Examining the Traits-Desires-Intentions-Behavior (TDIB) Model for Fertility Planning in Women Living with HIV in Ontario, Canada

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Abstract

The objective of this study was to determine the predictors of fertility behavior (i.e., trying to become pregnant) in a large representative sample of women living with HIV of reproductive age in Ontario, Canada. The Traits-Desires-Intentions-Behavior model was used to examine the key predictors of reproductive decision making and behavior. A total of 320 women living with HIV were included in the current analysis. The women living with HIV were between the ages of 18 and 52 (mean = 37.23, SD = 7.53), 56.4% had at least one child living in the home, over 40% identified as being of African ethnicity, and the average time since HIV diagnosis was 10.49 years (SD = 5.71). In hierarchical multilevel analysis, perceived family support for trying to become pregnant, living in a large metropolitan city (i.e., Toronto), women's fertility desires, and fertility intentions were associated with fertility behavior ($\chi^2_9 = 59.97$, $p < 0.001$). As only 10.6% of participants reported engaging in fertility-related behavior, while 57.5% intended a pregnancy in the future, identifying barriers to fertility and discrepancies between intentions and behaviors can support policy programs and assist health care providers to better facilitate the fertility goals of women living with HIV.

Introduction

THE REPRODUCTIVE DECISION-MAKING of women living with HIV is important due to the transition of HIV from an acute to a chronic infection, the increasing number of women living with HIV,¹ and the high rates of fertility desires within this population.^{2,3} Recent data suggest that women living with HIV in North America have strong reproductive desires and intentions.^{2,4,5} In one study of women living with HIV of reproductive age, 69% of women reported the desire to have children and 57% intended to have children.² Additionally, in a sample of adolescent females living with HIV, 70–80% report a desire to have a child now or some time in the future.⁶ Pregnancy desires and childbearing motivations among young women living with HIV are comparable to women who are not HIV positive.⁷

Finger et al.⁸ found that history of victimization as a child, having fewer living children, decreased disclosure of HIV status, increased likelihood of sexual intercourse and oral sex, and decreased condom use are correlated with desire for

pregnancy in sample of young women living with HIV. These data point to the need for services and fertility treatment plans to help women living with HIV to act on their reproductive intentions in a way that promotes their own health and avoids vertical transmission. Although the desires and intentions of women living with HIV to have children have been well examined in the past, less is known about the fertility-related decision-making factors associated with reproductive behavior.

The Traits-Desires-Intentions-Behavior (TDIB) framework has been used to describe fertility-related decision-making to assess reproductive motivations and behavior among a general population of women⁹ and in a truncated format with HIV-positive populations.⁵ The TDIB model is one of several frameworks that can be used to understand pregnancy-related decision-making. For instance, other researchers have used the Theory of Planned Behavior, a framework outlining predictors of intentions and behavior that has also been extended to pregnancy planning.^{10,11} Other general theoretical frameworks that have been applied to

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fertility behavior include the Purposive Action¹² and Theory of Commitment.¹³ Although general models are useful for understanding pregnancy decision-making, theories specific to fertility planning provide more tailored guidance to the selection of predictors, and hence our decision to use the TDIB model.

The model outlines stable motivational dispositions (traits) that interact with the cognitive constructs of desire (want) and intention (plan) to have a child, and in turn these factors contribute to reproductive behavior. Traits include age and ethnicity.^{2,3,5} Among HIV-positive populations, part of this model was assessed, but this model did not include behavior.⁵ Finnochario-Kessler and colleagues⁵ found strong support for the first three steps of the TDIB model and the associations between traits, desires, and intentions in their American sample of predominantly African American women living with HIV. The same authors also found higher knowledge of vertical transmission of HIV, no prior AIDS diagnosis, and high perceived partner desire for a child were associated with higher desire and intention.¹⁴ Only a third of the sample reported having personalized conversations with their health care provider about reproductive planning, and of that third, two-thirds of the women reported that they had initiated the conversation. Women who initiated conversations with their health care providers about personalized fertility planning were less likely to have a discrepancy between fertility desires and intentions.¹⁴ A qualitative study further confirmed these data showing that only 25% of women living with HIV have discussed pregnancy-related behaviors with their HIV health care provider. The in-depth interviews revealed that the women recognize the risk associated with conception, yet the majority failed to discuss it with their health care provider.¹⁵ In addition, given the large number of unplanned pregnancies among women living with HIV,¹⁶ there is clearly a growing need for appropriate services and care for this population.¹⁷ Understanding the fertility desires, intentions, and behaviors enables essential preconception consultation with health care providers, including reducing risk of fetal HIV transmission, improving maternal, partner and fetal health, and discontinuing the use of teratogenic HIV medications, such as efavirenz, before conception.¹⁴ Advanced clinical interventions, such as the planned use of anti-retroviral medications during labor and delivery, have been found to significantly reduce perinatal HIV transmission,¹⁸ and therefore carefully planning reproductive behaviors can significantly reduce the risk of horizontal HIV transmission.

Data from Finnochario-Kessler and colleagues^{5,14} coupled with analyses examining fertility decision-making in women living with HIV in Ontario, Canada^{2,19,20} have identified the following traits as being important to examine in terms of fertility decision-making: age, family support for having a child, importance of motherhood, African ethnicity, having been born in Canada or not, being on teratogenic HIV medications, and place of residence (e.g., large urban center). Additionally, traits such as number of children currently living with the woman, being in a romantic relationship or not, having an undetectable viral load or not, and current use or non-use of HIV medications need to be considered. Each of these traits may influence whether women would contemplate reproduction. These traits, however, have not been examined within the TDIB framework to determine how collectively and independently each factor is associated with

reproductive decision-making. Examining the factors that influence pregnancy-related decisions and behavior may help health care practitioners to provide better service to women living with HIV by understanding how motivational trait variables can be discussed and addressed in terms of pre-conception planning.

An improved understanding of the relationship between specific traits, fertility desires, intentions, and behaviors is particularly important due to the disconnect between desires and intentions for women living with HIV, and the negative mental health consequences that this disconnect may have on the women.¹⁹ For instance, lack of social support may be one of the barriers accounting for the marked decrease between desires and intention.¹⁹ Further, experiencing judgment from family and friends for trying to become pregnant is associated with increased reports of symptoms of anxiety.²⁰ Understanding the full trajectory, therefore, from general demographic variables or stable motivational dispositions (traits) to reproductive behavior allows for a better understanding of the complexity of the fertility decision-making process, any barriers that are in place, and for targeted public health policy and programs to be developed for women living with HIV.

The current study seeks to examine both the complete TDIB model as a model of pregnancy-related behavior and the predictive utility of this model among women living with HIV. Further, the focus is to determine if there is a need to focus clinically on a specific phase in order to fulfill the reproductive desires of women living with HIV in a Western, high-income country context. This study adds to the literature by investigating pregnancy-related decision-making and reproductive behavior using the TDIB theoretical model through the endpoint of the model (reproductive behavior).

Previous analyses indicate that there is a disconnect between desire and intention for women living with HIV, due to the presence of HIV stigma or lack of social support,¹⁹ but that strong fertility-related intentions remain despite barriers to reproductive medical care. We were interested in examining whether the TDIB model holds through behavior, despite this discordance between desire and intention, for women living with HIV. Identifying the factors associated with reproductive behavior, coupled with the very high rates of fertility intentions in this population and in other high-income contexts,^{2,4} would point to a need for comprehensive fertility services for women living with HIV that acknowledge the traits, desires, intentions, and reproductive behavior, as well as the barriers to this behavior faced by women living with HIV.

Methods

Study design and participants

This cross sectional study is part of a larger study that examined the fertility demands of women of reproductive age living with HIV.² The study received ethics approval from Ryerson University and Women's College Hospital (Toronto, Canada). A geographically representative sample of 445 women living with HIV were recruited through convenience sampling from 28 community-based AIDS Service Organizations, eight medical and HIV clinics, and two community health centers in Ontario, Canada between January 2008 and March 2009. To participate in this study, women had to be: (1) HIV-positive; (2) biologically female; (3) between the ages of 18 and 52 (the reproductive age range

was determined by consulting fertility clinics); (4) living in Ontario, Canada; and (5) able to read either English or French.

Procedures

The community-based AIDS Service Organizations and other participating sites invited all eligible women to complete a self-report questionnaire. Women provided written informed consent prior to completing the questionnaire assessing fertility desires, intentions, behaviors, and associated traits and demographic characteristics. The questionnaire was offered in both English and French. Utilizing a back-translation design, the French translated version of the questionnaire was verified by native speakers of French, including French speaking women living with HIV, to ensure the comparability of the questionnaire in both languages.²¹ An advisory committee comprised of community members, medical professionals, researchers, psychologists, and other HIV care-providers were appointed to facilitate the design of the questionnaire. Focus groups and feedback from 20 women living with HIV were used as a check to ensure that the questionnaire was relevant to women living with HIV from the community, thus supporting the ecological validity of the questionnaire. Participants were compensated \$25, debriefed, and provided with information on community resources.

Demographic characteristics

The questionnaire assessed several demographic characteristics including ethnicity, age, educational attainment, income, place of birth, and current city of residence. The women were also asked to report length of time since HIV diagnosis, viral load, CD4 cell count, whether the participants were in a romantic or sexual relationship, the number of children they currently lived with, and the number of children to whom they had ever given birth.

Traits

The following measures were created for the purpose of the study, but were based on the work of Ogilvie et al.,⁴ Oladapo et al.,²² Chen et al.,²³ and Morin et al.²⁴

Importance of being a mother. To assess the importance of motherhood to the participant, the following 4-item scale was generated for the purpose of this study:²⁵ (1) "Being a mother is important to me;" (2) "I think I would feel fulfilled by caring for children;" (3) "I feel that being a mother would increase my self-esteem;" and (4) "Children give meaning to life." Items were presented on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree). Cronbach's alpha for the scale in this sample was 0.90.

Support from family for trying to become pregnant. The item assessing participants' perceived support from family members for trying to become pregnant was created specifically for the purpose of this study. The item was verified with the Community Advisory Board and was pilot tested to support its ecological validity. The question was: "My family wants me to become pregnant," and the responses were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Desires to become pregnant

General desire to become pregnant was assessed with the following questions, created for the purpose of this study: (1) "I have thought about becoming pregnant in the future;" (2) "I would like to become pregnant in the future;" (3) "I would have an abortion if I became pregnant;" and (4) "I would like to learn more about fertility technologies and options for people with HIV." Items were assessed on a 5-point Likert-type scale from 1 (strongly disagree) to 5 (strongly agree). Cronbach's alpha for the scale in this sample was 0.80.

Intentions to become pregnant

The intentions to become pregnant item was created for this study and determined the number of children the women intended to have. The question assessing this construct was: "How many children do you expect to give birth to in the future?" For the analyses, this question was dichotomized into no intention for children (0) and intentions for one or more child/ren (1).

Pregnancy-seeking behavior

Pregnancy-seeking behavior was defined for this study as actions towards trying to conceive. Women responded yes or no to the question "I have stopped using any birth control method in the past 12 months in order to become pregnant."

Data analysis

All statistical analyses were performed on PASW Statistics 19.0.²⁶ The missing data were excluded using list-wise deletion. Bivariate analyses were examined to determine whether trait variables were associated with fertility desires, fertility intentions, and pregnancy-seeking behavior. A hierarchical, multivariable logistic regression was conducted with pregnancy-seeking behavior as the outcome variable, using the significant correlates in bivariate analyses. The multivariable logistic regression model was conducted to identify the demographic and psychosocial variables associated with pregnancy-seeking behavior among women living with HIV. Step one of the model included the identified trait characteristics, step two included fertility desires, and step three added fertility intentions, to make up the TDIB model. Multicollinearity was not detected as all standard error scores were below two, and calculated variance inflation factor (VIF) scores were below 10.²⁷

Results

Study population

From the 445 participants who were recruited into the study, two women were excluded because they were not of reproductive age (age > 52 years), and 20 participants were excluded due to missing data on the pregnancy-seeking behavior outcome question. An additional 103 participants had missing data on other variables included in the TDIB model used for the multivariable analysis, and were therefore excluded from the analyses. Three hundred and twenty participants were therefore included in the final analyses. Expectation-maximization (EM) estimation was conducted to determine if the missing variables were missing at random (MAR).²⁸ EM estimation was conducted with fertility

desires, intention, and pregnancy-seeking behavior, support of family members for becoming pregnant, importance of being a mother, age, residing in Toronto, having been born in Canada or not, being of African ethnicity or not, and currently being on efavirenz medication. The EM estimation indicated that the missing variables were missing completely at random ($\chi^2_{28}=27.82$, $p=0.47$), as an EM estimation with $p<0.05$ indicates that missing variables depended on other values. Therefore, the missing responses can be excluded from the analyses without compromising the quality of the data.

The mean age of the sample was 37.23 years ($SD=7.53$). On average, participants had been diagnosed with HIV for 10.49 years ($SD=5.71$). The largest percentage of the population identified as being Black or African (41.3%, $n=132$), while 21.5% identified as being British or European ($n=69$), 16.3% as North American ($n=52$), 12.8% as Caribbean ($n=41$), 7.8% as Aboriginal ($n=25$), and the remaining 13.7% ($n=44$) identified as Asian, Hispanic/Latina, Middle Eastern/North African, or "other". Participants were also able to identify multiple ethnicities on the questionnaire, and 43 participants (13.4%) endorsed this option and indicated a multi-ethnic identity. Over half of the women indicated that they had at least one child living in the home with them (56.4%, $n=180$), and over two-thirds of the women reported that they had ever given birth (70.3%, $n=225$). Fertility desires among the sample were high with an average score of 15.16 out of a possible 20 (mean response was 4.04, or "agree") ($SD=4.25$) on the measure of fertility desires. Thirty-four women indicated they were currently trying to become pregnant (10.6%). See Table 1 for demographic and clinical characteristics.

Bivariable analyses

Pearson correlations were conducted between fertility desires, intentions, behaviors, and each of the key trait variables identified. Each of the identified key trait variables was significantly associated with fertility desires and fertility intentions. Higher scores on traits of the importance of motherhood, stronger family support for becoming pregnant, and lower age were associated with pregnancy-seeking behavior. Fertility desires, intentions, and behavior were all significantly associated with each other. See Table 2 for a full description of the bivariable analyses.

Multivariable analysis examining the TDIB model

The results of the hierarchical, multivariable logistic regression testing the TDIB model with pregnancy-seeking behavior as the outcome variable are presented in Table 3. All of the trait variables significant at $p<0.05$ from the bivariate analyses were included in Block 1. Specifically, in Block 1, family support for becoming pregnant and living in Toronto were uniquely associated with pregnancy-seeking behavior ($\chi^2_7=37.42$, $p<0.001$), and these variables accounted for 22.4% of the variance. In Block 2, fertility desires were added, and the variable was also statistically significant ($\chi^2_1=16.83$, $p<0.001$) and associated with pregnancy-seeking behavior, improving the model by 9.3%. Fertility intentions were added in Block 3, and this variable was also statistically significant ($\chi^2_1=5.73$, $p=0.017$) and it further improved the model by 3.0%. Lastly, in the final model, family support for trying to become pregnant, living in Toronto, fertility desires, and fertility intentions were uniquely associated with reproductive-

TABLE 1. DESCRIPTIVE AND CLINICAL CHARACTERISTICS ($N=320$)

Variable	Range	Mean	SD
Age	18–52	37.23	7.53
Length of time since diagnosis (years)	2–26	10.49	5.71
Importance of being a mother	4–20	17.46	3.66
Family support to become pregnant	1–5	2.72	1.44
Fertility desires	4–20	15.16	4.25
	N (yes)	%	
Sexual orientation			
Heterosexual	275	85.9	
Bisexual	23	7.2	
Lesbian	5	1.6	
Other	5	1.6	
Ethnicity ^a			
African	132	41.3	
British or European	69	21.5	
North American	52	16.3	
Caribbean	41	12.8	
Aboriginal	25	7.8	
Asian, Hispanic/Latina, Middle Eastern/North African, or other	44	13.7	
Born in Canada	132	41.3	
Currently reside in Toronto	166	51.9	
Currently in a romantic relationship	192	61.3	
Living with one or more children	180	56.4	
Ever given birth	225	70.3	
Undetectable viral load	176	55.0	
Currently on HIV medications	240	75.0	
Currently taking efavirenz	55	17.2	
Fertility intentions	184	57.5	
Pregnancy-seeking behaviors	34	10.6	

^aParticipants could identify multiple ethnicities, and therefore totals do not add to 100%. Forty-three participants (13.4%) indicated a multi-ethnic identity.

seeking behavior ($\chi^2_9=59.97$, $p<0.001$), and these variables explained 34.7% of the variance of pregnancy-seeking behavior. The Hosmer-Lemeshow test of goodness of fit was nonsignificant, suggesting the model is a good fit for the data ($\chi^2_8=9.11$, $p=0.33$).

TABLE 2. CORRELATIONS AMONG VARIABLES IN THE TRAITS-DESIRES-INTENTIONS-BEHAVIORS (TDIB) MODEL AMONG WOMEN LIVING WITH HIV ($N=320$)

Variables	Fertility desires	Fertility intentions	Fertility behavior
<i>Traits</i>			
Age	−0.43**	−0.43**	−0.12*
Importance of motherhood	0.46**	0.34**	0.11*
Family support to become pregnant	0.50**	0.45**	0.29**
African ethnicity	0.33**	0.41**	0.10
Born in Canada	−0.23**	−0.37**	−0.06
Currently reside in Toronto	0.19**	0.34**	−0.05
Currently taking efavirenz	−0.17**	−0.11*	−0.10
<i>Fertility desires</i>	—	0.69**	0.30**
<i>Fertility intentions</i>	0.69**	—	0.28**
<i>Fertility behavior</i>	0.30**	0.28**	—

* $p<0.05$; ** $p<0.01$.

TABLE 3. HIERARCHICAL LOGISTIC REGRESSION MODEL FOR FERTILITY BEHAVIOR AMONG WOMEN LIVING WITH HIV (N=320)

Variables	β	SE	Wald's χ^2	Odds ratio (95% CI)
<i>Block 1 - Traits</i>				
Importance of motherhood	0.07	0.08	0.87	1.08 (0.92–1.25)
Family support to become pregnant	0.69	0.17	15.73	1.99 (1.42–2.79)**
Currently taking efavirenz	–1.10	0.78	2.01	0.33 (0.07–1.52)
African ethnicity	0.31	0.58	0.29	1.37 (0.44–4.27)
Age	–0.05	0.03	2.26	0.96 (0.90–1.01)
Born in Canada	0.06	0.62	0.01	1.07 (0.32–3.61)
Currently residing in Toronto	–0.88	0.43	4.22	0.41 (0.18–0.96)*
<i>Block 2 - Desires</i>				
Importance of motherhood	–0.05	0.09	0.36	0.95 (0.80–1.13)
Family support to become pregnant	0.48	0.18	7.15	1.62 (1.14–2.31)**
Currently taking efavirenz	–0.83	0.80	1.09	0.44 (0.09–2.08)
African ethnicity	0.03	0.62	0.00	1.03 (0.31–3.44)
Age	–0.01	0.03	0.02	1.00 (0.93–1.06)
Born in Canada	0.04	0.69	0.00	1.04 (0.27–3.95)
Currently residing in Toronto	–0.90	0.44	4.08	0.41 (0.17–0.97)*
Fertility desires	0.38	0.11	11.37	1.47 (1.17–1.83)**
<i>Block 3 - Intentions</i>				
Importance of motherhood	–0.07	0.09	0.60	0.93 (0.79–1.11)
Family support to become pregnant	0.44	0.19	5.54	1.55 (1.08–2.22)*
Currently taking efavirenz	–0.80	0.79	1.02	0.45 (0.10–2.13)
African ethnicity	–0.01	0.61	0.00	0.99 (0.30–3.26)
Age	0.01	0.04	0.13	1.01 (0.94–1.09)
Born in Canada	0.27	0.68	0.15	1.30 (0.34–4.95)
Currently residing in Toronto	–1.01	0.44	5.34	0.36 (0.15–0.86)*
Fertility desires	0.28	0.13	5.02	1.33 (1.04–1.70)*
Fertility intentions	2.25	1.14	3.91	9.47 (1.02–88.13)*

Overall model: $\chi^2(9) = 59.97$, $p < 0.001$, $R^2 = 0.347$ (Nagelkerke); * $p < 0.05$; ** $p < 0.01$.

Discussion

The TDIB (Traits-Desires-Intentions-Behavior) model was used to determine the predictors of reproductive-seeking behavior among women living with HIV of reproductive age. The TDIB framework is a psychosocial model that includes the antecedent factors associated with reproductive behavior, namely traits, desires, and intentions. Pregnancy-seeking behavior was operationalized as subjective reports that birth control methods had not been used in the past 12 months with the intentions to become pregnant. Past studies have provided useful reports of intentions and desires but limited information on HIV-positive women's pregnancy planning efforts and behavior,^{5,22} whereas the novel contribution of the present study was in examining the pregnancy-seeking behaviors of geographically representative sample of women living with HIV in Canada. The TDIB model was used to guide the selection of predictors, and providers can use the TDIB model to further refine planning efforts to address barriers to reproductive behavior that women living with HIV are experiencing.

In our sample of women living with HIV, using the TDIB model we found that family support for trying to become pregnant, living in a large metropolitan city (i.e., Toronto), women's fertility desires, and fertility intentions were associated with pregnancy-seeking behavior. A central finding from the current study was that only 10.6% of the women living with HIV reported reproductive-related behaviors in the past 12 months, yet the majority of this sample of women

living with HIV indicated desire (69%) and intentions (57%) to get pregnant sometime in the future.² The finding that intentions were highly predictive of pregnancy-seeking behavior is in accordance with past findings from a mixed-gender sample of HIV negative individuals.²⁹ The present study advances the literature by demonstrating that pregnancy intentions have high predictive utility for pregnancy-seeking behaviors in a sample of HIV-positive women. It is noteworthy to highlight, however, that although intentions were highly predictive of pregnancy-seeking behavior, only one-fifth of women intending to become pregnant reported fertility-seeking behaviors. The cross-sectional findings that only a small percentage (10.6%) of women living with HIV in this study are engaging in pregnancy-seeking behaviors compared to their high intentions may be similar to findings from the general population.

Based on a longitudinal study with a sample of men and women from the general population, Morgan and Racking³⁰ showed that fertility intentions do not directly translate into the intended family size 20 years later. In fact, only 43% of women actualize their pregnancy-intentions (i.e., pregnancy intentions at 24 years of age, compared to 45 years old), with most women not reaching their intended family size. The discordance may be as a result of declining fertility with age, postponing reproduction due to nonfamilial pursuits, or not having a partner. The unique barriers that preclude women living with HIV from enacting their fertility intentions, however, remain to be determined and should be the focus of future research. The findings from this study, therefore, have

important implications for establishing the predictors of reproductive-seeking behavior. Longitudinal designs are needed to identify the percentage of women living with HIV who do not reach their intended family size, and the role of intention on pregnancy-seeking actions. The aforementioned significant antecedents of pregnancy-seeking behavior in this representative sample of women living with HIV from Ontario suggests that similarities can be drawn between the sample in this study and the general population of women in Ontario, and likely also in other Western high-income country contexts.

Some of the stressors and barriers that may preclude women living with HIV from acting on their fertility desires and intentions may include time lapse since HIV diagnosis, perceived stigma, taking anti-retroviral medications, partner's fertility desires, lack of pregnancy planning information from health care providers, or financial concerns. Future studies, however, need to test and provide empirical support for these hypothesized predictors. Understanding the stressors and barriers that prevent women living with HIV from moving along the stages of the pregnancy model and from fulfilling their fertility-seeking behaviors is required for clinicians and health care providers to provide optimal reproductive care to women living with HIV.

Examining the TDIB model dyadically with both women living with HIV and their partners, among women who have partners, would be an important future step to examine how these desires and intentions interact, as suggested by Miller and colleagues.³¹ Specifically, relationship status can be an important factor associated with pregnancy-seeking behavior among people living with HIV/AIDS. A partner's support and encouragement may be an important factor associated with pregnancy-seeking behavior.³² Similarly, among women in the general population, Wilson and Koo³³ found that being in a satisfactory relationship, not having a child with their current partner, and having positive expectations of their partner as a parent are factors associated with pregnancy desires.

Living in a large urban city, such as Toronto, and perceived family support related to becoming pregnant were positively associated with reproductive-seeking behavior in this sample of women living with HIV. In fact, these two factors were stronger predictors than age and women's ratings for importance of being a mother. Although it is not clear why women from a large urban city, in contrast to rural areas and smaller urban cities, reported highest reproductive behaviors, likely influences may include greater access to general health-care services and specific health-care services for people living with HIV,³⁴ greater access to social support services,²² less perceived HIV-related stigma,³⁵ and increased HIV-related knowledge in urban dwellers.^{34,36}

It will be beneficial for future research efforts to examine these predictions as such advances can help inform educational outreach efforts on reproductive planning for both women living with HIV and their health care providers. For instance, the Canadian HIV pregnancy planning guidelines have been recently published,³⁷ which provide clinical and health counseling recommendations for health care providers assisting individuals and couples living with HIV with their fertility and pregnancy planning. The guidelines recommend counseling to couples and individuals who face HIV-related stigma and other psychosocial concerns related to parenthood.³⁷ The guidelines further underscore the importance for

health care providers to generate reproductive-related discussions with patients soon after an HIV diagnosis. Recognizing the need to discuss reproductive decision-making and contraception can reduce the risk of vertical and horizontal transmission of HIV and unintended pregnancies.³⁷ Similarly, in the United States, the Department of Health and Human Services (DHHS) has published perinatal guidelines that provide recommendations for reducing mother to child HIV transmission.³⁸ In the United Kingdom, the guidelines for the management of sexual and reproductive health of people living with HIV provide similar recommendations.³⁹ These guidelines underscore the importance of psychosocial factors in relation to reproductive behavior among people living with HIV, and the medical management of HIV in pregnant women.³⁹ The implementation of programs aimed to increase health-care providers' awareness and knowledge of HIV pregnancy-planning guidelines needs to be of future focus.

Another novel finding of the present study was that increased perceived family support was associated with pregnancy-seeking behavior, adding to the literature that demonstrates social support to be a buffer against perceived HIV stigma⁴⁰ and perceived stress,⁴¹ associated with improved HIV treatment adherence,⁴² and lower anxiety.²⁰ The mechanism by which social support may be associated with reproductive-seeking behavior has not been empirically established. Financial and practical support (e.g., child care, guardianship following parental death)⁴³ and having emotionally supportive family members may be central to increased fertility planning, however these predictions need to be empirically supported. Additionally, some research findings point to the fact that family members who place high importance on having children also encourage their HIV-positive family members to have children.⁴⁴ Thus, understanding from whom the support needs to come, specifically family members as opposed friends and health care providers, provides information that can then be tailored to create interventions to increase family member involvement and support. Improved family support could have implications for reducing anxiety²⁰ and specific fears about pregnancy, and increasing appropriate and supportive fertility and pregnancy planning.

Strengths and limitations

The present study has notable strengths that include the assessment of a large and geographically representative sample of women living with HIV of reproductive age. Furthermore, a theoretical framework was used to guide the selection of the key predictors related to fertility planning and pregnancy behaviors. Despite this, however, the current study has several limitations. Although the questionnaire battery was back translated in two languages (French and English), the self-report measures of reproductive desires, intentions, and measurement of behavior were limited to women who could only read and understand French or English. Also, limited published measures related to fertility intentions, desires, and behaviors among women living with HIV are available, therefore questions assessing these constructs were specifically created for the present study to assess components of the TDIB model. Further, error measurement stemming from the wording of the items may be a limitation of the measures assessing reproductive-seeking behavior. Asking

about stopping birth control methods, as opposed to not using birth control methods, is a limitation of the study. Additionally, the study was cross-sectional and therefore does not assess for changes in behavior over time. In sum, these scales have not been validated, and it remains unclear whether the questionnaire may be biased with regards to under-reporting proceptive behaviors (e.g., unprotected sex) or over-reporting (e.g., fertility intentions).

A large number of women had missing data on the variables of interest, and while analyses indicate that these values were missing at random, it is possible that the self-report measures were too long or possibly unclear. It is also possible, due to current legislation criminalizing acts associated with the transmission of HIV,⁴⁵ that women would be unlikely to report behaviors that may result in perception of “risky” behavior. As a result of this possibility, health care providers need to create an environment that is patient-centered, cognizant of power dynamics between patient and provider, and that builds autonomy-supportive and trusting relationships prior to discussing reproductive decision-making.⁴⁶ Additionally, the use of efavirenz was of particular concern for women at the time the study was conducted, but it is recognized that teratogenic medications may not be as significant a concern today. Lastly, the present study examined exclusively the fertility desires, intentions, and behavior of women living with HIV, while future research efforts are required to assess the conjoint decision-making of partners where one or more partners are HIV-positive. A comprehensive understanding of sero-discordant couples and partners with the same HIV status may further assist pregnancy planning and optimally assist couples with reproductive decision making by providing tailored counseling. Future studies can use the TDIB model to understand pregnancy behavior among people living with HIV, and extend the current research to family members and partners by examining their attitudes and support towards fertility-related decisions.

Conclusions

The current study utilized the TDIB model to examine the predictors of reproductive behavior in an HIV-positive female population living in a Western, high-income country. Understanding the key predictors associated with fertility desires, intentions, and ultimately behavior can help to reduce barriers and stressors associated with fertility planning and optimize treatment for people living with HIV and sero-discordant couples. Women living with HIV who feel that they are not supported by their family members may benefit from extra support from health care providers and counseling as they may be at increased risk to sacrifice desired reproductive behaviors. Ultimately, the findings from the current study can help clinicians and health care providers to understand the stressors and barriers that prevent women living with HIV from moving along the stages of the pregnancy model and from fulfilling their fertility desires. The current findings indicated that family support, living in a large metropolitan city, and fertility intentions and desires are associated with reproductive behavior, and future research should examine how to bolster these predictors with resources and create others for women living with HIV who are currently experiencing a discrepancy between their fertility intentions and behaviors.

Author Disclosure Statement

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