intrapersonal, interpersonal, community and health system factors, which intertwined in complex ways to affect the decisions of Kenyan mothers to take their children to HIV care. Even considering the remarkable differences in cultural, socioeconomic and health care for HIV disease environments between the U.S. and Kenya, Wachira's et al. (2013) findings resemble the psychosocial ecology of the HIV-infected mothers found in this sample. One might ask if this study's measure of attendance to the screening visits assesses maternal health behaviors for infant care and captures the nuances of the experience faced by mothers living with HIV/AIDS. When assessing maternal health behaviors for infant care, the regular attendance of the infant's screening clinic appointments, and the no-attendance but completion of the HIV tests on time elsewhere appear to be equivalent behaviors in demonstrating protective attachment to their infants (A. Garcia, personal communication, September 30, 2013). Any intervention aiming to reduce the frequency of incomplete screening protocols for HIV-exposed infants by promoting maternal health behaviors for infant care could benefit from including at least some of these multi-level factors (Wachira et al., 2013).

Characteristics of Pregnant Women with HIV/AIDS

When compared with findings from other similar samples of HIV-infected pregnant women studied in previous research, findings on the socio-demographic, pregnancy-, and HIV-related characteristics of this sample could be interpreted within the context of changes, or lack of changes, in the evolution of the HIV epidemic in the U.S. over the last 30 years. The critical review of these descriptive findings aims to provide an update about an under-researched group of women, at high risk for poor maternal health behaviors and disrupted mother-infant attachments.

Socio-demographic characteristics. The pregnant women in this study were low-income Black or African-American, or Hispanic in the peak of the childbearing years, living in metropolitan Miami. These demographics parallel the general population of HIV-infected women in the U.S. in 2010 (The Kaiser Family Foundation, 2013) and concur with the demographics reported in previous studies, even those dating back to the late 1980s, investigating ART adherence or quality of prenatal care in similar samples (Bardeguez et al., 2008; Ethier et al., 2002; Mellins et al., 2008 Turner et al., 1996). This finding is consistent with public health surveillance reports indicating a persistent disproportionate impact of HIV disease on minority women, compared to their representation in the overall population of females in U.S. census (Kates et al., 2013). In contrast, most of the participants in this study reported a higher educational level (i.e., High School or more) than HIV-infected pregnant women sampled in previous research studies (i.e., less than high school education; Cohn et al., 2008; Ethier et al., 2002). The findings regarding housing arrangements indicated a trend towards stability for the women in this study compared to descriptions on this demographic characteristic in

earlier research (Ethier et al. 2002). Unfortunately, the advantages in educational achievements and housing arrangements for the participants in this study did not appear to translate into higher socioeconomic status. Although outside of the scope of this study, the persistent health disparities in HIV disease incidence and access to health care comes through in the descriptive characteristics of this sample, and may shed some light in understanding the findings of this study.

Measures of the marital partner status and the history of substance use variables were included in the maternal-fetal attachment model because they capture participants' socio-demographic characteristics, which are theoretically and empirically associated to the maternal health behaviors investigated in this study (Burns et al., 2008; Demas et al., 2005; Mellins et al., 2003; Riley et al., 2011). Most of the participants in this study reported being single or not living with a marital partner, regardless of this partner being the father of the infant they were expecting. Our finding differs from the demographics reported in previous research, which indicate a more even split or greater likelihood of reporting a marital relationship among pregnant women living with HIV/AIDS (Ethier et al., 2002; Mellins et al., 2008).

The findings in this sample regarding history of substance use compared to earlier reports suggest similarities in the use of licit (smoking and alcohol) and illicit drugs (marihuana, cocaine, crack-cocaine, or injection) among HIV-infected pregnant women during the 30 years history of the HIV epidemic (Cohn et al., 2008; Ethier et al., 2002; Turner et al. 1996). However, the drug of choice reported by the participants may have changed. Specifically, the women in this study did not report any history of injection drug use, which at the beginning of the HIV epidemic was the main transmission mode for

women; injection drug use was from the earliest days of the epidemic a known risk factor for AIDS and for HIV infection (CDC, 1982; Bardaguez et al., 2008; Ethier et al., 2002). Aside from the four women who reported acquiring HIV from their own mothers, heterosexual intercourse was the main mode of transmission for the participants in this study, and they learned their HIV diagnosis while receiving prenatal care for the current or previous pregnancies.

Pregnancy-related characteristics. Contrary to the findings reported by Ethier et al. (2002) from research conducted between 1996 and 1999, and similar to those findings from an investigation conducted between 2002 and 2005 by Cohn et al. (2008), the majority of participants did not plan this pregnancy (68%). Among those women reporting unplanned pregnancies, 54% reported not preventing it either. The women's perceptions about HIV as a chronic, versus a terminal illness, and the efficacy of the protocol to prevent mother-to-child HIV transmission may have led to lower vigilance in safe sex and reproductive planning practices. Ironically, advances in HIV prevention of mother-to-child transmission and treatment may explain the observed rising percentage of unplanned pregnancies. In addition, the percentage of unplanned pregnancies reported in this sample by far exceeds the U.S. proportion of pregnancies (37%) unintended at the time of conception, but resembles the proportion of unintended pregnancies among non Hispanic Black, unmarried, and low-income women, who were overrepresented in this sample (Mosher, Jones & Abma 2012).

The findings of this study regarding frequencies of early prenatal care (i.e., pregnancy-related care beginning in the first trimester of pregnancy; 37%), low birth weight (17%) and preterm birth (18%) among the women in this sample compared

favorably to the findings reported by Turner et al. (1996) after examining prenatal care and birth outcomes in a large cohort (N = 2254) of HIV-infected women delivering infants between 1985 and 1990 (20%, 28%, and 23%, respectively); and unfavorably with recent U.S. indicators of maternal and infant health (83.7 %, 8.1% and 12%, respectively; March of Dimes, 2013). On the one hand, the favorable comparisons could lead to the conclusion that HIV-infected women now practice improved health behaviors to access prenatal care early and reduce the frequency of low birth weight and premature birth among their newborns. On the other hand, a large gap still exists between the rates of specific maternal and infant health indicators observed in this sample, and those calculated for all recent births in the U.S. (March of Dimes, 2013). However, macro-structural factors must be considered in the interpretation of these results (Riley et al., 2011; Turner et al.). For example, the lack of health insurance associated with poverty often delays women's entry into prenatal care, regardless of their motivation; and the health disparities associated with the racial or ethnic background of participants may perpetuate this gap beyond their control. The findings reported by Ethier et al. (2002) on the proportion of HIV-infected women who registered into prenatal care at or before 19 weeks gestation (i.e., early entrants; 78.7%) is comparable to the findings of this study (74 %). This similarity strengthens the argument presented above, in favor of HIV pregnancy outcomes similar to the U.S. norm, because by extending the criterion for early entrants into prenatal care by 6 weeks of gestation (i.e., from 13 to 19), the proportion of women in this category moves further away from Turner et al. (1996) findings toward the U.S. parameter of maternal and infant health.

Consistent to findings in the research literature regarding the caregiving responsibilities of women living with HIV, most of the participants in this study (82%) are caregivers for one or more children, often singlehandedly (Murphy et al., 2002; Kates et al., 2013). Only 12% of the women reported this pregnancy as their first. The frequent deliveries by caesarean sections (68%) assessed in this sample are more than twice the rate reported for the U.S. population in 2010 (32.8%; March of Dimes, 2013). However, the protocol for the prevention of the mother-to-child HIV transmission indicates the use of this type of delivery in reducing the risk for transmission in women who have not achieved a low or undetectable viral load (DHHS Panel on Treatment of HIV-infected Pregnant Women and Prevention of Perinatal Transmission, 2011). This indication may explain the elevated frequency of cesarean deliveries in this sample.

HIV-related characteristics. Consistent with findings reported in previous studies, including those with time frames in the early 2000s, the majority of women in this sample strive for health during pregnancy, and become healthier as indicated by biomarkers (low HIV viral loads and high CD4 cell counts) assessed before delivery (Bardaguez et al., 2008; Cohn et al., 2008; Mellins et al., 2008). Also most women were diagnosed only with HIV disease not AIDS at the beginning of pregnancy (Bardaguez et al., 2008; Cohn et al., 2008; Mellins et al., 2008). Indeed, the impressive advances in the treatment of HIV disease with antiretroviral medication, and the protocols for the prevention of mother-to-child transmission afford women the benefits of health during pregnancy and beyond, for them and the infants they are expecting. This benefit assumes the women access prenatal care early, attend scheduled prenatal care visits, and adhere consistently to prescribed medication regimens. An additional challenge for researchers

regarding the majority of women has been to identify barriers and facilitators that will help them sustain this rush to health beyond pregnancy, after childbirth, and extend it to the care of the infant (Bardeguez et al., 2008; Mellins et al. 2008). Then, social workers could develop effective interventions aiming to remove barriers and promote facilitators for the sustained health and wellbeing of these mothers and infants. Ickovics et al. (2002) found a decline in medication adherence from pregnancy to the postpartum period, from low to very low; however, in contrast to findings in this and previously discussed studies, they reported low adherence during pregnancy. The 31% of women in this sample who show detectable amounts of viral load and low CD4 counts could be interpreted in this study as having poor adherence and/or poor response to the prescribed ART regimens. The clinical and psychosocial situations of this group of women pose multiple challenges for health practitioners, such as engaging and maintaining them in prenatal care, promoting medication adherence to lower their viral loads, and planning an optimal delivery for the prevention of mother-to-child transmission. This may be the same group of women who also challenge pediatric practitioners by showing inconsistent attendance or completion of HIV PCR test during postnatal screening visits for the infants.

Compared to findings reported by Ickovics et al. (2002), this study found a smaller number of women learning about their HIV diagnosis during this pregnancy (37% and 20%, respectively). This difference in newly diagnosed women at a given pregnancy fits the decline in new cases of HIV infection among women for the year 2010 reported by the CDC (The Kaiser Family Foundation, 2013). Although the majority of women in this sample learned about their HIV diagnosis before this pregnancy, they had lived less than six years with the disease. The relatively small number of years since

diagnosis parallel findings from studies conducted in the early to mid 2000s, and contrast with the findings from studies conducted in the late 1900s.

Summary. Findings regarding sociodemographic, pregnancy, and HIV disease characteristics among this sample of pregnant women with HIV suggest an evolution parallel to the evolution of the HIV epidemic in general. The minority ethnic and racial composition, the low income levels, and the use of substances may have persisted among women coping with pregnancy and HIV/AIDS. Conversely, the level of education, and some indicators of less severe and advanced HIV disease such as high rate of undetectable viral loads, low rates of AIDS diagnosis, and newly diagnosed women may have improved since the beginning of the HIV epidemic. This improvement appears to approximate today's HIV-infected mothers to some of the normative indicators of maternal and infant health such as early entry into prenatal care, and rates of premature births or low birth weights among HIV-exposed infants. Whereas Black and Hispanic indigent HIV-infected pregnant women appear healthier now than in past years of the HIV epidemic, still more work remains to be done before they could enjoy the full benefits of the advances in HIV medicine (Riley et al., 2011).

Associations Between Maternal-Fetal Attachment and Health Behaviors

In contrast to the medical model used in previous studies to investigate health behaviors—mostly adherence to antiretroviral medication—among this population of pregnant women, the maternal-fetal attachment model used here represents a socioecological and developmental model to assess health behaviors across time from mid pregnancy to 16 weeks after childbirth. This model investigates the health behaviors of HIV-infected women from a strength-based, instead of a deficit-based framework;

includes facilitators for optimal, instead of only risks for poor, health behaviors; and developmentally extends the scope of health behaviors beyond medication adherence to measures of health behaviors for pregnancy and infant care (Saleebey, 2006). The study findings partially support the potential protective role of maternal-fetal attachment among HIV-affected mothers and infants against poor maternal health behaviors.

This study found that a maternal-fetal attachment model predicts the health behaviors related to pregnancy care among HIV-infected pregnant women; however only three of the five predictors (i.e., maternal-fetal attachment, living with a marital partner status, and planning the pregnancy status) contribute substantially to the large effect size observed in this predictive relationship. The hypothesized model failed to predict the health behaviors associated with antiretroviral medication adherence and virologic response, and infant care across time. However, the effect sizes observed in the relationships between the maternal-fetal attachment model and these maternal health behaviors ranged, respectively, from medium to medium-large. These findings offer only partial support to the study's hypothesis; however they add emerging credence to similar associations suggested in the qualitative research literature (Ciambrone et al., 2007; D'Auria et al., 2006; Kelly et al., 2012; Njie-Carr et al., 2013). It also suggests potential benefits in attending to the relationship a woman has with her unborn child perhaps as an additional component of her prenatal care to possibly help resolve her struggles with health behaviors. Does attending to this prenatal relationship promote her health behaviors by focusing on the woman-identified aspirations and possibilities, rather than the expert-identified barriers and problems (Saleebey, 2006)? Are health practitioners missing the opportunity to address an influential dimension in the experiences of HIV-

infected women, at least during pregnancy? The following discussion of main results considers these questions, and raises further questions about the fitness of the maternal-fetal attachment model tested here.

Pregnancy care. This study found a large effect predictive relationship between the maternal-fetal attachment model and the health behaviors for pregnancy care, and maternal-fetal attachment made the strongest contribution in predicting this health behavior outcome. This study is original in examining a maternal-fetal attachment model on the health behaviors of pregnant women with HIV/AIDS. Lindgren (2001) found a weaker significant predictive relation of a different maternal-fetal attachment model examining the health behaviors of a completely different sample of pregnant women: uninfected, White, highly educated women of high socioeconomic status. Together, the findings from these two samples suggest that the higher the stakes in the pregnancy, the stronger the influence of maternal-fetal attachment in predicting optimal health behaviors. Second, it suggests that HIV-infected pregnant women who have stronger attachment to the unborn child on average take better care of their health during pregnancy. However, one cannot necessarily imply from this finding that a woman with high levels of maternal-fetal attachment would protect her unborn child against the transmission of HIV, and other adverse pregnancy outcomes, by practicing optimal prenatal health behaviors.

Any of the limitations identified earlier may explain this finding rather than the existence of a true predictive relationship between maternal-fetal attachment and this first maternal health behavior. For example, the positive association could be attributed to the overlap in the items included in the scales measuring maternal-fetal attachment (MFAS)

and health behaviors for pregnancy care (HPQ-II). However, despite the uncertainties in interpreting a finding from regression analysis from one single study, it still represents a promising research path for building knowledge about this association. Future replications may consider the strengths and limitations of this study to further explore this relationship. They could first investigate variables (e.g., timely access and adequate duration of prenatal care) not explored in this study, which may have even a more important influence than maternal-fetal attachment on maternal health behaviors. Still 63% of the variance in the proposed linear model of health behaviors remains unexplained, not an unusual result in modeling complex behaviors.

Furthermore, cautiously avoiding over interpretation of the contributions from each of the predictors in the maternal-fetal attachment model, the analysis of the predictor variables could also be promising in researching maternal health behaviors among women with HIV/AIDS. Specially those emerging as potential predictors of maternal health behaviors for pregnancy care, marital partner and planned pregnancy statuses. The finding regarding the marital partner living status is consistent with several isolated reports from the research literature linking single parent status, or lack of social support, in general, to poor health practices among HIV-infected women (Demas et al., 2005; Mellins et al., 2003). Napravick et al. (2000) using a deficit-based framework found that lack of support and unplanned pregnancy were among the most important barriers for HIV-infected women in accessing prenatal care. However, when extrapolating and comparing findings from previous research one must be critical about several issues related to definitions of the predictor variables, and ecological differences among the cohorts of HIV-infected women investigated in each study.

Nevertheless, the finding regarding these two predictors of maternal health behaviors could be tentatively interpreted from the logic of the strength-based maternal-fetal attachment model for the women in this sample. Some of the women in this sample who live with a marital partner may experience this relationship as emotionally supportive, a major resource during pregnancy (Dunkel-Schetter's et al., 2001). Especially, in the context of HIV disease, experiencing a supportive marital relationship may alleviate the isolation and stigma still associated with this disease (Saleebey 2006). The marital partner or the relationship itself, may motivate, or facilitate the practice of optimal prenatal health behaviors (Lindgren, 2001). Alternatively, accounting for the negative direction between this predictor and prenatal health behaviors in the entire maternal-fetal attachment model, one could interpret that in the absence of a supportive marital relationship a woman draws hope from the affectionate relationship with her unborn child (Lindgren, 2001). Then, her investment on adopting a healthy life style becomes a paramount task. Does maternal-fetal attachment take a more central role in predicting prenatal health behaviors when a woman lacks the support of a marital partner? Does this finding suggest the hypothesis of a buffering effect of maternal-fetal attachment on the adverse circumstances in the experience of HIV-infected pregnant women?

When a woman plans a pregnancy while coping with HIV disease, she makes a very purposeful, potentially life transforming decision. Implicit in this decision is her intention to take charge of her health, her future, and perhaps her dreams of becoming a mother (Kelly et al., 2012). A planned pregnancy brings along a strong attachment to the child she expects, an impetus to adopt healthy life styles, and a willingness to adhere to

HIV treatments (Njie-Carr et al., 2013). She may invest herself in practicing optimal prenatal health behaviors to protect her child from harm and deliver an uninfected infant. However, only slightly less than a third of the participants in this study planned their pregnancy. Are the women in this sample affected by a now subtle, or perhaps insidious, social stigma supporting the belief that women living with HIV/AIDS should not reproduce or plan for a family? Is this social stigma preventing them from disclosing their HIV status in the context of family planning or reproductive health services in the community, and accessing these services? The policy and practice implications of this possibility are discussed below.

A supportive marital relationship and a planned pregnancy are conceptualized as protective resources for the health practices of pregnant women in general, with and without HIV/AIDS in Dunkel-Schetter's et al.'s (2001) bio-psychosocial theoretical model of stress processes in pregnancy, and the Bronfenbrenner's (1979) socio-ecological theory on child development. One could consider that these predictor variables might even be more applicable in a protective role for the participants in this study. This knowledge has long been part of the theoretical foundation of well-established and efficacious home visiting, maternal-child health, and parenting, prevention and intervention programs for the general population of low-income or minority families in need (Mosher et al., 2012). Interestingly, since its inception, the Healthy People national health initiative has embraced a goal that aims to reduce the percentage of all unintended pregnancies in the U.S. by 2020 (Mosher et al.). The question remains, how do these universal theories and initiatives for pregnant women, mothers and infants apply to the cohort of women in this study?

As the HIV epidemic evolves beyond its third decade, are HIV-infected pregnant women and HIV-affected families becoming more similar to their uninfected counterparts (Ethier et al. 2002)? Or are researchers and practitioners failing to assess subtle but important differences? Should practitioners use the similarities to empower HIV-affected families and also carefully assess the differences, working in partnership with the women, to inquire and respond more effectively to their unique psychosocial needs (Saleebey, 2006)?

The finding about the role of a history of substance use in predicting maternal health behaviors for pregnancy care is difficult to interpret probably because this study included only one question in the analysis of this variable, despite using several questions to measure it. Nonetheless, its contribution to the medium predictive relationship assessed in this regression analysis is minimal. In contrast, multiple studies in the research literature found relationships between poor health behaviors among HIV-infected pregnant women and either a history of substance use, a substance abuse diagnosis, or an active substance use problem (Burns et al., 2008; Mellins et al., 2003; Napravick et al., 2000). Do variables measuring risks for poor maternal health behaviors, such as history of substance use diminish when examined in conjunction with potential protective factors against adversity or facilitators of wellbeing? The task of testing mixed models of risk and protective factors related to maternal health behaviors is complex but it may help elucidate some of the actual dynamics of these factors in the lives of these women.

The predictor variable of the timing of HIV diagnosis (i.e., before or during this pregnancy) remains puzzling. This analysis fails to offer much insight into this variable

probably because only a fifth of the women in this sample reported being diagnosed with HIV during the current pregnancy. In addition, the measurement of this variable consisted on a sequence of three questions, but the response to only one of these questions was included in the analysis. Certainly, this predictor variable needs further exploration in future studies. This predictor was included in the maternal-fetal attachment model mostly for exploratory purposes based on clinical observations and theoretical leads in the literature review describing striking differences between coping styles and impact of diagnosis and disease among the women diagnosed with HIV during or before a given pregnancy (Kotze et al., 2013; Tareq et al. 2012).

Medication adherence. Contrary to the study sub hypothesis, no predictive relationship was found between the maternal-fetal attachment model and the maternal health behaviors for medication adherence in this sample of HIV-infected pregnant women. Some of the limitations of this study may account for this finding; at the same time many of the strengths of this study support the rigor of this specific analysis. Some of these strengths and limitations in the analysis of this maternal health behavior are discussed ahead.

The measurement of adherence to antiretroviral medication in pregnant women is not a simple task. Whereas the HIV-1 viral load counts abstracted from the maternal medical record are considered the most objective and reliable, albeit indirect, measure of levels of ART adherence for the women in the sample. However, limiting this measure only to viral load counts present some challenges, even when these counts were closely monitored across the duration of the pregnancy, in preparation for delivery. A very high viral load after six months of ART would suggest low adherence, while an undetectable

viral load would suggest perfect or close to perfect adherence. However, factors other than medication adherence or related to imperfect medication adherence, but beyond the women's control could explain a high viral load in certain cases. Brief prenatal care time, very high pre-ART initiation viral load, pharmacokinetic issues related to other medically prescribed or alternative medications, or unsuspected antiretroviral resistance are among the factors other than medication adherence, which would account for a high viral load count. For example, a woman entry into prenatal care late in the course of the pregnancy with a high viral load would not allow time to perform an antiretroviral resistance test on her strain, resolve any resistance if needed, and lower her viral load count by the time of her delivery. In other cases, several financial, environmental or psychosocial factors outside of a woman's control could interfere with her ability to access medication or ingest the medication as prescribed (Firth et al., 2012; Riley et al., 2011). For example, gaps in health coverage for prescription drugs, pharmacy mistakes in filling or delays in delivering the medications, lack of food to accompany some of the medications, unexpected hospitalizations for other medical conditions, homelessness, or incarceration compromised the women's ability, in this sample, to adhere to their medication regimen. Information about these factors was available to the PI from the nurses' case notes in the maternal medical record, reports by the PRIM team during pre-clinic conferences, or direct observations in clinic. Additionally, the undetectable HIV-1 viral load counts abstracted from the maternal medical records were recorded by the obstetric practitioners either with numbers (e.g., < 20 or < 50) or letters (ND for non detectable), already reflected each practitioner's personal clinical interpretation of the different sensitivities of the HIV tests used in the lab to detect levels of the virus in the blood specimen (Cobbs et

al., 2011). Recording procedures of the undetectable viral load may have varied by obstetric practitioner, creating inconsistencies which may have led to errors. Nevertheless, many of the difficulties described above were carefully considered and addressed when performing the data abstraction and recording from the maternal medical record or the data screening and log transformation processes on the measurement of HIV viral load in this study. In addition, the distribution of the log transformed HIV viral load data satisfied required assumptions for the use of a parametric test, which in comparison to an alternative non parametric test may prove a more powerful and efficient statistical analysis to test this sub hypothesis.

The rigor of this regression analysis, including the resulting undesirable sample size attrition, could explain the medium effect size assessed for the prospective relationship between the maternal-fetal attachment model and maternal health behavior for medication adherence. On the one hand, an unidentified bias in this non randomized sample may have led to the inaccurate assessment of a medium to large effect size (Slavin and Smith, 2009). On the other hand, avoiding the division of this continuous variable into dichotomous categories of medication adherence (i.e., adherence and non adherence) may have enhanced the rigor of this analysis to detect a medium effect size (Hansen & Collins, 1994). Moreover, the outliers in the distribution of this outcome variable were the women who presented late for prenatal care either with unknown last HIV viral load before delivery, unknown resistance, or very high viral loads. In fact, one of the above cases is listed in this regression analysis output as an unusual one showing a large discrepancy between the predicted and the observed value of (log of) viral load (ART adherence). Although these outliers passed the screening performed here,

recommending against their removal, they may have exerted an undue influence in this multivariate regression analysis. Alternatively, it is possible that a mother was strongly attached to her unborn child, but that other circumstances in her life discouraged her from taking ART during pregnancy and delayed her decision to receive prenatal care until very close to delivery. Finally, the marked heterogeneity of this sample in terms of cultural background and HIV disease trajectory may also have contributed to decreased power to detect the hypothesized association between the maternal-fetal attachment model and maternal health behaviors for medication adherence, as measured by virologic response (Hansen & Collins, 1994).

Assuming for a moment some validity of this and the previous findings, they may suggest that the large effect of the MFA model in predicting the pregnancy-related health behavior does not extend or, at least, fades away in this second health outcome in the hypothesized model. It contradicts suggestions in the qualitative literature of a relationship between maternal prenatal concerns for the health of the fetus and medication adherence during pregnancy (Ekama et al., 2012; Kelly et al. 2012). It argues against the anticipated permeation of pregnancy care to HIV care health behaviors as suggested by Bardeguez et al. (2008). Although participants take care of the pregnancy and the HIV disease at once, reportedly for the benefit of the unborn child, does this finding suggest that the two sets of maternal health behaviors are not connected, or perhaps are of a completely different nature? Is the influence of maternal-fetal attachment on maternal health behaviors short lived and limited to the pregnancy-related behaviors as suggested by Kotze et al. (2013) among South African women diagnosed with HIV during pregnancy?

The variables measuring time of entry into prenatal care, total number of prenatal care visits attended, and ethnicity examined in the exploratory analysis (Table 13) may shed some light on possible lurking variables influencing this prospective relationship. The associations between these variables, maternal-fetal attachment and the (log of) viral load as a measure of adherence are suggestive in different ways. The variables related to entry and duration of prenatal care combined with the expected number of prenatal visits recommended by the American College of Obstetrics and Gynecology for uncomplicated pregnancies, and the gestational age at delivery become the measure of the adequacy of initiation of prenatal care (March of Dimes, n.d.). Then, this measure combined with the adequacy of received prenatal services becomes a summary index measuring adequacy of prenatal care. Turner et al. (1996) and Napravnik et al. (2000) used two different measures of adequacy of prenatal care to assess, respectively, relationships between the adequacy of prenatal care and birth outcomes and optimal utilization of prenatal care among pregnant women with HIV/AIDS. Rachas et al. (2013) also concluded that for some women the short duration of HIV treatment may explain their inability to achieve an undetectable viral load. Interestingly, the exploratory analyses performed in this study show a medium positive correlation between maternal-fetal attachment and the number of prenatal care visits variables (Table 13). The concept of adequacy of prenatal care emerges as promising in the investigation of the health behaviors for medication adherence among HIV-infected women. Furthermore, this construct may help understand, if any exists, the links between maternal-fetal attachment, pregnancy- and HIV-related health behaviors in this cohort of pregnant women.

The correlation between the variable measuring Hispanic ethnicity, and the (log of) viral load could possibly refer to the unique difficulties faced by the Hispanic participants in this study, related to their immigration and/or health insurance status, in accessing early prenatal care or undisrupted antiretroviral medication (Firth et al., 2012). As suggested in the literature, the influential factors on medication adherence seem to be multidimensional and multidirectional, especially when examined prospectively –not only comparatively before and after pregnancy– across the pre and postnatal period for women living with HIV/AIDS (Nachega et al., 2012). The post hoc t test conducted to examine the mean differences between Hispanic and non Hispanic participants on the measure of (log) viral load as medication adherence revealed that the latter exhibited, on average, lower viral loads (higher medication adherence) than the former. The finding of a large effect size of the difference in medication adherence relative to ethnicity adds evidence to the likelihood of above interpretation. The health behaviors of HIV-infected pregnant women and mothers related to antiretroviral medication adherence are embedded in various favorable and adverse psychosocial circumstances, which interact in different ways at different moments of their lives in the period surrounding childbirth (Kotze et al. 2013).

Postnatal pediatric visits. The present study found a non-predictive relationship, and a medium to large effect size between the maternal-fetal attachment model and the maternal health behavior for infant care. Some of the limitations of this study may account for this finding. For example, the use of a random sample and the extension of the study period to accommodate the completion of the screening visits for all 82 recruited participants could have changed the results of this analysis by increasing its

power to detect this hypothesized predictive association. The coding procedure of the variable measuring attendance to the scheduled screening clinic appointments for the infants was revised to accommodate those mothers who do not attend their infants' medical appointments but they manage to have them tested elsewhere. Whereas this revision may have improved the appropriateness of this measure, using attendance and test performed to measure maternal health behaviors for infant care may have been insufficient. Could the medium to large effect size observed in this regression analysis compared to the medium assessed for medication adherence suggest a greater affinity of maternal-fetal attachment with the maternal health behaviors for infant care than those related to HIV care?

A quantitative international study investigated the factors related to maternal adherence to the medical appointments for herself and her infant using a cohort of 169 French HIV-infected mothers in a 24-month longitudinal and retrospective design (Lemly et al., 2007). France and the U.S. are developed countries that invest resources in advancing the medical treatment for HIV disease during pregnancy; however, their health and cultural value systems differ in that the French population has universal health coverage, among some other differences. Comparisons between Lemly's et al. findings and those of the current study may not apply due to these differences; however, the former may still shed some light in attempting to understand the latter. Lemly et al. (2007) found a strong association between attendance to maternal and infant follow up medical visits and, similar to the findings of the current study, the majority of mothers (79% and 77% respectively) demonstrated regular attendance to the follow up medical appointments for their infants. In addition, both studies observed that some mothers did

not adhere to their own treatment, yet they regularly brought the children to their scheduled medical appointments. Similar to the present study, Lemly et al. examined the role of marital living status, defined as living with or without a male partner, in this maternal health behavior; and found that this variable was not significantly associated with the postnatal maternal health behaviors. The secondary role of the marital living status in relation to postnatal maternal health behavior could be interpreted as the relevance of the new emotional support drawn from the attachment to her infant over the relationship to her marital partner. Furthermore, Lemly et al. found that regular attendance to the medical appointments for her and her infant after childbirth were significantly associated with the greater numbers of HIV-related prenatal visits and the prescription of combination antiretroviral therapy (as opposed to zidovudine monotherapy) during pregnancy. Could the frequency of prenatal visits and the number of antiretroviral pills during pregnancy also predict the maternal postnatal health behaviors in the U.S. as it did in the French cohort (Lemly et al., 2007)? Apparently the women diagnosed with HIV before this pregnancy, or even those with more advanced HIV disease, may have an advantage over the women diagnosed with HIV during this pregnancy because the former possibly attend more prenatal visits, earlier in pregnancy, and were more likely to receive combined therapy regimens. If so, the women with pre-pregnancy HIV diagnoses would demonstrate more optimal maternal behaviors for infant care compared to those with new HIV diagnoses. Alternatively, the knowledge and experience of the screening protocol from a previous pregnancy may relax compliance with the current medical appointments. For example, they may skip the third appointment in the protocol knowing that it involves counseling, not HIV DNA PCR testing of the

infant. They may also be less anxious about the screening process, and more trusting of the medical team.

The question still remains unanswered by the findings in this single study: Does the use of a maternal-fetal attachment model hold promise to investigate the connections between the pregnancy- , HIV- , and infant-related health behaviors of HIV-infected women? After all, MFA clearly originates in pregnancy and transforms, in unknown ways for now, into actual mother-infant attachment after childbirth. However, the findings of this study contributed to reassessing the connections between maternal-fetal attachment and medication adherence and response to HIV care as counterintuitive and complex, almost a forced detour in maternal-fetal attachment development; and to explore one potential variable, adequacy of prenatal care, that although not included in the model tested here (Grace, 1989) may influence the predictive relationship between maternal- fetal attachment and maternal health behaviors.

Future Studies

Future investigations could use the strengths and limitations of this study to further examine the relationships between maternal-fetal attachment and maternal health behaviors in pregnant women living with HIV/AIDS. The recruitment of a large randomized, perhaps multi-site sample of pregnant women living with HIV/AIDS would strengthen the external validity of findings and justify the interpretation of the significance of the statistical analyses (Kam et al., 2007). The findings from such sample of participants could be generalized to others within this population. Such study could be extended in duration to maintain the prospective design by either recruiting a larger sample, or allowing for the completion of the 16-week screening protocol after the birth

of all infants whose mothers were recruited in the study, or both (Hansen & Collins, 1994). Future studies could consider the translation of instruments into Creole and reaching out to other private or public obstetric clinics in the community to recruit more inclusive samples than the one used in this study.

Future research may need to refine the conceptualization of the MFA construct, further exploring its different dimensions (e.g., protection of the fetus, motherhood role, and attributions of characteristics to the fetus). Future studies could consider the use of structured interviews to assess a qualitatively dimension of maternal-fetal attachment (e.g., The Pregnancy Interview-Revised; Slade, 2007) in addition to its quantitative characteristics. The use of multi-measure approaches could improve the measurement of maternal health behaviors for medication adherence and pregnancy care. For example future studies could combine HIV viral load and other more direct measures of medication adherence such as self-report, electronic monitoring, pill count or pharmacy refills to add validity to this measurement (Williams et al., 2013). They could use a revised abbreviated HPQ-II scale, or the 34-item version of the HPQ-II scale to improve the reliability of this instrument.

Future studies investigating the maternal health behavior for infant care could use a more comprehensive measurement of this outcome variable instead of only attendance to the screening visits or completion of the HIV test for the infant, as done in this study. Such composite measure of maternal health behavior for infant care could include other indicators of postnatal maternal caregiving (e.g. mother-infant attachment) or variables measuring the psychosocial barriers interfering with maternal caregiving (e.g., health insurance coverage).

Summary

The main hypothesis regarding a prospective relationship between maternal-fetal attachment, other relevant predictors, and health behaviors for pregnancy care, ART adherence and infant care was only partially supported by the findings in this study. The predictive relationship between the maternal-fetal attachment model and the pregnancy-related health behaviors showed a large effect size. Maternal-fetal attachment, marital partner status, and planned pregnancy status contributed in that order to the predictive ability of the model. This model did not predict the maternal health behaviors related to ART adherence and virologic response or infant care. However, the relationships observed between these variables and the maternal-fetal attachment model showed a medium to large effect. The concept of adequacy of prenatal care emerged in the exploratory analyses as promising to further investigate the prospective relationships hypothesized in this study.

CHAPTER VII: IMPLICATIONS FOR SOCIAL WORK

The theoretical relevance of MFA to the prevention of poor health behaviors and suboptimal infant care by promoting prenatal maternal caregiving and postnatal attachment seems well grounded. This investigation found a large predictive association between maternal-fetal attachment and other relevant predictors and the maternal health behaviors for pregnancy care among pregnant women with HIV/AIDS, from a strength-based and socio-ecological developmental framework. Altogether, the theoretically conceived predictor variables, the prospective design, medical record-abstracted objective measures of health behaviors, a back translation of study instruments into Spanish, and an infant-related outcome variable utilized in this study ensured a reasonable level of internal validity. At conceptual, practical, and policy levels, this study dovetails with the aims of infant mental health interventions and child maltreatment prevention agendas. Some implications for research, interventions and policy suggested by the findings are presented next.

Research

The overall findings of the present study suggest the need for additional research to further explore the potential role of maternal-fetal attachment in predicting the maternal health behaviors among women with HIV/AIDS. The maternal-fetal attachment experience of these pregnant women appears associated to their health behaviors, at least those related to pregnancy care; yet very little is known about this dimension of their pregnancy (Lindgren 2001). Future studies could further assess the full scope of their maternal-fetal attachment experience, including which dimensions of this experience impact their health behaviors during pregnancy and after childbirth. The current findings

revealed that the majority of participants experience high levels of maternal-fetal attachment and practice high levels of pregnancy-, HIV-, and infant-related maternal health behaviors. However, given the limitations of this study the prospective relationship between maternal-fetal attachment and maternal health behaviors remains unclear. Maternal-fetal attachment showed a large effect size relationship to the pregnancy-related maternal health behaviors in this sample of women, but further investigation is necessary to examine the influence of maternal-fetal attachment and other predictors on HIV- and infant-related maternal health behaviors.

The measurement of the living marital status, history of substance use variables, and maternal health behaviors for infant care may need refinement relevant to the cohort of women in this study in order to ascertain predictive relationships between MFA and maternal health behaviors. The use of follow up questions to measure the supportive or problematic characteristics of the marital relationship of the women, or the extent and nature of the substance use history could help elucidate the role of these predictors on maternal health behaviors. In addition, the use of a composite measure to measure the maternal behaviors for infant care would collect additional relevant data about this variable. Such measure could include other indicators of postnatal maternal caregiving like a mother's planning for infant care in anticipation of barriers, or the mother-infant attachment itself. For example, one participant arranged for a family member to bring her infant to the screening clinic appointment because she was temporarily incarcerated for a domestic violence incident. A composite variable could also measure the psychosocial barriers interfering with postnatal maternal caregiving such as health insurance difficulties to access the screening visits or HIV testing for the infant, hospitalizations or

medical complications for mother or infant, or lack of family support due to the secrecy and stigma surrounding HIV disease.

The current exploratory findings suggest the possible relevance of the variables measuring time of entry into prenatal care and total number of prenatal care visits, to further explore prospective relationships between maternal-fetal attachment and maternal health behaviors among this cohort of HIV-infected women (Napravick et al., 2000; Turner et al., 1996). Conceptually, these two variables fall in the realm of the construct defined as 'adequacy of prenatal care' in the pregnancy literature. Future studies could consider the inclusion of this construct in exploring prospective relationships between maternal-fetal attachment and maternal health behaviors before and after childbirth among women with HIV/AIDS.

A study using qualitative methods could contribute new conceptual material regarding the possible relationships between maternal-fetal attachment and maternal health behaviors by collecting detailed narratives on the maternal-fetal attachment experience and their choices of health behaviors (Njie-Carr et al., 2013). Do women choose optimal health behaviors when their maternal-fetal attachment experience reflects a strong affiliation with their unborn child, and grounds itself in other past childhood and present adult secure attachments (Slade, 2007)? A qualitative study may also capture the nuances and complexity of measuring the maternal health behavior for infant care from the women's perception. Finally, it could be useful to replicate Lemly's et al. (2007) with a U.S. cohort of HIV-affected mother and infant pairs to simultaneously investigate attendance to maternal and infant follow up HIV-related medical appointments.

This study contributes to the existing research literature examining the health behaviors in pregnant women living with HIV/AIDS by introducing the use of a socio-ecological, strengths-based and developmental approach. Maternal-fetal attachment represents a theoretical shift from a medical deficit-based model to a developmental strength-based model, and the integrated approach offers an alternative or complementary framework to the exclusive medical approach, most often found in the relevant research literature. Previous studies examined the maternal health behaviors in HIV-infected women almost exclusively by comparing measures of ART adherence during and after pregnancy (Demas et al., 2005; Ikovicz et al., 2002). A maternal-fetal attachment integrated approach opens the door to examining a wider range of maternal health behaviors (i.e., pregnancy-, HIV-, and infant-related) prospectively across time. On the one hand, a medical model examines and interprets health behaviors from the lens of HIV disease, an unfortunate occurrence in the lives of these mothers. On the other hand, when using a maternal-fetal attachment model, the perspective becomes that of a woman preparing to give birth and nurture her infant, while coping with HIV/AIDS (Bywaters 1986). In the long term, this integrated approach could lead to the implementation of innovative and interdisciplinary research in the fields of HIV/AIDS, maternal and child health or the socio-emotional development of young children. Some of these research teams could reach out to the HIV-affected families in the communities where they live and conduct participatory research investigating the potential prospective relationship between maternal-fetal attachment and maternal health behaviors.

Practice

Social work practitioners could benefit from the findings of this study when working with HIV-affected families during pregnancy or after childbirth, in or outside health care settings. They could revise their work with HIV-infected mothers based on an increased awareness of a potential relationship between the clients' maternal-fetal attachment experience and their health behaviors. In revising their work, practitioners may include a developmental dimension to assessing the complex situations reported by HIV-infected pregnant women, or intervene from a socio-ecological and strength-based perspective which would be complementary or alternative to the medical model typically practiced in most health care settings (Bywaters, 1986). In fact, social work practitioners working with these families in any setting may welcome the theoretical framework of this study due to its compatibility with the principles of medical social work and infant mental health (NASW standards for social work practice in health care settings, 2005; Shonkoff & Phillip, 2000). Future research examining the health behaviors of these women from a maternal-fetal attachment model may help guide practitioners in designing and delivering interventions or programs aiming to protect against poor maternal health behaviors by promoting prenatal and postnatal attachments and maternal caregiving (Barbosa & Bezerra, 2011). For example, the women diagnosed with HIV during pregnancy most likely lack the knowledge of HIV disease and the experience in coping with this disease, in addition to providing this information, they may benefit from working on issues related to maternal-fetal attachment, marital relationship, and planned pregnancy status to improve their health behaviors during pregnancy. The maternal sensitivity and reflective functioning that equips a mother to effectively read and respond to the cues of her infant

could be extended downward to the prenatal period by facilitating maternal-fetal attachments (Shin, Park, & Kim, 2006; Slade, Sadle, & Mayes, 2005).

Policy

The descriptive findings of this study urge social workers and other public health professionals to advocate for those policies in the national agenda to fight HIV/AIDS in the U.S. that favor an increase in early access to prenatal and follow-up care for the mothers and postnatal HIV-related care the infants (The White House Office of National AIDS Policy, 2010). This advocacy work should include those policies which remove barriers to access family planning and reproductive health services for HIV-infected women, such as lack of health care insurance or perceived stigma. Finally, given the findings of a predictive relationship between planned pregnancy status and maternal health behaviors for pregnancy care, social work advocates should support the aim of the Healthy People national health initiative to reduce all unintended pregnancies in the U.S. by 2020 (Mosher et al., 2012). It is worth noticing that from a public health perspective the prevention of unintended pregnancy dovetails the prevention of HIV transmission.

The descriptive findings of this study suggest the need to advocate for those policies, such as the Part D legislation in the Ryan White CARE Act, the main HIV law in the U.S. which allocates resources addressing the subsistence and socio-ecological needs of HIV-infected mothers, the developmental needs of their affected infants, and the socio-emotional health of the mother-child relationship. The collaborations between Part D programs and other universal child welfare or maternal child health federal programs addressing unstable housing, poverty, unemployment, and substance abuse in minority communities should focus in facilitating the improved health and long-term wellbeing

among HIV-affected families (Hernandez & Potocky, in press). These findings also suggest that social work practitioners must advocate for universal federal or state policies that facilitate the provision of stigma-free services for HIV-affected families to prevent unintended pregnancies, promote maternal child health or detect early developmental delays. Moreover, advocates should work in partnership with the HIV-infected mothers to ensure that these preventive programs respond effectively to their unique psychosocial needs, and expand their options in availability of service (Saleebey, 2006). For example, existing early intervention programs (e.g. Early Steps or Healthy Start) could detect socio-emotional developmental delays or attachment problems early in a HIV-affected family and deliver, or facilitate access to realistic and reasonable remedies (Malee et al., 2011).

In sum, an effective social work advocacy agenda for HIV affected mother and infant dyads must include: a) the coordination of resources between federal laws governing HIV programs and universal maternal child health, mental health and child welfare policies to address the specific needs of HIV-affected families; b) advanced outreach efforts to engage HIV-affected families into programs that provide the services they need; and c) increased responsiveness of all service programs to the special needs of these underserved and under researched families (Hernandez & Potocky, in press; Salisbury, 2000; The White House Office of National AIDS Policy, 2010).

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APPENDICES

Appendix A
PID# _____ **Maternal Chart Review**

Review Date: _____

Lab findings:

HIV Viral load at enrollment: _____ Date_____

Last HIV Viral load before delivery: _____ Date_____

Viral resistance testing: □ Yes □ No □ N/A

Resistance resolved: □ Yes □ No

Pregnancy HIV Medication Adherence Classification:

□ High adherence= HIV VL ≤ 40-75

□ Low adherence= HIV VL > 40-75

HIV disease stage during pregnancy:

□ HIV infection (Class A or B) □ AIDS (Class C)

□ Number of years since HIV diagnosis _____

Prenatal care entry: □ First Trimester (0-13 weeks)

□ Second Trimester (14-27 weeks)

□ Third Trimester (≥28 weeks)

Maternal age at delivery: _____

Appendix B

PID#_____ Infant Chart Review

Review Date: _____

Attendance to infant's screening clinic visits:

2-week appointment: □ Yes □ No Date_____

4-week appointment: □ Yes □ No Date_____

6-week appointment: □ Yes □ No Date_____

16-week appointment: □ Yes □ No Date_____

Infant Care Adherence Classification:

□ Poor Adherence=0-2 visits

□ Good Adherence=3-4 visits

Appendix C

PID#_____ SOCIO-DEMOGRAPHIC SURVEY

Date of Birth: _____ Survey Date: _____
MM/DD/YY MM/DD/YY

Educational level: □ Less than 9th grade □ Some high school □ High School/GED
□ Some college □ Bachelor's degree or more

Income: □ less than $10,000 per year □ $10,001-30,000 per year □ More than 30,000 per year

Race: □ American Indian or Alaska Native □ Asian □ Black or African American
□ Native Hawaiian or other Pacific Islander □ White
Ethnicity: □ Hispanic or Latino □ Not Hispanic or Latino
***Marital partner status**: □Yes __Married living with partner __Single living with partner
□ No __Married not living with partner __Single not living with partner
Problems with partner: □ Yes □ No

Gestational age: _____ weeks
***Planned pregnancy**: □ Yes actively planning
□ No ___Actively preventing __ Not preventing/not planning
Number of previous pregnancies: □ None □ One □ Two or more
Number of live births: □ None □ One □ Two or more

***History of drug use**: □ Yes □ No
Smoking: __ Six months before pregnancy __Year before pregnancy
Alcohol use: __Six months before pregnancy __Year before pregnancy
Marijuana use: __ Six months before pregnancy __Year before pregnancy
Cocaine use: __Six months before pregnancy __Year before pregnancy
Ever injected any drug: __
Other: __

***HIV diagnosis**: □ perinatal transmission □ before pregnancy □ during pregnancy

* Indicates predictor

Appendix D. Maternal-Fetal Attachment Scale (MFAS)

PID# _____

Please respond to the following items about yourself and the baby you are expecting. There is no right or wrong answers. Your first impression is usually the best reflection of your feelings. Make sure you mark only one answer per sentence.

I THINK OR DO THE FOLLOWING:	DEFINITELY NO	NO	DON'T KNOW	YES	DEFINITELY YES
1. I talk to my unborn baby.					
2. I feel all the trouble of being pregnant is worth it.					
3. I enjoy watching my tummy jiggle as the baby kicks inside.					
4. I picture myself feeding the baby.					
5. I'm really looking forward to seeing what the baby looks like.					
6. I wonder if the baby feels cramped in there.					

7. I refer to my baby by a nickname.					
8. I imagine myself taking care of the baby.					
9. I can almost guess what my baby's personality will be from the way she/he moves around.					
10. I have decided on a name for a baby girl.					
11. I do things to try to stay healthy that I would not do if I were not pregnant.					
12. I wonder if the baby can hear inside me.					
13. I have decided on a name for a baby boy.					
14. I wonder if the baby thinks and feels "things" inside of me.					
15. I eat meat and vegetables to be sure my baby gets a good diet.					

16. It seems my baby kicks and moves to tell me it time to eat.					
17. I poke my baby to get him/her to poke back.					
18. I can hardly wait to hold my baby.					
19. I try to picture what the baby will look like.					
20. I stroke my tummy to quiet the baby when there is too much kicking.					
21. I can tell when the baby has hiccups.					
22. I feel my body is ugly.					
23. I give up doing certain things because I want to help my baby.					
24. I grasp my baby's foot through my tummy to move it around.					

Appendix E. PID#_____ Health Practices Questionnaire

Circle the one answer that best describes your actions since you found out you were pregnant. I know that sometimes you are prevented from doing things the way you planned because of, for example, illness, nausea, or medical necessity. If these special circumstances apply to you, answer questions by thinking about what you did before the problem occurred that required you to change your actions.

1. Since becoming pregnant, I think I am practicing a healthy lifestyle: never rarely sometimes often always

2. Since becoming pregnant, I have gotten at least 7 to 8 total hours of sleep a night: never rarely sometimes often always

3. Since becoming pregnant, I drink more than 2 caffeinated beverages (coffee, tea, colas, or soda in a day: never rarely sometimes often always

4. Since becoming pregnant, I have used marijuana: never rarely sometimes often always

5. Since becoming pregnant, I have used cocaine, crack cocaine, amphetamines or speed, LSD, heroin, or inhalants: never rarely sometimes often always

6. Since becoming pregnant, my partner and/or I have had sex with other people: never rarely sometimes often always

7. Since becoming pregnant, I take actions that reduce my risk for getting sexually transmitted diseases (for example, I have used condoms or avoided intercourse): never rarely sometimes often always

8. When I have questions about my pregnancy or there is something I don't understand I ask my doctor or midwife: never rarely sometimes often always

9. Since becoming pregnant, I have read food labels to be sure I am buying an item that will be good for me and my baby (for example, not too high in salt or fat, avoiding artificial sweeteners, and good sources of vitamins): never rarely sometimes often always

10. Since becoming pregnant, I have limited or avoided exposure to toxic chemicals and other substances (for example, second-hand smoke, insecticides / pesticides, lead in drinking water):

never rarely sometimes often always

11. Since becoming pregnant, I have taken my multivitamins or prenatal vitamins (if recommended by your doctor or midwife):

never
1 to 2 times a week
3 to 4 times a week
5 to 6 times a week
daily or not recommended

12. Since becoming pregnant, I have smoked cigarettes:

never smoke
quit since finding out I was pregnant
less than 10 cigarettes daily
11 to 20 cigarettes daily
more than a pack a day

13. Since becoming pregnant, I have had alcoholic beverages (wine, beer, or liquor):

no alcoholic drinks while pregnant
before knowing I was pregnant
less than 3 times a month
1 time a week
more than 1 time a week

14. Since becoming pregnant, at one sitting I usually drink (a drink is equal to a 12 ounce bottle of beer, 4 ounces of wine or a shot of liquor):

no drinks while pregnant
1 drink
2 drinks
3 drinks
more than 3 drinks

15. I began seeing my doctor or midwife for prenatal care:

to plan a pregnancy before conception
in the first 3 months of pregnancy
before 5 months of pregnancy
before 7 months of pregnancy
before 9 months of pregnancy

16. Since becoming pregnant, I have: (Missed appointment means forgot to schedule or didn't show up for an appointment with my doctor or midwife):

never missed an appointment
missed one appointment
missed 2 to 3 appointments
missed 4 to 5 appointments
missed more than 5 appointments

17. Since becoming pregnant, I have talked with friends and family member to learn more about pregnancy and childbirth.

never
less than one time a week
1 to 2 times a week
3 to 5 times a week
more than 5 times a week

18. Since becoming pregnant, I have taken time to do something relaxing for myself:

never
less than or one time a month
2 to 3 times a month
4 times a month (weekly)
more than 4 times a month

19. Since becoming pregnant, I have gained the amount of weight recommended by my doctor or midwife for this time in pregnancy:

I have lost weight
I have gained too little or too much weight
I have not gained or lost weight
I do not know
I have gained the right amount of weight

20. I have attended or plan to attend childbirth classes

definitely yes
no, I have taken them before
not sure
probably not
definitely not

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PUBLICATIONS AND PRESENTATIONS

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