Applying the Health Action Process Approach (HAPA) in Program Evaluation of a Theory-Based Parental HIV Disclosure Intervention Among Parents Living With HIV (PLH) in China

Wendi Da

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APPLYING THE HEALTH ACTION PROCESS APPROACH (HAPA) IN PROGRAM
EVALUATION OF A THEORY-BASED PARENTAL HIV DISCLOSURE
INTERVENTION AMONG PARENTS LIVING WITH HIV (PLH) IN CHINA

by

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DEDICATION

I dedicate this thesis to my parents, Hongxiang Da and Zhengping Xu; my husband, Cheng Li, and my beloved boys Banjo and Tank for their constant support and unconditional love. I love you all dearly.
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I would like to express my sincere gratitude to my academic advisor and dissertation co-chair Dr. Xiaoming Li. Thank you for all the continuous guidance, encouragement, and support ever since I joined the team. I would like to express my sincere gratitude to my secondary advisor and dissertation chair Dr. Shan Qiao. Thank you for all the hands-on guidance on my research and dissertation. I would like to thank my committee members – Dr. Jiajia Zhang, Dr. Donaldson Conserve, and Dr. Bankole Olatosi, for all the valuable feedback and insights throughout my dissertation process.

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ABSTRACT

With prolonged lives thanks to antiretroviral therapy, parents living with HIV (PLH) face challenges regarding telling their HIV-positive status to children (i.e., parental HIV disclosure). With aims to assist PLH in making a well-planned and developmentally appropriate HIV disclosure to their uninfected children, a theory-driven intervention was conducted among 791 PLH with children aged between 6-15 years in Guangxi, China.

Guided by the stage model of the Health Action Process Approach (HAPA), three critical disclosure stages were defined: 1) the pre-intention stage, in which people have not yet decided to disclose; 2) the intention stage, in which people have decided to disclose but have not yet started action; 3) the action stage, in which individuals make actual disclosure event. Accordingly, people at the three stages were defined as pre-intenders, intenders, and actors.

Using secondary data from the baseline (W1) and the first two follow-ups (W2 at 6-month and W3 at 12-month) data, this dissertation evaluated the intervention effect on parental HIV disclosure stages and examined the roles disclosure-related psychosocial factors play in the process. Three major research questions were addressed: 1) is there any intervention effect on HIV disclosure stage transition between W2 and W3? 2) is there any intervention effect on disclosure-related psychosocial factors from W1 to W2 and from W2 to W3? 3) do disclosure-related psychosocial factors at W2 yield stage-specific predictive effects on disclosure stage transition from W2 to W3?
To address the first question, a multigroup first-order manifest Markov Chain method was conducted to assess intervention effect on disclosure stage transitions between W2 and W3. Among pre-intenders at the first follow-up, those in the intervention group were more likely to progress to the action stage rather than being static (OR = 3.43, 95% CI 1.17, 10.01). However, no statistically significant intervention effect was detected in promoting progression from pre-intention to intention (OR = 1.02, 95% CI 0.47, 2.20). Among intenders at the first follow-up, no statistically significant intervention effect was detected in preventing backward transition to pre-intention (OR = 0.71, 95% CI 0.35, 1.43) or promoting forward transition to action (OR = 2.01, 95% CI 0.84, 4.79).

To address the rest two questions, a proportional latent change score (LCS) method was used to assess intervention effect on disclosure-related psychosocial factors including knowledge, outcome expectancy (perceived costs and rewards), self-efficacy, and planning. Predictive effects of these psychosocial factors on disclosure stage transitions were examined by treating these factors as covariate in the Markov chain. At the first follow-up, statistically significant intervention effect was detected for disclosure knowledge, action self-efficacy, and action planning but not for disclosure outcome expectancy. Stage-specific predictive effects of action self-efficacy and action planning on HIV disclosure stage transitions were detected.

Findings from the dissertation have significant implications for future studies. First, the 3-stage HAPA model can be applied to the evaluation of HIV disclosure interventions. Second, the identification of stage-specific psychosocial predictors of stage transition allows the development of stage-matched interventions tailored to their needs.
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CHAPTER 1

INTRODUCTION

1.1 HIV EPIDEMIC

1.1.1 Global HIV epidemic

According to the Joint United Nations Programme on HIV and AIDS (UNAIDS), by the end of 2018, there were 37.9 million people living with HIV (PLHIV) worldwide (Joint United Nations Programme on HIV/AIDS, 2019). Among 36.2 million adults (aged between 15 and 49 years old) living with HIV, 18.8 million (52%) were women. Data from the World Health Organization (WHO) showed that the prevalence of HIV among adults aged between 15 and 49 years old was 0.8% worldwide, which ranged between 0.1% (in Eastern Mediterranean and Western Pacific) and 3.9 (in Africa) (World Health Organization, 2019).

In 2014, UNAIDS launched its ambitious 90-90-90 target for 2020. Simply, 90% of PLH would know their HIV status, 90% of people diagnosed with HIV infection would receive treatment, and 90% of PLH on treatment would reach viral suppression. Based on the 2019 UNAIDS data, by the end of 2018, 79% of PLH have known their HIV status, 78% of PLH who know their status have received treatment, and 86% of PLH on treatment have reached viral suppression (Joint United Nations Programme on HIV/AIDS, 2019). Six countries (Botswana, Cambodia, Denmark, Eswatini, Namibia and the Netherlands) have already reached the 90–90–90 targets. Another 9 countries
(Australia, France, Germany, Iceland, Ireland, Rwanda, Spain, Thailand, and United Kingdom) have reached the threshold of 73% regarding viral load suppression among all PLH yet gaps were identified particularly in the first two targets. Key populations, including men who have sex with men, people who inject drugs, sex workers, and transgender people, together with their sexual partners, accounted for 54% of new HIV infections worldwide. AIDS-related mortality has declined by 33% since 2010. Tuberculosis (TB) remains the leading cause of AIDS-related deaths. Data on government spending for HIV between 2016 and 2018 showed that among 70 low- and middle-income countries, 45 reported an increase in spending since 2010. An increase of more than 50% were reported by 36 countries.

1.1.2 HIV epidemic in China

As reported on the 5th National Conference on HIV/AIDS in China, there were 820,756 reported people living with HIV (PLHIV) in China by the end of June 2018, among which 80.4% were receiving ART (China Center for Disease Control and Prevention, 2018). The 2019 UNAIDS data showed that in China, 83% of PLH who know their status have received the treatment, and 94% have suppressed viral loads (Joint United Nations Programme on HIV/AIDS, 2019). Although a low prevalence rate of 0.037% was found for the overall population, high prevalence was detected in some areas (Yunnan, Sichuan, Guangxi) and among certain groups. The percentage of sexually transmitted cases among the newly diagnosed ones had increased from 33.1% in 2006 to 92.2% in 2014, with heterosexual transmission increasing from 30.6% to 66.4% and becoming the dominant route of infection (National Health and Family Planning Commission of People’s Republic of China, 2015). Based on the data released by China
CDC, among newly diagnosed HIV cases in 2017, 69.6% were contracted via heterosexual sex, 25.5% were MSM, and 3.2% were drug injections (China Center for Disease Control and Prevention, 2018). China increased government spending on HIV from about US$ 400 million in 2010 to more than US$ 1 billion in 2018 (Joint United Nations Programme on HIV/AIDS, 2019). Based on the 2018 Global AIDS Monitoring Country Progress Report, from 2008 to 2017, the number of HIV testing medical and health facilities increased from 7,642 to 30,435 (Joint United Nations Programme on HIV/AIDS, 2018b).

1.2 DEFINITION OF HIV DISCLOSURE

As early as 1999, the WHO described HIV as “a process to inform others about one’s HIV positive status by the person himself or by a third party with or without consent” (World Health Organization, 1999). In the 2011 review of facilitating HIV disclosure across diverse settings, Obermeyer argued that “rather than being a one-time event, disclosure is often a gradual process of disclosing to an increasing number of others in one's networks over time” (Obermeyer, Baijal, & Pegurri, 2011). This definition has been used in the evaluation of partner HIV disclosure interventions. For example, partner disclosure rate was calculated by the proportion of partners to whom participants had disclosed among partners they had in the past 6 months (Conserve, Groves, & Maman, 2015).

Regarding a specific disclosure target, in 2004, the World Health Organization (WHO) published a review paper on HIV disclosure (World Health Organization, 2004). The paper argues that disclosure should be conceptualized as a process rather than a one-time event of disclosure/nondisclosure. For example, a disclosure process can be
composed of decision-making, action, and post-disclosure adaptation. Such conceptualization has been incorporated in the Disclosure Process Model (DPM) which describes “how people make decisions to disclose and how people are affected by their disclosure decisions” (Chaudoir & Fisher, 2010).

Specifically, existing literature has proposed and investigated the decision-making process of disclosure. For example, a 6-step process was developed by Kimberly (Kimberly, Serovich, & Greene, 1995). The first step is adjustment to the diagnosis. Appropriate adjustment to the diagnosis can help individuals develop personal acceptance. The second step is the assessment of personal disclosure skills. Individuals need to evaluate whether they have adequate level of skills necessary for disclosure. The third step is the assessment of the potential disclosure recipient. Individuals may go through members in their social network and choose an individual as the disclosure recipient. The fourth step is the assessment of the circumstances for disclosure. Some circumstances may not be appropriate for disclosure to certain individuals. The fifth step is the anticipation of recipients’ potential reactions. The final step is the identification of disclosure motivation.

1.3 OUTCOMES OF HIV DISCLOSURE

According to the DPM, disclosure can affect both individual, dyadic, and social contextual outcomes (Chaudoir & Fisher, 2010). Individual outcomes include psychological, behavioral, and physical well-being, dyadic outcomes include liking, intimacy, and trust, social contextual outcomes include cultural stigma and norms for disclosure. For the person who discloses, HIV disclosure was associated with initiation of ART and better ART adherence, better clinical outcomes and psychological wellbeing, as
well as higher levels of social support and closer relationships with the disclosure recipient (Bulali, Kibusi, & Mpondo, 2018; Dessie et al., 2019; Hodgson et al., 2014; Mayfield Arnold, Rice, Flannery, & Rotheram-Borus, 2008; Stutterheim et al., 2011; Weiss, 2004). Specifically, for partner disclosure, awareness of partner’s HIV status allows the disclosure recipient to get HIV testing and negotiate safer-sex practices, which is critical for the risk reduction of HIV transmission (Conserve et al., 2015). However, HIV disclosure may not always be associated with positive outcomes. HIV disclosure can lead to HIV-related stigma, blame, abandonment, physical and emotional abuse, worse partner relationship, and loss of social support (Chaudoir, Fisher, & Simoni, 2011; Hawk, 2007; Mayfield Arnold et al., 2008; Stutterheim et al., 2011; Weiss, 2004).

1.4 Psychosocial Factors Influencing Disclosure Decision-Making

Several key psychosocial factors have been identified to influence the decision-making of disclosure. According to the consequence theory of HIV disclosure, people assess the rewards and costs for disclosure and a decision to disclosure is made once the rewards outweigh the costs (Serovich, 2001). Based on the Disclosure Decision-Making Model (DDMM), besides assessment of the costs and rewards for HIV disclosure, patients also evaluate their ability to disclosure (i.e., disclosure self-efficacy) (Greene et al., 2012). The individual’s likelihood to disclosure increases as disclosure self-efficacy increases.

Moreover, different effects have been found regarding how these factors influence HIV disclosure behavior. For example, one study conducted among HIV positive MSM found that disclosure costs and self-efficacy predict HIV disclosure, while disclosure rewards do not (Serovich, Laschober, Brown, & Kimberly, 2018). However, another
study conducted among HIV positive women found disclosure rewards to be a predictor for HIV disclosure, while disclosure costs were not (Serovich, Lim, & Mason, 2008).

1.5 CHILDREN IN TERMS OF HIV DISCLOSURE

Regarding children in HIV disclosure, most studies have focused on disclosure of a child’s HIV status (i.e., pediatric HIV disclosure). A systematic review on pediatric HIV disclosure differentiated disclosure as full disclosure, partial disclosure, no disclosure, and deflected disclosure (Britto, Mehta, Thomas, & Shet, 2016). Full disclosure involves the mentioning of HIV specifically. Partial disclosure involves mentioning the illness in a way that was consistent with HIV but without the term “HIV”. No disclosure means telling nothing about the illness. Deflected disclosure involves deceptive description of the illness by telling the children about less-stigmatized conditions (e.g., asthma, cancer) unrelated to HIV.

In Tasker’s book, How Can I tell you, a four-phase disclosure model was described (Tasker, 1992). The first is the secrecy/privacy phase which occurs immediately after learning the child’s diagnosis. The second is the exploratory phase characterized by parents’ willingness to disclose to a close friend or family member. Meanwhile, the parent will often provide some information (not directly mentioning HIV) regarding the child’s illness and needs for medical visits. The third phase is the readiness phase characterized by parents’ willingness and planning of fully disclosing to the child. The fourth is the disclosure phase when parents fully disclosure to the child with mentioning the word “HIV”.
1.6 PARENTAL HIV DISCLOSURE

1.6.1 Disclosure rate

With prolonged lives thanks to ART, parents living with HIV (PLH) are more likely to raise their children to adolescence or even adulthood. Meanwhile, PLH face ongoing challenges regarding whether, when, and how to disclose their HIV-positive status to children (i.e., parental HIV disclosure). A systematic review found that parental HIV disclosure rate ranged from 20%-97% in high-income countries. Lower rates ranging from 11% to 44% were found in resource-constrained countries. According to the China Stigma Index Report, less than half of PLH reported that their children were aware of their HIV status (Institute of Social Development Research, 2009). An even lower rate of 25% was found in the 2012 survey among 1254 PLH who had children between 5-16 years old (Qiao et al., 2015).

1.6.2 Disclosure outcomes

Both positive and negative outcomes have been reported regarding parental HIV disclosure, both for the children, for the parent, and for the family (Conserve et al., 2015). For the children, although some studies reported short-term negative consequences on externalizing problems, internalizing behaviors, anxiety and depression, and school performance, others suggested that most children, particularly younger children, adjusted to parental HIV disclosure over time in terms of the aforementioned psychosocial functioning factors. For the parents, parental HIV disclosure was associated with better ART adherence and lower levels of depression and anxiety. Moreover, parents also reported higher levels of social support from the children, as well as a closer parent-child relationship, and better family communication.
1.6.3 Barriers to parental HIV disclosure

Relatively low disclosure rate can be caused by several barriers including concerns that children are too young to understand, poor parent-child relationship and family functioning, limited parent-child communication skills, and lack of accurate HIV knowledge (Clifford, Craig, McCourt, & Barrow, 2013).

Regarding the concerns about children’s young age, studies on pediatric HIV disclosure argued that the disclosure should be conceptualized as a process “that considers the child’s social, emotional, and developmental level” (Cantrell, Patel, Mandrell, & Grissom, 2013). Based on Piaget’s cognitive development theory, three critical developmental stages are identified --- the preoperational stage, the concrete operational stage, and the formal operational stage. A structured sequence of HIV infection information was recommended for children at three different developmental stages with suggested ages being 6-7 years, 8-11 years, and 11-14 years, respectively.

Regarding parent-child relation and family functioning, both quantitative and qualitative studies have found that poor parent-child relationship was a key barrier to parental HIV disclosure (Clifford et al., 2013; Kennedy et al., 2010; Osingada, Okuga, Nabirye, Sewankambo, & Nakanjako, 2017). Moreover, studies on parental HIV disclosure preparation activities have found that besides thinking about and making disclosure plans, PLH also tried to improve family relationships in order to better prepare their children for the upcoming disclosure (Gachanja, Burkholder, & Ferraro, 2014a).

Regarding poor intergenerational communication skills, studies have suggested that intergenerational communication was the most modifiable causal pathway for family-based interventions (van Rooyen et al., 2016). Contrary to traditional strategies
focusing on the individual patient or considering the family only as a source of social support, family-based interventions emphasize the educational, relational, and personal needs of all family members (Fisher & Weihs, 2000).

1.7 STAGE MODELS TO FILL THE INTENTION-BEHAVIOR GAP

The relatively low parental HIV disclosure rate can also be due to the failure of translating disclosure intention to disclosure behavior (i.e., the intention-behavior gap). Studies examining HIV disclosure to partners showed significantly lower actual disclosure rates compared to intended disclosure rates in both developed and developing countries (Maman & Medley, 2007).

To fill the intention-behavior gap, researchers argued that stage models of behavior change should be applied (Schwarzer, 2016; Velicer & Prochaska, 2008). Specifically, the stage models posit that people pass through an ordered set of qualitatively different stages to make behavior change (Weinstein, Rothman, & Sutton, 1998). Based on the Transtheoretical Model (TTM), individuals move through five stages of change: 1) the pre-contemplation, in which people do not intend to take action within the next 6 months; 2) the contemplation, in which people intend to change within the next 6 months; 3) the preparation, in which people intend to take action usually within the next month; 4) the action, in which people have made specific overt behavior change within the past six months; 5) the maintenance, in which people have made specific overt behavior change for more than 6 months.

Although the TTM has been widely used in physical activity, smoking cessation, and substance use cessation interventions, it is not readily applicable for the HIV disclosure process as the definition of most stages is based on the duration of a certain
behavior or behavioral intention. Specifically, for the pre-action stages, differentiation between the preparation stage and the contemplation stage is based on whether there’s an intention to make immediate (i.e., within the next month) behavior change or not. It fails to capture the preparation and planning component which plays a key role in translating disclosure intention into actual behavior. For the post-action stages, differentiation based on the duration of a certain behavior fails to capture the feature of HIV disclosure action which may progress in terms of depth and width, but not duration.

As argued in the HAPA (Schwarzer, 2016), the intention-behavior gap can be bridged by adopting the stage models where the role of action planning (i.e., making “When-Where-How” plans) is pinpointed. HAPA posits that engaging in behavior change starts with forming an intention, followed by a stage of planning, and ends in action. Briefly, there are three critical stages: 1) the pre-intention stage, in which people have not yet decided to act; 2) the intention stage, in which people have decided to act and started making plans but have not yet started action; 3) the action stage, in which individuals make actual behavior change.

1.8 RESEARCH GAPS IN PROGRAM EVALUATION

Although HIV disclosure has been depicted as a process with several key steps, such conceptualization has not been incorporated in the evaluation of parental HIV disclosure interventions. In a systematic review of existing parental HIV disclosure interventions, intervention effects have been evaluated focusing on the actual HIV disclosure action rather than the process (Conserve et al., 2017). Moreover, although HAPA has been applied to behavior change interventions on physical exercise, smoking cessation, oral health, and nutrition, the 3-stage operationalization has not been adopted
in depicting HIV disclosure process. Therefore, the stage-specific predicting roles of key psychosocial factors such as outcome expectancy and self-efficacy have not been well studied in the context of HIV disclosure.

1.9 AIMS OF THE DISSERTATION STUDY

To address the research gaps in HIV disclosure intervention evaluation, this dissertation project aims to apply the HAPA model to the program evaluation of an existing parental HIV disclosure intervention. This dissertation project builds on the “Interactive Communication with Openness, Passion, and Empowerment” (ICOPE) intervention funded by an NIH R01 (Principal investigator: Dr. Xiaoming Li). Aimed at assisting PLH to make a well-planned and developmentally appropriate HIV disclosure to their uninfected children, a theory-driven intervention was conducted among 791 PLH with children aged between 6-15 years in Guangxi, China. Participants receive interactive training sessions focusing either on cognitive and behavioral skills regarding parental HIV disclosure (i.e., the intervention group) or on nutrition education (i.e., the control group). Participants completed the baseline survey before intervention and 6 waves of follow-ups were conducted every 6 months.

This dissertation research project will contribute to the theoretical aspect of HIV disclosure research by 1) applying the HAPA to the operationalization of HIV disclosure stage; 2) evaluate the intervention effects of a theory-based parental HIV disclosure intervention on HIV disclosure stage; 3) evaluate the intervention effects of a theory-based parental HIV disclosure intervention on disclosure-related psychosocial factors; 4) assess the predictive effects of disclosure-related psychosocial factors on HIV disclosure stage transition. Three major research questions were addressed by this study:
1) is there any intervention effect on HIV disclosure stage transitions?

2) is there any intervention effect on disclosure-related psychosocial factors?

3) do disclosure-related psychosocial factors yield stage-specific predictive effects on disclosure stage transition?
CHAPTER 2

BACKGROUND AND SIGNIFICANCE

2.1 PROBLEM STATEMENT

According to the Joint United Nations Programme on HIV and AIDS (UNAIDS), by the end of 2018, there were 37.9 million people living with HIV (PLHIV) worldwide (Joint United Nations Programme on HIV/AIDS, 2019). As reported on the 5th National Conference on HIV/AIDS in China, by the end of June 2018, there were 820,756 reported PLHIV in China, among which 80.4% were receiving ART (China Center for Disease Control and Prevention, 2018). The 2019 UNAIDS data reported that 83% of PLH in China who know their status have received the treatment, and 94% have reached viral suppression (Joint United Nations Programme on HIV/AIDS, 2019).

China national statistics showed that HIV infections were largely concentrated in the childbearing 20–29 and 30–39 age groups, which together account for 70.0% of all infections (Huang et al., 2015). A cross-sectional survey conducted in 2012 among 2987 PLHIV in Guangxi, China showed that most (n=2458; 82.3%) participants had at least one child. With prolonged lives thanks to ART, parents living with HIV (PLH) are more likely to raise their children to adolescence or even adulthood. Over the course of their lifetime, PLH face challenges regarding telling their HIV-positive status to children (i.e.,
parental HIV disclosure). According to the China Stigma Index Report, less than half of PLH reported that their children were aware of their HIV status (Institute of Social Development Research, 2009). Parental HIV disclosure is even more challenging when it comes to younger children. A disclosure rate of 25% was found in the 2012 survey among 1254 PLH who had children between 5-16 years old (Qiao et al., 2015).

In 2011, the World Health Organization (WHO) published the Guideline on HIV Disclosure Counselling for Children Up to 12 Years of Age (World Health Organization, 2011). Although the guideline has been focused on pediatric HIV disclosure (i.e., disclosing children’s HIV status), it also provided some recommendations that children of school age should be told of their parent’s HIV status. Specifically, considering the developmental stage of younger children, HIV disclosure should be conducted incrementally to accommodate their cognitive skills and emotional maturity. Till now, there’s no standardized guideline regarding parental HIV disclosure counseling services launched in China.

2.2 THEORETICAL MODELS OF PARENTAL HIV DISCLOSURE INTERVENTIONS

2.2.1 Social Cognitive Theory (SCT)

Bandura (Bandura, 1994) posited the Social Cognitive Theory of HIV-related behaviors. The author highlighted that although knowledge of health risks and constituent skills are important preconditions for self-directed change, people need to be provided with the behavioral means, resources, and social supports for behavioral changes. The two central tenets of the theory are outcome expectancies and self-efficacy. In terms of outcome expectancies, a person needs to believe that the benefits of a certain behavior
outweigh the costs. In terms of self-efficacy, a person needs to believe that he or she can implement a certain behavior with acquired skills under counteracting circumstances.

Specifically, for parental HIV disclosure, outcome expectancies can be either positive (i.e., the anticipation of social approval or recognition by the child) or negative (i.e., the anticipation of rejection from the child). Self-efficacy regarding parental HIV disclosure is defined as the perceived ability to conduct the disclosure event in a successful manner.

2.2.2 The Disclosure Decision-Making Model (DDMM)

Built on several theoretical perspectives including the social cognitive theory, Greene et al. (Greene et al., 2012) posited the Disclosure Decision-Making Model (DDMM) with an emphasis on key predictors of disclosure likelihood and disclosure depth. Separate models were developed for the likelihood of disclosure and for disclosure depth among people who have already disclosed. Briefly, the DDMM argues that people make disclosure decisions based on the evaluation of three major factors: the diagnosis (the information), the potential receiver of disclosure, and the disclosure self-efficacy. The five major components in the information are stigma, disease prognosis, disease symptoms, discloser’s preparation, and the relevance of the diagnosis to others. In terms of assessing the potential receiver, the discloser evaluates the relationship quality, the anticipated reaction (including both short-term reaction and long-term consequence), and the confidence in response (i.e., the certainty that the receiver will respond in the way that the discloser anticipates).
2.2.3 The Disclosure Process Model (DPM)

With the two aforementioned models focusing on the decision-making process of disclosure, the Disclosure Process Model (DPM) posited by Chaudoir et al. (Chaudoir et al., 2011) incorporated disclosure outcomes as a key component of HIV disclosure. Similar to the DDMM, the decision-making of HIV disclosure depends on the antecedent goals, and the disclosure event is characterized by the depth, duration, and breadth of the disclosure. Moreover, the reaction of the confidant was added to comprehensively measure disclosure event. In terms of disclosure outcomes, both the individual-, dyadic- and social contextual-level factors were taken into consideration. One key feature of the DPM is the mediating process linking the disclosure event to disclosure outcomes. In addition, the DPM recognizes the reciprocity of disclosure by adding the feedback loop linking disclosure outcomes back to the decision-making process of future disclosure.

2.3 PSYCHOSOCIAL FACTORS INFLUENCING HIV DISCLOSURE

Several psychosocial factors have been identified to influence HIV disclosure in the three models mentioned above. The first is outcome expectancy. According to the consequence theory of HIV disclosure, people assess the rewards and costs for disclosure and a decision to disclosure is made once the rewards outweigh the costs (Serovich, 2001). Defined as “anticipated reaction”, the DDMM further differentiated anticipated response (i.e., immediately after the disclosure) and anticipated outcome (i.e., the endpoint results of the disclosure). In DPM, outcome expectancy was defined as antecedent goals with the approach goals as pursing rewards and avoidance goals as preventing the costs.
The second factor is self-efficacy, which refers to patients’ confidence in their ability to disclosure (Greene et al., 2012). Aligning with Bandura’s argument that self-efficacy should be measured for a specific task, the DDMM specified that disclosure self-efficacy refers to sharing the diagnosis, not general communication. The individual’s likelihood of disclosure increases as disclosure self-efficacy increases. Moreover, for those who have disclosed, higher levels of disclosure self-efficacy relate to higher levels of disclosure depth.

Besides outcome expectancy and self-efficacy, the DDMM identifies an additional construct called “confidence in response”. It refers to the discloser’s level of certainty regarding how the disclosure target would respond. Although not directly related to the likelihood of disclosure, confidence in response was hypothesized to influence the likelihood via disclosure self-efficacy. A similar construct “likelihood of the anticipated outcome” was posited in the HIV disclosure anxiety model (Evangeli & Wroe, 2017).

2.4 PARENTAL HIV DISCLOSURE INTERVENTION PROGRAMS

Considering the potential benefits of disclosing HIV status to children, several interventions have been conducted to assist PLH with parental HIV disclosure. This section will review the evaluation of previous parental HIV disclosure interventions.

2.4.1 Interventions based on the Social Cognitive Theory (SCT)

Rotheram-Borus et al. (Rotheram-Borus, Lee, Gwadz, & Draimin, 2001) implemented a randomized controlled trial among 307 PLH with adolescent children in the US. The intervention group received two modules with the first model involving parents only and the second module involving both parents and their children. Module 1
covered topics on coping with HIV and disclosure decision-making. Topics in Module 2 covered both parent topics (e.g., making custody plans, parent-child communication) and youth topics (e.g., coping with parent’s illness and resolving family conflicts). The control group received standard HIV care. Follow-ups were conducted every 3 months over 2 years. Disclosure outcome variable was whether the parent disclosed to his/her child or not. The results showed no statistically significant difference in disclosure between the intervention group and the control group.

2.4.2 Interventions based on the Disclosure Decision Making Model (DDMM)

The Amagugu intervention with a pre- and post- design was developed and pilot tested among 24 HIV-positive mothers with children aged 6-9 years in rural South Africa (Rochat, Mkwanazi, & Bland, 2013). The intervention was further scaled up to 281 HIV-positive mothers with children aged 6-10 years in rural South Africa (Rochat, Arteche, Stein, Mkwanazi, & Bland, 2014). Six structured counseling sessions covering two intervention stages were delivered. The pre-disclosure stage involved preparing and training the mother to disclosure, and the post-disclosure stage involved counseling on health promotion and custody planning. Impact evaluation was conducted immediately after the 6- to 8-week intervention. Disclosure outcome variable was whether participants partially, fully, or not disclosed to their child. In the first study, 11/24 fully disclosed to their children and 13/24 partially disclosed. In the second study, 60% of participants fully disclosed and 40% partially disclosed.

The “Teaching, Raising, And Communicating with Kids” (TRACK) program was developed by Murphy et al. (Murphy, Armistead, Marelich, Payne, & Herbeck, 2011) and implemented among 80 HIV-positive mothers with children aged 6-12 years in the US.
The intervention targets familial communication and parenting skills in the context of parental HIV disclosure. In the intervention group, participants received 3 sessions with topics on children’s development, benefits and risks of parental HIV disclosure, and parent-child communication. Behavioral exercises for disclosure were also practiced. In the control group, participants received standard care. Follow-ups were conducted every 3 months over the next 9 months. Disclosure outcomes included whether participants disclosed to their children or not and disclosure self-efficacy. The results showed that participants in the intervention group were 6 times more likely to disclose their HIV status to their children (OR = 6.33, 95% CI 1.64, 24.45). A statistically significant increase in disclosure self-efficacy was also found.

2.4.3 Interventions based on the Decision Process Model (DPM)

Simoni et al. (Simoni et al., 2015) implemented a randomized controlled trial built on the Chinese Parental HIV Disclosure Model (which was adapted from the DPM) among 20 PLH in China. The intervention group received three counseling sessions regarding disclosure decision-making, HIV disclosure event, and disclosure consequences. In session one, participants shared stories of their HIV diagnosis and their current disclosure status (to partners or family members) with the nurse interventionist. In session 2, the nurse provided psycho-education regarding what to be expected from their children during the disclosure process. In session 3, participants developed a plan for achieving a certain goal along the disclosure continuum. The control group received standard care. Follow-ups were conducted immediately after the 4-week intervention, and at 13 weeks. Disclosure continuum was measured with a 7-point scale ranging from no disclosure (0) to complete disclosure and communication about HIV (6). Disclosure
distress and self-efficacy were also measured. The results showed statistically significant decrease in disclosure distress (OR = 0.17, 95% CI 0.03, 0.91), increase in self-efficacy (OR = 9.00, 95% CI 2.06, 39.29), as well as shift towards the higher end of the disclosure continuum (β=1.40, 95% CI 0.31, 2.50).

2.5 Methodological gaps in impact evaluation of parental HIV disclosure interventions

2.5.1 HIV disclosure as a process

HIV disclosure has been described as a process of decision-making to determine whether, when, and how to disclose (Omarzu, 2000). The first stage is about disclosure intention formation and the latter two stages are about preparation and planning for intention translation. The HIV/AIDS Resources & Community Health (ARCH) published an HIV Disclosure Guide (HIV/AIDS Resources & Community Health, 2016). HIV disclosure is depicted as a process starting from recovery from the diagnosis and self-educating, moving into preparation and planning for disclosure, and finally translating into disclosure action. In the preparation and planning phases, patients create disclosure plans by setting disclosure goals, deciding where, when, and how to disclose, as well as seeking disclosure support.

However, among most parental HIV disclosure interventions, intervention effects have been evaluated focusing on the actual HIV disclosure action rather than the process. Two studies measured HIV disclosure action as a binary yes-or-no measure, one measured disclosure as no disclosure, partial disclosure using the word virus, and full disclosure using the word HIV, and one measured disclosure as a 0-6 scale ranging in disclosure breadth (i.e., the topics covered in the communication). To the best of our
knowledge, no measure has been developed to measure HIV disclosure process starting from intention-formation and ending in disclosure action.

2.5.2 Other HIV disclosure-related outcomes

As suggested by Simoni et al. (2015), HIV disclosure interventions should “aim more to diminish distress than achieve a specific behavioral outcome” (Simoni et al., 2015). Therefore, disclosure beliefs, HIV disclosure distress, and disclosure self-efficacy need to be considered in impact evaluations of HIV disclosure interventions (Simoni et al., 2015).

Moreover, HIV disclosure is a process that takes time. A study among PLH in Kenya showed that the preparation for disclosure often took several years before the actual disclosure event (Gachanja et al., 2014a). In addition, the intention-behavior gap identified in multiple health behaviors also exists in terms of HIV disclosure. Studies examining HIV disclosure to partners showed significantly lower actual disclosure rates compared to intended disclosure rates in both developed and developing countries (Maman & Medley, 2007). Therefore, single long-term measures such as the HIV disclosure event may fail to capture the short- to medium-term efficacy of interventions in terms of changes in disclosure-related psychosocial factors.

2.6 HEALTH ACTION PROCESS APPROACH

The stage models of behavior change have been widely used to depict the process of making behavior change (Schwarzer, 2016; Velicer & Prochaska, 2008). Specifically, the stage models posit that people pass through an ordered set of qualitatively different stages to make behavior change (Weinstein et al., 1998). Among existing stage models, the Health Action Process Approach (HAPA) aligns well with the HIV disclosure process.
According to HAPA, engagement in behavior change starts with forming an intention, followed by a stage of planning, and ends in action. Briefly, there are three critical stages: 1) the pre-intention stage, in which people have not yet decided to act; 2) the intention stage, in which people have decided to act and started making plans but have not yet started action; 3) the action stage, in which individuals make actual behavior change. However, to the best of our knowledge, the HAPA has never been applied in HIV disclosure research.

The importance of psychosocial factors such as outcome expectancy and self-efficacy is emphasized in HAPA. Outcome expectancy is defined as beliefs about the positive and negative outcomes of the anticipated behavior, and self-efficacy is defined as one’s confidence in being capable of performing the behavior (Schwarzer, 2016). Different stages are characterized by psychological similarities within stages and psychological differences between stages (Schüz, Sniehotta, Mallach, Wiedemann, & Schwarzer, 2008). Theoretically, pre-intenders will show lower perceived rewards and self-efficacy but higher perceived costs than intenders. Intenders will show lower self-efficacy than actors, but no differences in perceived costs or rewards are expected. Therefore, for pre-intenders, higher levels of perceived rewards and self-efficacy, as well as lower levels of perceived costs, would promote stage progression. For intenders, higher levels of self-efficacy would promote stage progression, while lower levels of costs and higher levels of rewards would prevent stage regression.

As emphasized by HAPA, as people pass different stages to make behavior change, self-efficacy should be differentiated by the stages of change (i.e., intention-formation, behavior initiation, and behavior maintenance) (Schwarzer et al., 2003).
Action self-efficacy plays a key role in the early intention formation stage. People with high action self-efficacy tend to imagine potential outcomes of diverse strategies and are more likely to initiate a new behavior. People with low action self-efficacy are more likely to imagine failure and tend to procrastinate (Schwarzer, 2011).

In addition, the HAPA posits that planning precedes the initiation of behavior change action. By planning, the intention is more likely to be translated into action. Further differentiation is made between action planning (i.e., when-where-how plans) and coping planning (i.e., anticipating barriers and developing corresponding self-regulatory strategies). Specifically, for HIV disclosure, patients create disclosure plans by setting disclosure goals, deciding where, when, and how to disclose, as well as seeking disclosure support (HIV/AIDS Resources & Community Health, 2016).

Although psychosocial factors such as disclosure self-efficacy have been considered in program evaluation of previous parental HIV disclosure interventions, as HIV disclosure has not been operationalized as a 3-stage process, limited understanding has been developed regarding whether such psychosocial factors yield stage-specific roles on HIV disclosure stage transition as hypothesized in HAPA.

2.7 CONCEPTUAL FRAMEWORK

The proposed dissertation was guided by the conceptual framework diagrammed in Figure 2.1. There were two main studies in this dissertation. The first study 1) modelled the HIV disclosure stage (pre-intention, intention, and action) and the transition matrix based on the 3-stage HAPA, and 2) evaluated intervention effects on HIV disclosure stage transition. The second study evaluated 1) intervention effects on parental HIV disclosure-related psychosocial factors (disclosure knowledge, disclosure outcome
expectancy including the perceived costs and rewards, disclosure action self-efficacy, and disclosure action planning), and 2) the stage-specific predictive effects of these factors on HIV disclosure stage transition.

2.8 PURPOSE

The HAPA has been widely used in behavior change interventions on smoking cessation, physical exercise, nutrition, and dental health. However, less is known about whether this model is applicable to HIV disclosure intervention. Given the lack of research applying the stage models to the operationalization of HIV disclosure process, one of the main purposes of the proposed study is to model HIV disclosure stages based on the HAPA.

![HIV disclosure stage transition matrix]

Figure 2.1 Conceptual framework

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**Psychosocial Factors**
- Knowledge
- Perceived costs
- Perceived rewards
- Action self-efficacy
- Action planning
Moreover, although several key psychosocial factors have been identified in leading HIV disclosure models, previous studies have focused on the linear relationship between psychosocial predictors and the likelihood of disclosure action. Little is known about whether such factors yield stage-specific predictive effects of HIV disclosure stage transitions. Therefore, the other purposes of this study are to evaluate intervention effects on the proposed psychosocial factors, as well as to examine how these factors influence HIV disclosure stage transitions.

The proposed research will build on past research on HIV disclosure by conceptualizing and operationalizing it as a process. Instead of focusing on actual HIV disclosure behavior, such operationalization gives credits to participants who make progress in the early stages before HIV disclosure action is conducted. Moreover, it will expand the application of HAPA to the HIV disclosure field by adopting the 3-stage definition as well as examining the role action self-efficacy plays in disclosure stage transition. Lastly, by assessing the potential stage-specific predictive effects of psychosocial factors, this study will provide evidence for the development of future stage-specific psychosocial interventions tailored to participants at different disclosure stages.

2.9 RESEARCH QUESTIONS

Three major research questions were addressed in this study.

I. Is there any intervention effect on HIV disclosure stage transitions?

a. Does the intervention affect specific stage transition probabilities?
b. Does the intervention influence the overall pattern of HIV disclosure stage transition (i.e., backward transition or forward transition)?

II. Is there any intervention effect on disclosure-related psychosocial factors?

a. Does the intervention improve participants’ knowledge regarding parental HIV disclosure?

b. Does the intervention improve participants’ perceived rewards regarding parental HIV disclosure?

c. Does the intervention decrease participants’ perceived costs regarding parental HIV disclosure?

d. Does the intervention improve participants’ perceived action self-efficacy regarding parental HIV disclosure?

e. Does the intervention improve participants’ perceived action planning regarding parental HIV disclosure?

III. Do disclosure-related psychosocial factors yield stage-specific predictive effects on disclosure stage transition?

a. How does knowledge regarding parental HIV disclosure influence HIV disclosure stage transition?

b. How does perceived rewards regarding parental HIV disclosure influence HIV disclosure stage transition?
c. How does perceived costs regarding parental HIV disclosure influence HIV disclosure stage transition?

d. How does action self-efficacy regarding parental HIV disclosure influence HIV disclosure stage transition?

e. How does action planning regarding parental HIV disclosure influence HIV disclosure stage transition?
CHAPTER 3
METHODOLOGY

3.1 STUDY SETTING

This intervention was conducted in Zhuang Autonomous Region of Guangxi (i.e., Guangxi). Guangxi is a province on China’s southwestern border with Vietnam, with a total of 14 cities and 75 rural counties. It is a mountainous province with a large population of minority ethnic groups. Guangxi was ranked third among all the provinces of China in terms of HIV prevalence in the general population (1.30 per 1000) (Zheng et al., 2018). By the end of 2016, more than 110,000 people in Guangxi were registered to be living with HIV, among which 63,000 received treatment. Moreover, Guangxi was ranked second in terms of late HIV diagnosis, with a percentage of 51% much higher than the national average of 35.5% (Jin, Xiong, Wang, & Mao, 2016). Regarding the route of transmission, Guangxi was ranked the highest for heterosexual transmission. Among all registered HIV cases in 2016, more than 92% reported that they were infected by heterosexual sexual transmission (Zheng et al., 2018).

To select participating sites, all 14 cities and 75 rural counties in Guangxi were ranked in terms of number of reported HIV/AIDS cases. The top two cities (urban centers) and the top eight rural counties with the largest number of reported HIV/AIDS cases were selected to participate. Next, primary public HIV clinics in urban districts of the two cities and in townships of the eight rural counties were identified, and a total of
40 clinics were randomly selected from those clinics with at least 200 HIV/AIDS cases. About 20 PLH were randomly selected from each of the 40 participating clinics.

To minimize the confounding of contextual factors, stratified cluster randomization was used to assign each clinic into either the intervention or the control conditions. Briefly, all 40 clinics were first stratified into 10 strata (4 clinics/stratum) based on their similarities in the number of PLHIV served and geographic locations (rural vs. urban). Within each stratum, two clinics were randomly assigned to the intervention group and the other two were assigned to the control group.

3.2 STUDY SAMPLE

Patients who have not disclosed their HIV infection to their seronegative children aged between 6 to 15 years of age were recruited from 40 participating clinics. Inclusion criteria were: at least 18 years of age; a confirmed diagnosis of HIV or AIDS; living with at least one child 6 to 15 years of age; having not disclosed their HIV status to their children; willing to consent one child to participate in the study. Exclusion criteria were: linguistic, mental or physical inability to respond to assessment questions or to participate in intervention; currently incarcerated or institutionalized for drug use or commercial sex; plan to permanently relocate outside of the province within a year.

Medical staff or case managers at HIV clinics referred potential participants to local team members who visited each clinic twice a week during the recruitment period. If both father and mother in a family were eligible, the mother or the healthier parent was invited to participate. The project protocol was approved by the Institutional Review Boards (IRB) at Guangxi CDC in China and Wayne State University in the United States. All participants provided written informed consent.
3.3 Intervention Delivery

In each clinic, two nurses or other paraprofessionals were trained and certified to deliver the parent sessions (with separate training for intervention and control facilitators). The two trained facilitators delivered the materials through discussions, role-play, exercise, and/or games (for group sessions). The five two-hour parent intervention and control sessions were delivered one session per week for five weeks in the clinics where the parents are recruited.

3.4 Data Collection

Interviewers administered the baseline and all six-month follow-up surveys to the parents in a private room (e.g., doctor’s office) at district/township clinics where these parents were recruited. The interviewer read each question in the questionnaire, and the participant gave an oral response to the interviewer. Clarifications were provided by the interviewers as needed.

3.5 Intervention Contents

3.5.1 Intervention group

The parent curriculum consisted of five 2-hour interactive training sessions with three specific components: child development, illness communication, and coping. The first component focused on understanding the stages of childhood cognitive development in the context of parental illness (Session #1 “Child’s readiness for disclosure”). The second component focused on improving the parents’ cognitive and behavioral skills related to parental HIV disclosure (Session #2 “Benefits and risks of disclosure”, Session #3 “How to tell and what to tell”, and Session #4 “Disclosure is an ongoing process”).
The third component focused on improving parental psychosocial well-being in adapting to living with HIV/AIDS (Session #5 “Cope with my infection/illness”).

3.5.2 Control group

The attention control condition for parents was five 2-hour sessions of nutrition education curriculum. The nutrition curriculum was modeled after the “Simply Good Eating” curriculum (Sherman et al., 2012) and modified in accordance with current “Dietary Guidelines for Chinese Residents” (Ge, Yang, & Chen, 2008). The modified curriculum consisted of five 2-hour interactive training sessions with aims to increase parents’ knowledge of nutrition (Session #1: Food variety; Session #2: Food for growing child), healthy diets and cooking practice (Session 3: Fat, salt and sugar; Session 4: Fruits, vegetables and minerals), and food safety (Session #5 “Food safety”).

3.6 KEY MEASURES

3.6.1 Disclosure-related outcomes

Primary outcome: HIV disclosure stage

One question was asked at both follow-ups to capture individual’s level of HIV disclosure: 1 = “having not started disclosure in the past 6 months and no intention to start”, 2 = “having not started disclosure in the past 6 months but is intending to start”, 3 = “having not started disclosure in the past 6 months but already made a plan”, 4 = “started disclosing but not mentioning HIV”, 5 = “started disclosing with the word HIV”, and 6 = “started disclosing with the word HIV and how I got infected”. This question was not asked at baseline considering all participants had not disclosed at that time.
Secondary outcome: HIV disclosure-related psychosocial factors

Participants were asked about their perceptions regarding the costs and rewards of parental HIV disclosure. Disclosure costs were measured with 4 questions (e.g., “do you agree that disclosing to children will impact their academic performance?”), and disclosure rewards were measured with 5 questions (e.g. “do you agree that children will provide more support after knowing your status?”). Responses ranged from 1 = “completely disagree” to 4 = “completely agree”.

Considering the perceived costs and rewards depends on patients’ understanding of parental HIV disclosure, participants were also assessed on their knowledge regarding parental HIV disclosure using an author derived scale with 5 questions (e.g. “do you agree that parental HIV disclosure should take children’s developmental stage into consideration”). Responses ranged from 1 = “completely disagree” to 4 = “completely agree”.

Participants’ action self-efficacy regarding parental HIV disclosure was measured with an author derived scale with 9 questions. Sample questions are “how confident are you that you can make a parental HIV disclosure plan?” and “how confident are you that you can talk with children about basic HIV/AIDS knowledge?”. Responses ranged from 1 = “completely unconfident” to 5 = “completely confident”.

Participants’ action planning regarding parental HIV disclosure was measured with an author derived scale with 9 questions. Three general questions regarding when, who, and how to disclose and 6 specific questions (e.g., “how to explain what HIV is”, “how to deal with children’s reaction”) were asked. Responses were 1 = “will never consider”, 2 = “have not considered yet”, 3 = “considering”, and 4 = “already planned”.
3.6.2 Baseline characteristics

Parent-level variables include parents’ demographics (age, gender, marital status, level of education) and HIV-related variables (route of infection, and time since diagnosis, antiretroviral therapy uptake, CD4 count, viral load). Child-level variables include gender and age group (6-9 years, 10-12 years, and 13-16 years).

3.7 ANALYSIS PLAN

For the dissertation study, data from the baseline (W1) and the first two follow-ups (W2 at 6 months and W3 at 12 months) were used. All analysis was conducted in Stata 13.0 (College Station, TX) and Mplus 7.4 (Muthén & Muthén).

3.7.1 Randomization check

Chi-square tests and multivariate analysis of variance (MANOVA) were used to investigate potential differences in baseline demographics and HIV-related variables. In case there were differences between groups, the respective variable(s) were used as covariates in the analysis of main outcome variables.

3.7.2 Attrition analysis

A CONSORT flowchart was provided (Figure 3.1). The rate of attrition and whether it varies between intervention assignment were examined using chi-square tests. MANOVA was conducted to test whether participants who completed the study differ in any baseline variables compared to those who dropped out. In case there were differences, the respective variable(s) were used as covariates in the analysis of the main outcome variables.
Figure 3.1 CONSORT flowchart of participants between baseline and W3

3.7.3 Main analysis

**Intervention effects on HIV disclosure stage transition from W2 to W3**

Methodologically, the central outcomes in stage theories such as HAPA are stage transitions, which can be modeled using Markov chain approaches. A simple illustration of the Markov chain is shown in Figure 3.2. C1 and C2 represent the latent stages at t and t+1, u1 and u2 represent the observed variables at t and t+1. Three sets of parameters are estimated: 1) latent status (i.e. stage) prevalence, which represents the prevalence of latent status s at time t; 2) item-response probabilities which represent the probability of a
given response to observed variable j, conditional on membership in a latent status s at time t; and 3) transition probabilities which represent the conditional probability of a transition to status s at time t + 1, given membership in status s at time t.

Figure 3.2 Simple illustration of the Markov chain model

A multigroup Markov model estimating group-specific transition matrix was conducted. In this way, the intervention arm was treated as a grouping variable, that is, we tested the moderating effect of the intervention on the transition probability (Figure 3.3).

Figure 3.3 Multigroup Markov model testing the moderating effect of the intervention on the transition probability
To yield statistical estimates of the intervention effects on the transition matrix, a different parameterization equivalent to the previous model was displayed in Figure 3.4. Intervention effects can be modelled using a conditional multinomial logistic regression shown in Table 3.1.

![Figure 3.4 Alternative parameterization of the intervention effect](image)

Table 3.1 Illustration of the effect size of intervention on transitions

<table>
<thead>
<tr>
<th>U1</th>
<th>1</th>
<th>b11+g11*Intervention</th>
<th>b21+g21*Intervention</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td>b12+g12*Intervention</td>
<td>b22+g22*Intervention</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: The b parameters are slopes for the multinomial regression of U2 on U1. The g parameters are slopes for the intervention, varying over the U1 and U2 classes.

**Intervention effects on disclosure-related psychosocial factors**

A latent change score (LCS) method was used to evaluate the intervention effect on psychosocial factors. Both a structural model and a measurement model was included. Based on the classical test theory, an observed score \( Y[t] \) can be decomposed into a true score \( y[t] \) and a unique score \( u[t] \). This can be written as
\[ Y[t]_n = y[t]_n + u[t]_n \]

For the difference between two time points, the true score at time \( t \) \((y[t]_n)\) is a function of the true score at time \( t-1 \) \((y[t-1]_n)\) plus the change in the true score from time \( t-1 \) to \( t \) \((\Delta y[t]_n)\). This can be written as
\[ y[t]_n = y[t-1]_n + \Delta y[t]_n \]

Therefore, the latent different score can be written as
\[ \Delta y[t]_n = y[t]_n - y[t-1]_n \]

To model the latent different scores, the proportional change model was used. The predicted changes \( \Delta y[t]_n \) are proportional to the state (or status) of the prior true score \( y[t-1]_n \). Simply, it can be written as
\[ \Delta y[t]_n = \beta \cdot y[t-1]_n \]

where \( \beta \) is an estimated parameter that does not vary over time. The model was depicted in Figure 3.5.

![Figure 3.5 Latent proportional change model](image)

Variance of \( y[t]_n \) is decomposed into three parts: variance associated with one’s true score at \( t-1 \) \((y[t-1]_n)\), variance associated with the true change \( \Delta y[t]_n \) from \( t-1 \) to \( t \), and covariance between \( y[t-1]_n \) and \( \Delta y[t]_n \).
In the structural model, the mean and variance of the first latent true score ($M_1$) were freely estimated, but the means and variances of the subsequent latent true scores ($M_2$ and $M_3$) were fixed at 0. The latent change scores ($LCS_{21}$ and $LCS_{32}$) were set to have a mean and a variance of 0. The autoregressive coefficients were set to 1. Intervention assignment was treated as a predictor of latent change scores. In the measurement model, the latent construct of interest was measured using several indicators (e.g., items 1-3). We assumed measurement invariance and correlated residual errors over time. The overall model was depicted in Figure 3.6.

3.7.4 Missing data

Cases with missing data on outcome variables at any follow-up wave were retained through the use of the full information maximum likelihood (FIML) estimator which gives valid estimates when missing data are MCAR or missing at random (MAR) (17). Complete-case analysis was conducted when data were missing on covariates.

3.7.5 Clustering

In the main analysis, a sandwich estimator of standard errors was used to account for the clustered nature of data (patients were nested within clinics). In addition, sensitivity analysis was conducted by applying the multi-level method (details in Appendix A). Simply, the mean and the variance were decomposed into the within-clinic level and the between-clinic level. The intervention was treated as a clinic-level covariate in the analysis.
Figure 3.6 Structural modeling for the proportional latent change score (LCS) model
CHAPTER 4
MANUSCRIPTS

4.1 Intervention Effects of A Theory-based Parental HIV Disclosure Intervention among Parents Living with HIV (PLH) in China --- Application of the Health Action Process Approach (HAPA)\textsuperscript{1}

\textsuperscript{1}Da, W., Li, X., Qiao, S. (2019). To be submitted to AIDS and Behavior.
Abstract

With prolonged lives thanks to antiretroviral therapy, ongoing challenges are faced by parents living with HIV (PLH) regarding telling their HIV-positive status to children (i.e., parental HIV disclosure). To assist PLH in making a well-planned and developmentally appropriate HIV disclosure to their uninfected children, a theory-driven intervention was conducted among 791 PLH with children aged between 6-15 years in Guangxi, China.

Using secondary data from the baseline (W1) and the first two follow-ups (W2 at 6-month and W3 at 12-month) data, intervention effect on HIV disclosure process was evaluated. Three critical disclosure stages were defined based on the stage model of the Health Action Process Approach (HAPA): 1) the pre-intention stage, in which people have not yet decided to disclose; 2) the intention stage, in which people have decided to disclose but have not yet started action; 3) the action stage, in which individuals make actual disclosure event. Accordingly, people at the three stages were defined as pre-intenders, intenders, and actors.

A multigroup first-order manifest Markov Chain method was conducted to assess the intervention effect on disclosure stage transitions between W2 and W3. Among pre-intenders at the first follow-up, those in the intervention group were more likely to progress to the action stage rather than being static (OR = 3.43, 95% CI 1.17, 10.01). However, no statistically significant intervention effect was detected in promoting progression from pre-intention to intention (OR = 1.02, 95% CI 0.47, 2.20). Among intenders at the first follow-up, no statistically significant intervention effect was detected
in preventing backward transition to pre-intention (OR = 0.71, 95% CI 0.35, 1.43) or promoting forward transition to action (OR = 2.01, 95% CI 0.84, 4.79).

Study findings suggest HIV disclosure can be modeled as a process with 3 stages guided by HAPA. Also, the stage-specific intervention effects suggest PLH at different stages may respond differently to the intervention. In order to develop stage-specific interventions tailored to parents’ needs, better understanding in terms of key psychosocial factors predicting HIV disclosure stage transitions is needed.

**Introduction**

By the end of 2017, there were 36.9 million people living with HIV (PLHIV) worldwide, among which 21.7 million were receiving antiretroviral therapy (ART) (Joint United Nations Programme on HIV/AIDS, 2018a). As reported on the 5th National Conference on HIV/AIDS in China, there were 820,756 reported PLHIV in China by the end of June 2018, among which 80.4% were receiving ART (China Center for Disease Control and Prevention, 2018). With prolonged lives thanks to ART, parents living with HIV (PLH) are more likely to raise their children to adolescence or even adulthood. The 2012 survey showed that among 2458 PLH, 1043 (42.1%) had more than one adult children, and 1254 (50.6%) had at least one child between 5-16 years old.

For PLH, telling their HIV-positive status to children (i.e., parental HIV disclosure) is challenging especially when it comes to younger children. According to the China Stigma Index Report, less than half of PLH reported that their children were aware of their HIV status (Institute of Social Development Research, 2009). An even lower rate of 25% was found in the 2012 survey among 1254 PLH who had children between 5-16 years old (Qiao et al., 2015).
In 2011, the World Health Organization (WHO) published the Guideline on HIV Disclosure Counselling for Children Up to 12 Years of Age (World Health Organization, 2011). As there is evidence of mutual health benefits for both children and caregivers, parental HIV disclosure is recommended to school-aged children. Noticeably, a 2013 systematic review of global literature on parental HIV disclosure reported mixed findings regarding the impacts of disclosure on children (Qiao, Li, & Stanton, 2013). As argued by the authors, a large number of parental disclosures were unintentional, poor-prepared, or even forced. This suggests the desired benefits of parental HIV disclosure may only be generated when it is culturally and developmentally appropriate and well-planned.

According to Omarzu et al., HIV disclosure is a cognitive process to determine whether, when, and how to disclose (Omarzu, 2000). The first stage is about disclosure intention formation and the next two stages are about preparation and planning for the intention-to-action translation. In the HIV Disclosure Guide published by the HIV/AIDS Resources & Community Health (ARCH) (HIV/AIDS Resources & Community Health, 2016), HIV disclosure is depicted as a process starting from diagnosis adjustment and self-educating, moving into preparation and planning for disclosure, and finally translating into disclosure action. Great emphasis was put on the preparation and planning phases where patients create disclosure plans by setting disclosure goals, deciding where, when, and how to disclose, as well as seeking disclosure support.

However, a dearth of interventions with aims to assist PLH with parental HIV disclosure have focused on the stage of disclosure process in the impact evaluation (Conserve et al., 2017). In the recent systematic review on parental HIV disclosure interventions, all the included intervention studies used HIV disclosure action (event) as
the primary outcome in the evaluation. Of these four intervention studies, two studies assessed intervention effect on HIV disclosure action as a binary yes-or-no measure, one study assessed intervention effect on disclosure as no disclosure, partial disclosure using the word virus, and full disclosure using the word HIV, and one study assessed intervention effect on disclosure as a 0-6 scale ranging in disclosure breadth (i.e., the topics covered in the communication).

Considering the lack of studies viewing HIV disclosure decision-making as a process, we borrowed the conceptualization posited by the Health Action Process Approach (HAPA) stating that people pass through an ordered set of qualitatively different stages to make behavior change (Weinstein et al., 1998). According to HAPA, engagement in behavior change goes through the intention formation and the intention translation processes. Briefly, there are three critical stages: 1) the pre-intention stage, in which people have not yet decided to act; 2) the intention stage, in which people have decided to act but have not yet started action; 3) the action stage, in which individuals make actual behavior change (Schüz et al., 2008).

Given that the central outcomes in stage theories such as HAPA are stage transitions, the current study focused on applying HAPA to evaluate intervention effects on HIV disclosure stage transitions. The primary research questions addressed were: (1) Does intervention condition affect specific stage transition probabilities; and (2) Does the intervention influence the overall pattern of HIV disclosure stage transition (i.e., backward transition or forward transition)?
Methods

a. Study setting

This intervention was conducted in Guangxi, one of the regions with the highest prevalence of HIV in China. The HIV epidemic in Guangxi features a large number of newly reported HIV/AIDS cases, as well as multiple modes of HIV transmission (e.g., drug use, same-sex behavior, commercial sex behavior)(Zheng et al., 2018).

The top two cities (urban centers) and the top eight rural counties with the largest number of reported HIV/AIDS cases were selected among all 14 cities and 75 rural counties to participate. Next, urban districts in the two cities and townships in the eight rural counties with at least 200 HIV/AIDS cases were identified, and a total of 40 clinics were randomly selected. To select participants, 20 PLH were randomly selected from each of the 40 participating clinics.

Stratified cluster randomization was used to assign each clinic into either the intervention or the control conditions. Briefly, all 40 clinics were first stratified into 10 strata (4 clinics/stratum) based on their similarities in the number of PLHIV served and geographic locations (rural vs. urban). Within each stratum, two clinics were randomly assigned to the intervention group and the other two were assigned to the control group. Baseline survey and 6-waves of follow-ups (every 6 months) were conducted.

b. Study sample

Patients who have not disclosed their HIV infection to their seronegative children aged between 6 to 15 years of age were recruited from the participating primary public HIV clinics in the 40 districts/townships. Medical staff or case managers at HIV clinics referred potential participants to local team members who visited each clinic twice a
week during the recruitment period. If both father and mother in a family were eligible, the mother or the healthier parent was invited to participate. The project protocol was approved by the Institutional Review Boards (IRB) at Guangxi CDC in China and Wayne State University in the United States. All participants provided written informed consent.

**c. Description of intervention**

**1. Intervention contents**

**Intervention group**

Three main components (child development, illness communication, and coping) were included for the intervention group. Child development focused on understanding the stages of childhood cognitive development in the context of parental illness and assessing the child’s readiness for disclosure. Illness communication focused on improving the parents’ cognitive (benefits and risks of disclosure, disclosure is an ongoing process) and behavioral skills (how to tell and what to tell) related to parental HIV disclosure. Coping focused on improving parental psychosocial well-being in adapting to living with HIV/AIDS.

**Control group**

The control group received nutrition education modeled after the “Simply Good Eating” curriculum (Sherman et al., 2012) and modified in accordance with current “Dietary Guidelines for Chinese Residents” (Ge et al., 2008). The modified curriculum aims to increase parents’ knowledge of nutrition, healthy diets and cooking practice, and food safety.
2. Intervention delivery

A two-hour session was delivered every week for five weeks in the clinics where the parents were recruited. At each clinic, two trained facilitators delivered the materials through discussions, role-play, exercise, and/or games.

3. Data collection

The baseline and a total of six-month follow-up surveys were administered to the parents in a private room (e.g., doctor’s office) at district/township hospitals where these parents were recruited. The interviewer read each question in the questionnaire, and the participant gave an oral response to each question. Clarifications were provided when needed.

d. Measures

1. HIV disclosure stage

Participants’ HIV disclosure stage was measured using one question with 6 points: 1 = “having not started disclosure in the past 6 months and no intention to start”, 2 = “having not started disclosure in the past 6 months but is intending to start”, 3 = “having not started disclosure in the past 6 months but already made a plan”, 4 = “started disclosing but not mentioning HIV”, 5 = “started disclosing with the word HIV”, and 6 = “started disclosing with the word HIV and how I got infected”.

The original 6 categories were collapsed into pre-intenders (response 1), intenders (responses 2-3), and actors (responses 4-6) based on the 3-stage HAPA (Schüz et al., 2008). These three stages of HIV disclosure were used in further analysis of intervention effects.
2. Baseline characteristics

Parents’ demographics (age, gender, marital status, level of education) and HIV-related characteristics (route of infection, and time since diagnosis, antiretroviral therapy uptake, CD4 count, viral load) were collected at baseline. Children’s gender and age group (6-9 years, 10-12 years, and 13-16 years) were also collected.

Analysis

The baseline (W1) and two follow-ups (W2 at 6-month and W3 at 12-month) data were used for this study. The analysis was conducted using Stata 13.0 (College Station, TX) and Mplus 7.4 (Muthen & Muthen). Somers' D was calculated to compare the distribution of HIV disclosure stage between the intervention and the control groups at W2 and W3.

Intervention effect on HIV disclosure stage was examined using a first-order manifest Markov model by assuming that 1) the stage occupied at W3 depends only on the stage occupied at W2, not W1 (i.e., first-order); and 2) there was no measurement error in the stages (i.e., manifest). Details of the model can be found in Chapter 3, session 3.7.3. Briefly, two regressions were conducted --- one for the stage membership at W2 (U1) and one for the stage transition between W2 and W3 (U2). A multinomial logistic regression was conducted to model stage membership at W2. Conditional multinomial logistic regressions were conducted to model stage membership at W3 given a certain W2 stage membership.

In terms of stage membership, no restriction was made on stage membership at W2. An absorbing stage of actors (e.g., no one could move out of this class) was defined by imposing parameter restrictions on backsliding from action to earlier stages.
Therefore, six possible transition patterns were modeled: static at pre-intention, forward transition from pre-intention to intention, forward transition from pre-intention to action, static at intention, backward transition from intention to pre-intention, and forward transition from intention to action.

To test the equivalence of stage membership at W2 by intervention arms, the intervention arm was treated as a covariate. To test for the equality of transition matrix by intervention group, comparison of model fit was made between a model allowing different group-specific transition patterns (Model 1) and a model with a constraint on equal transition matrix across intervention arms (Model 2). Model fit was compared using log-likelihood ratio G² difference tests (L. M. Collins, Fidler, Wugalter, & Long, 1993). The Akaike Information Criteria (AIC) and the Bayesian Information Criteria (BIC) were also used. The entropy of models was also considered.

In order to produce a broader picture of intervention effect on transition probabilities, unsuccessful and successful stage transitions were further defined. For pre-intenders, forward transition to either the intention or the action stage was defined as “successful”, whereas no change was defined as “unsuccessful”. For intenders, a backward transition to the pre-intenders was defined as “unsuccessful”, whereas no change or forward transition to the action stage was defined as “successful”. Different categorization of the “no change” group was based on the fact that HIV disclosure preparation and planning can take much longer than 6 months. A study conducted among HIV-positive parents found that most “take years to prepare for disclosure, proceeding when they judge themselves ready to impart the news and their children receptive to receive the news” (Gachanja, Burkholder, & Ferraro, 2014b).
Further, the baseline covariates influencing stage membership at W2 were included. These covariates were selected a priori (European Medicines Agency, 2015). As suggested by Streiner, “the ideal covariates are those that are related to intrinsic properties of the participants, such as age or sex, or are measured before the randomization” (Streiner, 2016). Moreover, according to the guideline on adjustment for baseline covariates in clinical trials, “the clinical and statistical relevance of a covariate should be assessed and justified from a source other than the current dataset” (Committee for Medicinal Products for Human Use, 2015). Therefore, Individual prognostic covariates were selected based on 1) previous observational studies conducted among PLHIV in Guangxi, China; 2) previous literature review regarding correlates of parental HIV disclosure (Adeoye-Agboola, Evans, Hewson, & Pappas, 2016; Hawk, 2007; Rochat, Stein, Cortina-Borja, Tanser, & Bland, 2017). Parent-level variables included parents’ age, gender, marital status, route of infection, and CD4 count. Child-level variables included gender and age group (6-9 years, 10-12 years, and 13-16 years). Collinearity of individual-level covariates was checked using the variance inflation factors (VIF).

The full information maximum likelihood (FIML) estimator was used to retain cases with missing data at either wave. It gives valid estimates when missing data are MCAR or missing at random (MAR) (Enders & Bandalos, 2001). Complete-case analysis was conducted for missing covariates. A sandwich estimator of standard errors was used to account for the clustered nature of data (patients were nested within clinics). Random start values were used to ensure that the models converge on global, rather than local solutions (Peel & McLachlan, 2000).
Results

A CONSORT flow diagram was shown in Figure 4.1. Among all 791 who completed the baseline survey, participants who did not respond to the HIV disclosure question at both W2 and W3 were excluded from further data analysis. In total, 374 participants from the intervention group and 377 participants from the control group were included in the final analysis.

Figure 4.1 CONSORT flow diagram of 791 participants
The distribution of baseline covariates by intervention group was shown in Table 4.1. A total of 791 participants completed the baseline survey. The average age was 37.7 years old, most participants were males (57.5%) and married (76.5%). Nearly half of the participants had only completed primary school education (46.5%). Around half of the participants were full-time employed (46.8%), and most had a monthly income of less than 1000 RMB (54.2%). More than a third (35.3%) were infected by their main partner/spouse, and nearly one fourth (23.9%) had a CD4 count greater than 500 copies/ml. For children, around half were between 6 to 9 years old (47.7%), and most were boys (53.0%). No statistically significant differences were detected in the randomization check or the attrition analysis.

Table 4.1 Baseline characteristics by intervention status

<table>
<thead>
<tr>
<th>Variables</th>
<th>Intervention N = 403</th>
<th>Control N = 388</th>
<th>Total N = 791</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socio-demographics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>37.6±5.7</td>
<td>37.8±5.4</td>
<td>37.7±5.6</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>231(57.3)</td>
<td>224(57.7)</td>
<td>455(57.5)</td>
</tr>
<tr>
<td>Female</td>
<td>172(42.7)</td>
<td>164(42.3)</td>
<td>336(42.5)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>303(75.4)</td>
<td>301(77.6)</td>
<td>604(76.5)</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>32(8.0)</td>
<td>31(8.0)</td>
<td>63(8.0)</td>
</tr>
<tr>
<td>Widowed</td>
<td>58(14.6)</td>
<td>46(11.9)</td>
<td>104(13.2)</td>
</tr>
<tr>
<td>Education completed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>169(43.0)</td>
<td>186(50.3)</td>
<td>355(46.5)</td>
</tr>
<tr>
<td>Middle school</td>
<td>195(49.6)</td>
<td>156(42.2)</td>
<td>351(46.0)</td>
</tr>
<tr>
<td>High school and higher</td>
<td>29(7.4)</td>
<td>28(7.6)</td>
<td>57(7.5)</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>97(24.1)</td>
<td>58(15.2)</td>
<td>155(19.8)</td>
</tr>
<tr>
<td>Part-time</td>
<td>131(32.6)</td>
<td>131(34.3)</td>
<td>262(33.4)</td>
</tr>
<tr>
<td>Full-time</td>
<td>174(43.3)</td>
<td>193(50.5)</td>
<td>367(46.8)</td>
</tr>
<tr>
<td>Income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-999</td>
<td>20(57.1)</td>
<td>199(51.3)</td>
<td>429(54.2)</td>
</tr>
</tbody>
</table>
Variables | Intervention N = 403 | Control N = 388 | Total N = 791
---|---|---|---
1000-1999 | 125(31.0) | 130(33.5) | 255(32.2)
≥2000 | 48(11.9) | 59(15.2) | 107(13.5)

Clinical-related factors

Route of infection

Spouse/main partner | 144(35.7) | 135(34.8) | 279(35.3)
Commercial sex | 121(30.0) | 143(36.9) | 264(33.4)
IDU | 58(14.4) | 49(12.6) | 107(13.5)
Others | 80(19.9) | 61(15.7) | 141(17.8)

CD4 group

<200 | 77(19.5) | 69(18.8) | 146(19.1)
200-349 | 121(30.6) | 117(31.8) | 238(31.2)
350-500 | 99(25.1) | 98(26.6) | 197(25.8)
≥500 | 98(24.8) | 84(22.8) | 182(23.9)

Child-level

Age group

6-9 | 199(49.3) | 172(46.0) | 371(47.7)
10-12 | 110(27.2) | 86(23.0) | 196(25.2)
13-18 | 95(23.5) | 116(31.0) | 211(27.1)
Gender

Male | 209(54.1) | 185(51.8) | 394(53.0)
Female | 177(45.9) | 172(48.2) | 349(47.0)

Descriptive analysis of HIV disclosure stage

Distribution of HIV disclosure stage at W2 and W3 by intervention group was shown in Table 4.2. Somers’ D statistics suggested a statistically significant difference in HIV disclosure stage by intervention group at W3, but not W2.

Table 4.2 Distribution of HIV disclosure stage at W2 and W3 by intervention group

<table>
<thead>
<tr>
<th>Study wave</th>
<th>Intervention group</th>
<th>HIV disclosure stage</th>
<th>Somers’ D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-intention</td>
<td>Intention</td>
<td>Action</td>
<td>Total</td>
</tr>
<tr>
<td>W2</td>
<td>Intervention</td>
<td>173(46.8)</td>
<td>133(36.0)</td>
</tr>
<tr>
<td>Control</td>
<td>179(48.1)</td>
<td>134(36.0)</td>
<td>59(15.9)</td>
</tr>
<tr>
<td>W3</td>
<td>Intervention</td>
<td>170(46.1)</td>
<td>127(34.4)</td>
</tr>
<tr>
<td>Control</td>
<td>200(54.6)</td>
<td>129(35.3)</td>
<td>37(10.1)</td>
</tr>
</tbody>
</table>
**Intervention specific stage movement patterns**

Model fit statistics were shown in Table 4.3. A statistically significant difference in $G^2$ was detected, suggesting that the unrestrained Model 1 was favored over the restrained Model 2 ($p = 0.021$). Therefore, unrestrained Model 1 was selected for further analysis. The chi-square test for MCAR showed no statistically significant effect ($p = 0.85$), suggesting that the assumption of MCAR was met. The entropy was 0.95, suggesting a good model fit.

Table 4.3 Model fit comparing the unrestrained Model 1 with the restrained Model 2

<table>
<thead>
<tr>
<th></th>
<th>$G^2$</th>
<th>H0 value</th>
<th>No. of free parameters (p)</th>
<th>Df = W – P - 1</th>
<th>AIC</th>
<th>BIC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model 1</strong></td>
<td>5290.58</td>
<td>-2645.29</td>
<td>13</td>
<td>4</td>
<td>5316.58</td>
<td>5376.66</td>
</tr>
<tr>
<td><strong>Model 2</strong></td>
<td>5302.09</td>
<td>-2651.04</td>
<td>9</td>
<td>8</td>
<td>5320.09</td>
<td>5361.68</td>
</tr>
<tr>
<td><strong>Difference</strong></td>
<td>11.51</td>
<td></td>
<td>4</td>
<td></td>
<td>$p = 0.021$</td>
<td></td>
</tr>
</tbody>
</table>

The transition probabilities were shown in Figure 4.2. The probability of staying in a given stage is represented by a circle and the probability of transition is represented by either solid (for forward movement) or dashed (for backward movement) arrows. In the control group, among pre-intenders at W2, 78.3% stayed static at W3, 19.4% progressed to the intention stage, and only 2.3% progressed to the action stage. Among intenders at W2, 34.2% regressed to the pre-intention stage at W3, 57.7% stayed static, and 8.1% progressed to the action stage.

In the intervention group, among pre-intenders at W2, 74.1% stayed static at W3, 18.7% progressed to the intention stage, and only 7.3% progressed to the action stage. Among intenders at W2, 24.7% regressed to the pre-intention stage at W3, 58.8% stayed static, and 16.6% progressed to the action stage.
Figure 4.2 Estimated transition probabilities by intervention groups

**Intervention effects on HIV disclosure stage membership at W2 and stage transition**

Intervention effects on stage membership were shown in Table 4.4. No statistically significant difference was detected for either pre-intenders (OR = 1.37, 95% CI 0.66, 2.84) or intenders (OR = 1.36, 95% CI 0.74, 2.48). Similar results were found after adjusting for baseline covariates, with the ORs being 1.45 (95% CI 0.66, 3.19) for pre-intenders and 1.53 (95% CI 0.79, 2.97) for intenders.

Table 4.4 Intervention effect on W2 stage membership

<table>
<thead>
<tr>
<th>W2 stage membership</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-intention</td>
<td>1.37</td>
<td>0.66, 2.84</td>
<td>0.483</td>
</tr>
</tbody>
</table>
Intervention effects on stage transition were shown in Table 4.5. Among pre-intenders at W2, those in the intervention group were more likely to progress to the action stage rather than being static (OR = 3.43, 95% CI 1.17, 10.01). However, no statistically significant intervention effect was detected in promoting progression from pre-intention to intention (OR = 1.02, 95% CI 0.47, 2.20). Overall, no statistically significant intervention effect was detected in promoting a successful transition. Among intenders at W2, no statistically significant intervention effect was detected in preventing backward transition to pre-intention (OR = 0.71, 95% CI 0.35, 1.43), promoting forward transition to action (OR = 2.01, 95% CI 0.84, 4.79), or promoting overall successful transition (OR = 1.59, 95% CI 0.82, 3.09). Similar results were detected after adjusting for covariates.

### Table 4.5 Intervention effects on stage transition

<table>
<thead>
<tr>
<th>W2 stage membership</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>1.36</td>
<td>0.74, 2.48</td>
<td>0.401</td>
</tr>
<tr>
<td>Action (ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted model</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-intention</td>
<td>1.45</td>
<td>0.66, 3.19</td>
<td>0.432</td>
</tr>
<tr>
<td>Intention</td>
<td>1.53</td>
<td>0.79, 2.97</td>
<td>0.289</td>
</tr>
<tr>
<td>Action (ref)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Unadjusted model    |            |         |         |
| Pre-intention       | Ref        | 1.02(0.47, 2.20) | 3.43(1.17, 10.01) | 1.27(0.59, 2.71) |
| Intention           | 0.71(0.35, 1.43) | Ref   | 2.01(0.84, 4.79) | 1.59(0.82, 3.09) |

| Adjusted model      |            |         |         |
| Pre-intention       | Ref        | 1.07(0.49, 2.35) | 6.66(1.72, 25.8) | 1.42(0.65, 3.13) |
| Intention           | 0.69(0.33, 1.40) | Ref   | 1.81(0.74, 4.45) | 1.60(0.80, 3.18) |
Discussion:

This is one of the first efforts applying the HAPA in the evaluation of parental HIV disclosure interventions. Our results showed that the theory-based intervention yielded different effects when targeting PLHIV at different initial stages of HIV disclosure. Specifically, pre-intenders responded most to the intervention with higher odds of transition into action rather than staying at the pre-intention stage. However, for intenders, no statistically significant intervention effect was detected.

Interestingly, our results showed that stage sequential change does not necessarily occur in a linear fashion as a small number of patients were found to skip stages out of the sequential order. Specifically, such pre-intenders skipped the intention stage and went directly to the action stage within the 6 months. One possible explanation, as mentioned earlier, was the measurement error which has the highest impact on the smallest response category (i.e., the pre-intenders) (Bassi, Hagenaars, Croon, & Vermunt, 2000). Another explanation was that the time window of 6 months was too wide to capture their sequential change. However, as mentioned earlier, it may take years before the intention is transformed into action. Further studies comparing the transition structure models with and without constraints on forward transition from pre-intention to action may help better understand whether such abrupt transition is possible. Moreover, if patients did actually make an abrupt transition without detailed planning and preparation, more studies are needed to disentangle predictors of such stage skipping and its corresponding consequences.

Mixed findings have been reported regarding the efficacy of previous parental HIV disclosure interventions (Conserve et al., 2017). For example, Rotheram-Borus et al.
found no statistically significant difference in the presence or absence of parental HIV disclosure across conditions over 24 months. However, a previous parental HIV disclosure intervention conducted among PLH in Shanghai, China was found to promote movement along the disclosure behavior continuum as soon as 4 weeks after intervention. Noticeably, the Shanghai intervention was conducted among patients with teenage or adult children. The parental HIV disclosure literature showed that disclosure rates were higher among parents with older children compared to younger school-aged children. Moreover, if we look at the changes in the mean score of the 7-point disclosure behavior continuum, the intervention promoted participants’ movement from 1 (i.e., giving general information about HIV) to 3 (i.e., disclosing having a specific disease but not HIV). Therefore, such movement may suggest more of an increase in parent-child communication rather than the disclosure process posited in this study.

The lack of intervention effect on the intention to action transition may also be explained by the variation of children’s age in our study. As mentioned earlier, around half of children were between 6 to 9 years old (47.7%), 25.2% were between 9-12 years old, and 27.1% were between 13-16 years old. Previous studies have found a lower disclosure rate among parents with younger children as they were considered as “too young to understand”. However, age-appropriate disclosure for young children may not cover stigmatized and sensitive questions such as the route of infection, which has been identified as a key barrier for parental HIV disclosure. However, we were unable to test the moderating effect of child age due to the limited sample size.

Several limitations exist in this study which may influence the interpretation of our findings. First, we assumed no measurement error regarding HIV disclosure stage.
However, theoretically impossible backward stage transition out of the action stage was observed in this study. To cope with such measurement error, more complicated latent Markov models estimating the item-response probabilities can be used. Second, child age has been identified as one of the most consistent and influential predictor of parental HIV disclosure (Qiao et al., 2013). As child age increases, the incidence of parental HIV disclosure increases significantly. However, we were unable to test the moderating effect of child age due to the limited sample size.

Despite these limitations, this study has significant implications for future studies. First, the 3-stage HAPA model can be applied to the evaluation of HIV disclosure interventions yet more complicated models such as the mover-stayer latent transition analysis need to be explored. Second, when assessing the intervention effects on stage transition, consideration of both specific transition probabilities and overall forward or backward transition patterns enables a more comprehensive interpretation of intervention effects. Third, the stage-specific intervention effects detected in this study indicate the need for stage-specific interventions which may be more effective in promoting stage transitions. To develop such tailored interventions, a better understanding of different predictors for each specific stage transition is warranted. Therefore, further mediation analysis exploring the mediating effects of such predictors on HIV disclosure stage transitions may help us elucidate the mechanism causing HIV disclosure stage transitions.
4.2 Psychosocial Factors Predicting Transitions in HIV Disclosure Stages --- Evaluation of A Theory-based Parental HIV Disclosure Intervention among Parents Living with HIV in China

1Da, W., Li, X., Qiao, S. (2019). To be submitted to AIDS and Behavior.
Abstract

Several key psychosocial factors such as outcome expectancy and self-efficacy have been identified to influence HIV disclosure. However, when operationalized as a process with 3 stages according to the Health Action Process Approach (HAPA), the potential stage-specific roles of psychosocial factors on HIV disclosure stage transition have not been well studied.

Using secondary data from a theory-based parental HIV disclosure intervention conducted among parents living with HIV in China, 2012, intervention effects on psychosocial factors such as parental HIV disclosure knowledge, disclosure outcome expectancy measured by perceived costs and rewards, disclosure action self-efficacy, and disclosure action planning were evaluated. Moreover, the predictive effects of such factors on HIV disclosure stage transition was examined.

Guided by the stage model of the Health Action Process Approach (HAPA), three critical disclosure stages were defined: 1) the pre-intention stage, in which people have not yet decided to disclose; 2) the intention stage, in which people have decided to disclose but have not yet started action; 3) the action stage, in which individuals make actual disclosure event. A latent change score (LCS) method was used to assess the intervention effect on disclosure-related psychosocial factors including knowledge, outcome expectancy (perceived costs and rewards), self-efficacy, and planning. Predictive effects of these psychosocial factors on disclosure stage transitions were examined by treating these factors as covariates in a Markov chain model estimating HIV disclosure stage transition matrix.
At the first follow-up, statistically significant intervention effect was detected for disclosure knowledge ($\beta=0.137$, 95% CI 0.037-0.237, $p=0.007$), action self-efficacy ($\beta = 0.277$, 95% CI 0.120, 0.434, $p=0.001$), and action planning ($\beta = 0.344$, 95% CI 0.168, 0.519, $p<0.001$) but not for disclosure outcome expectancy. Stage-specific predictive effects of action self-efficacy and action planning on HIV disclosure stage transitions were detected. Specifically, the progression from pre-intention to intention was promoted by action self-efficacy and action planning, and regression from intention to pre-intention was prevented by action planning.

The identification of stage-specific psychosocial predictors of stage transition allows matching future interventions to psychologically defined HIV disclosure stages.

**Introduction**

As reported on the 5th National Conference on HIV/AIDS in China, there were 820,756 reported PLHIV in China by the end of June 2018, among which 80.4% were receiving ART (China Center for Disease Control and Prevention, 2018). The 2019 UNAIDS special analysis reported that 83% of PLH who know their status have received the treatment, and 94% have suppressed viral loads (Joint United Nations Programme on HIV/AIDS, 2019). With prolonged lives thanks to ART, PLH face ongoing challenges regarding telling their HIV-positive status to children (i.e., parental HIV disclosure).

According to the Disclosure Decision-Making Model (DDMM), parents assess the rewards and costs for HIV disclosure (i.e., outcome expectancy) and a decision to disclosure is made only when the rewards outweigh the costs (Chaudoir & Fisher, 2010). Also, parents evaluate their ability to disclosure (i.e., disclosure self-efficacy) in the decision-making process. The likelihood of disclosure increases as the rewards and self-efficacy increase and the costs decrease.
Such a linear relationship between psychosocial predictors and the likelihood of target behavior corresponds to the continuum model of behavior change (Lippke & Ziegelmann, 2008). In contrast, stage models of behavior change posit that people pass through qualitatively distinct, ordered phases during the process of behavior change (Weinstein et al., 1998). Therefore, the HIV disclosure process, according to the Health Action Process Approach (HAPA), can be measured with three critical stages: 1) the pre-intention stage, in which people have not yet decided to disclose; 2) the intention stage, in which people have decided to disclose but have not yet started action; 3) the action stage, in which individuals make actual disclosure action (Schwarzer, Lippke, & Luszczynska, 2011).

Moreover, such stages are characterized by similarities within stages and psychological differences between stages (Schüz et al., 2008). Theoretically, pre-intenders will show lower perceived rewards and self-efficacy but higher perceived costs than intenders. Intenders will show lower self-efficacy than actors, but no differences in perceived costs or rewards are expected. Therefore, for pre-intenders, higher levels of perceived rewards and self-efficacy, as well as lower levels of perceived costs, would promote stage progression. For intenders, higher levels of self-efficacy would promote stage progression, while lower levels of costs and higher levels of rewards would prevent stage regression.

As emphasized by HAPA, as people pass different stages to make behavior change, self-efficacy should be differentiated by the stages of change (i.e., intention-formation, behavior initiation, and behavior maintenance) (Schwarzer et al., 2003). In the early pre-actional phase of behavior change, action self-efficacy plays a key role. People
with high action self-efficacy “imagine success, anticipate potential outcomes of diverse strategies, and are more likely to initiate a new behavior”. On the contrary, people with low action self-efficacy “imagine failure, harbor self-doubts, and tend to procrastinate” (Schwarzer, 2011).

Noticeably, the HAPA posits that planning precedes the initiation of behavior change action. By planning, people first imagine a suitable future situation (“when” and “where”) for behavior change. A specific behavioral action (“how”) is expected to be effective for the intention to be translated into action in that situation. Among intenders, those who form action plans may be more likely to translate their intentions into action. Specifically, for HIV disclosure, patients create disclosure plans by setting disclosure goals, deciding where, when, and how to disclose, as well as seeking disclosure support (HIV/AIDS Resources & Community Health, 2016).

Although previous studies have included psychosocial factors in program evaluation of parental HIV disclosure interventions, as no stage model was used to operationalize HIV disclosure, their roles in disclosure stage transition have not been well studied. The purposes of the present study are 1) to assess intervention effects on psychosocial factors, and 2) to assess the predictive effects of psychosocial factors on parental HIV disclosure stage transition. The main hypotheses of the study are outlined in Table 4.6. Briefly, knowledge, outcome expectancy (costs and rewards), and action self-efficacy were hypothesized to influence 1) the progression from pre-intention; and 2) the regression from intention. Action planning was hypothesized to influence the progression from intention.
Table 4.6 Hypothesis of stage-specific psychosocial predictors

<table>
<thead>
<tr>
<th>Stage</th>
<th>Transition</th>
<th>Predictors</th>
<th>Non-significant factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-intention</td>
<td>Progression</td>
<td>Knowledge (+)</td>
<td>Action planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived costs (-)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived rewards (+)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action self-efficacy (+)</td>
<td></td>
</tr>
<tr>
<td>Intention</td>
<td>Progression</td>
<td>Action planning (+)</td>
<td>Knowledge</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived costs</td>
<td>Perceived costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived rewards (-)</td>
<td>Action self-efficacy</td>
</tr>
<tr>
<td>Regression</td>
<td>Regression</td>
<td>Knowledge (-)</td>
<td>Action planning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived costs (+)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived rewards (-)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Action self-efficacy (-)</td>
<td></td>
</tr>
</tbody>
</table>

(+) indicates high levels of the predictor and (-) indicates low levels of the predictor

Methods

Study setting and study sample

This intervention was conducted in Guangxi, a southwest region ranked 3rd in terms of HIV prevalence in China. The top two cities (urban centers) and the top eight rural counties with the largest number of reported HIV/AIDS cases were selected as study sites. Within the 10 cities/counties, urban districts or rural with at least 200 HIV/AIDS cases were identified, among which a total of 40 clinics were randomly selected. Within each clinic, 20 PLH who have not disclosed their HIV infection to their seronegative children aged between 6 to 15 years of age were randomly selected. Cluster randomization was used to assign each clinic into either the intervention or the control conditions. Baseline survey and 6-waves of follow-ups (every 6 months) were conducted. The project protocol was approved by the Institutional Review Boards (IRB) at Guangxi
CDC in China and Wayne State University in the United States. All participants provided written informed consent.

**Description of intervention**

The intervention group received five 2-hour interactive training sessions with three specific components: child development, illness communication, and coping. Details of the components were summarized in Table 4.7. The control group received five 2-hour sessions of nutrition education curriculum. The nutrition curriculum was modeled after the “Simply Good Eating” curriculum (Sherman et al., 2012) and modified in accordance with current “Dietary Guidelines for Chinese Residents” (Ge et al., 2008).

Table 4.7 Intervention components and corresponding sessions

<table>
<thead>
<tr>
<th>Intervention components</th>
<th>Intervention sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding the stages of childhood cognitive development in the context of parental illness</td>
<td>Session #1 “Child’s readiness for disclosure”</td>
</tr>
<tr>
<td>Improving the parents’ cognitive and behavioral skills related to parental HIV disclosure</td>
<td>Session #2 “Benefits and risks of disclosure”</td>
</tr>
<tr>
<td></td>
<td>Session #3 “How to tell and what to tell”</td>
</tr>
<tr>
<td></td>
<td>Session #4 “Disclosure is an ongoing”</td>
</tr>
<tr>
<td>Improving parental psychosocial well-being in adapting to living with HIV/AIDS</td>
<td>Session #5 “Cope with my infection/illness”</td>
</tr>
</tbody>
</table>

**Intervention delivery and data collection**

Within each clinic, two trained facilitators delivered the materials through discussions, role-play, exercise, and/or games (for group sessions). The five two-hour parent intervention and control sessions were delivered one session per week for five
weeks in the clinics where the parents are recruited. Two trained interviewers administered the baseline and all six-month follow-up surveys to the parents in a private room (e.g., doctor’s office). Participants completed the baseline survey before intervention and 6 waves of follow-ups were conducted every 6 months.

**Measures**

1. **HIV disclosure stage**

   One question was asked at both follow-ups to capture individual’s level of HIV disclosure: 1 = “having not started disclosure in the past 6 months and no intention to start”, 2 = “having not started disclosure in the past 6 months but is intending to start”, 3 = “having not started disclosure in the past 6 months but already made a plan”, 4 = “started disclosing but not mentioning HIV”, 5 = “started disclosing with the word HIV”, and 6 = “started disclosing with the word HIV and how I got infected”.

   Based on the stage model of HAPA, the original 6 categories were collapsed into pre-intenders (response 1), intenders (responses 2-3), and actors (responses 4-6). These three stages of HIV disclosure were used in further analysis.

2. **Psychosocial factors**

   Disclosure outcome expectancy was measured by the perceived costs and rewards of parental HIV disclosure. Disclosure costs were measured with 4 questions (e.g., “do you agree that disclosing to children will impact their academic performance?”), and disclosure rewards were measured with 5 questions (e.g. “do you agree that children will provide more support after knowing your status?”). Responses ranged from 1 = “completely disagree” to 4 = “completely agree”.

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As the perceived costs and rewards depend on patients’ understanding of parental HIV disclosure, participants were also assessed on their knowledge regarding parental HIV disclosure using an author derived scale with 5 questions (e.g. “do you agree that parental HIV disclosure should take children’s developmental stage into consideration”). Responses ranged from 1 = “completely disagree” to 4 = “completely agree”.

Action self-efficacy regarding parental HIV disclosure was measured with an author derived scale with 9 questions. Sample questions are “how confident are you that you can make a parental HIV disclosure plan?” and “how confident are you that you can talk with children about basic HIV/AIDS knowledge?”. Responses ranged from 1 = “completely unconfident” to 5 = “completely confident”.

Action planning regarding parental HIV disclosure was measured with an author derived scale with 9 questions. Three general questions regarding when, who, and how to disclose and 6 specific questions (e.g., “how to explain what HIV is”, “how to deal with children’s reaction”) were asked. Responses were 1 = “will never consider”, 2 = “have not considered yet”, 3 = “considering”, and 4 = “already planned”.

3. Baseline characteristics

Parent-level variables include parents’ demographics (age, gender, marital status, level of education) and HIV-related variables (route of infection, and time since diagnosis, antiretroviral therapy uptake, CD4 count, viral load). Child-level variables include gender and age group (6-9 years, 10-12 years, and 13-16 years).

Analysis

Only baseline (Wave 1 or W1), 6-month follow-up (Wave 2 or W2), and 12-month follow-up (Wave 3 or W3) data were used in this paper. All analysis was
conducted in Mplus 7.4 (Muthen & Muthen). A proportional latent change score (LCS) method was used to evaluate intervention effect on psychosocial factors. Simply, the predicted changes are proportional to the state (or status) of the prior true score. Intervention assignment was treated as a predictor of latent change scores. In the measurement model, the latent construct of interest was measured using the observed items for each psychosocial variable. We assumed measurement invariance and correlated residual errors over time. Details of the model were depicted in Figure 4.3.

In order to use information from cases with only baseline or only follow-up valid values in estimating the model parameters, the Full Information Maximum Likelihood (FIML) method was used. Robust (sandwich) variance estimator was used to account for clinic-level correlation, and potential baseline confounders were included.

To assess whether psychosocial factors at W2 can predict stage transitions between W2 and W3, we first modeled the stage transition matrix. Details of the model specification can be found in manuscript 4.1. As backward transition from the action stage is not theoretically possible, six stage-specific transition patterns were modeled (Figure 4.4): static at pre-intention (A1), forward transition from pre-intention to intention (A2), forward transition from pre-intention to action (A3), static at pre-intention (B1), backward transition from intention to pre-intention (B2), and forward transition from intention to action (B3).
Figure 4.3 Structural modeling setup for the proportional latent change score (LCS) model
Second, the predictive effect of the proposed psychosocial factor at W2 on HIV disclosure stage transition was tested by including the estimated value at W2 based on the LCS model as a covariate for stage-specific transition probabilities. Intervention assignment was also included as a covariate for stage-specific transition probabilities. Parents’ age and gender, as well as the child’s age group and gender, were included as covariates influencing stage membership at W2 and W3. Details of the conditional multinomial logistic regression can be found in Table 4.8.

Table 4.8 Predictive effect of psychosocial factors on stage transition

<table>
<thead>
<tr>
<th></th>
<th>U1</th>
<th>U2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>b11+g11<em>Intervention+h11</em>M2</td>
<td>b21+g21* Intervention+h21*M2</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>b12+g12<em>Intervention+h12</em>M2</td>
<td>b22+g22* Intervention+h22*M2</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Note: The b parameters are slopes for the multinomial regression of U2 on U1. The g parameters are slopes for the intervention. The h parameters are slopes for the estimated value of psychosocial factors at W2 based on the LCS model.
Results

Baseline characteristics by intervention group were shown in Table 4.9. Among all 791 participants who completed the baseline survey, the average age was 37.7 years old. Most were males (57.5%) and married (76.5%). Around half of participants had only completed primary school education (46.5%) and full-time employed (46.8%). More than half had a monthly income of less than 1000 RMB (54.2%). More than a third were infected by their main partner/spouse (35.3%), and less than one fourth had a CD4 count greater than 500 copies/ml (23.9%). Around half of the children were between 6 to 9 years old (47.7%), and most were boys (53.0%).

Table 4.9 Baseline characteristics by intervention status

<table>
<thead>
<tr>
<th>Variables</th>
<th>Intervention</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 403</td>
<td>N = 388</td>
<td>N = 791</td>
</tr>
<tr>
<td><strong>Parent level</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Socio-demographics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>37.6±5.7</td>
<td>37.8±5.4</td>
<td>37.7±5.6</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>231(57.3)</td>
<td>224(57.7)</td>
<td>455(57.5)</td>
</tr>
<tr>
<td>Female</td>
<td>172(42.7)</td>
<td>164(42.3)</td>
<td>336(42.5)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>303(75.4)</td>
<td>301(77.6)</td>
<td>604(76.5)</td>
</tr>
<tr>
<td>Separated/divorced</td>
<td>41(10.2)</td>
<td>41(10.6)</td>
<td>82(10.4)</td>
</tr>
<tr>
<td>Widowed</td>
<td>58(14.4)</td>
<td>46(11.9)</td>
<td>104(13.2)</td>
</tr>
<tr>
<td><strong>Education completed</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>169(43.0)</td>
<td>186(50.3)</td>
<td>355(46.5)</td>
</tr>
<tr>
<td>Middle school</td>
<td>195(49.6)</td>
<td>156(42.2)</td>
<td>351(46.0)</td>
</tr>
<tr>
<td>High school and higher</td>
<td>29(7.4)</td>
<td>28(7.6)</td>
<td>57(7.5)</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>97(24.1)</td>
<td>58(15.2)</td>
<td>155(19.8)</td>
</tr>
<tr>
<td>Part-time</td>
<td>131(32.6)</td>
<td>131(34.3)</td>
<td>262(33.4)</td>
</tr>
<tr>
<td>Full-time</td>
<td>174(43.3)</td>
<td>193(50.5)</td>
<td>367(46.8)</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-999</td>
<td>20(57.1)</td>
<td>199(51.3)</td>
<td>429(54.2)</td>
</tr>
</tbody>
</table>
Variables | Intervention N = 403 | Control N = 388 | Total N = 791
--- | --- | --- | ---
1000-1999 | 125(31.0) | 130(33.5) | 255(32.2)
≥2000 | 48(11.9) | 59(15.2) | 107(13.5)
Clinical-related Route of infection | 125(31.0) | 130(33.5) | 255(32.2)
Spouse/main partner | 144(35.7) | 135(34.8) | 279(35.3)
Commercial sex | 121(30.0) | 143(36.9) | 264(33.4)
IDU | 58(14.4) | 49(12.6) | 107(13.5)
Others | 80(19.9) | 61(15.7) | 141(17.8)
CD4 group | 125(31.0) | 130(33.5) | 255(32.2)
<200 | 77(19.5) | 69(18.8) | 146(19.1)
200-349 | 121(30.6) | 117(31.8) | 238(31.2)
350-500 | 99(25.1) | 98(26.6) | 197(25.8)
≥500 | 98(24.8) | 84(22.8) | 182(23.9)
Child-level Age group | 125(31.0) | 130(33.5) | 255(32.2)
6-9 | 199(49.3) | 172(46.0) | 371(47.7)
10-12 | 110(27.2) | 86(23.0) | 196(25.2)
13-18 | 95(23.5) | 116(31.0) | 211(27.1)
Gender | 125(31.0) | 130(33.5) | 255(32.2)
Male | 209(54.1) | 185(51.8) | 394(53.0)
Female | 177(45.9) | 172(48.2) | 349(47.0)

Intervention effects on psychosocial factors

High internal consistency was observed for all five scales at both baseline and two follow-ups (Cronbach’s alpha 0.80 to 0.97). For parental HIV disclosure knowledge, statistically significant intervention effect was detected for change between W2 and baseline (β = 0.137, 95% CI 0.037, 0.237, p = 0.007), while no change was detected between W2 and W3 (β = -0.002, 95% CI -0.119, 0.115, p = 0.555). Regarding outcome expectancy, no statistically significant intervention effect was detected either for disclosure rewards or costs. Statistically significant intervention effect was detected for parental HIV disclosure self-efficacy between baseline and W2 (β = 0.277, 95% CI 0.120, 0.434, p=0.001), but not between W2 and W3 (β = 0.057, 95% CI -0.135, 0.249, p
The intervention improved disclosure action planning both from baseline and W2 ($\beta = 0.344$, 95% CI 0.168, 0.519, p<0.001) and between W2 and W3 ($\beta = 0.140$, 95% CI 0.003, 0.277, p=0.045). Detailed results were shown in Table 4.10.

Table 4.10 Intervention effects on psychosocial factors

<table>
<thead>
<tr>
<th></th>
<th>Coefficients (95 % CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>W1 to W2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>0.137(0.037, 0.237)</td>
<td>0.007</td>
</tr>
<tr>
<td>Rewards</td>
<td>-0.006(-0.07, 0.058)</td>
<td>0.847</td>
</tr>
<tr>
<td>Costs</td>
<td>0.078(-0.028, 0.184)</td>
<td>0.147</td>
</tr>
<tr>
<td>Action self-efficacy</td>
<td>0.277(0.120, 0.434)</td>
<td>0.001</td>
</tr>
<tr>
<td>Action planning</td>
<td>0.344(0.168, 0.519)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>W2 to W3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>-0.002(-0.119, 0.115)</td>
<td>0.976</td>
</tr>
<tr>
<td>Rewards</td>
<td>-0.043(-0.126, 0.041)</td>
<td>0.316</td>
</tr>
<tr>
<td>Costs</td>
<td>0.030(-0.071, 0.132)</td>
<td>0.558</td>
</tr>
<tr>
<td>Action self-efficacy</td>
<td>0.057(-0.135, 0.249)</td>
<td>0.560</td>
</tr>
<tr>
<td>Action planning</td>
<td>0.140(0.003, 0.277)</td>
<td>0.045</td>
</tr>
</tbody>
</table>

**HIV disclosure stage transition matrix**

The crude HIV disclosure stage transition matrix was shown in Figure 4.5. For pre-intenders at W2, 76.0% stayed static between W2 to W3, 19.3% progressed to intention, and 4.6% progressed to action. For intenders at W2, 57.8% stayed static between W2 to W3, 30.2% regressed to pre-intention, and 12.0% progressed to action.
Predictive effect of psychosocial factors on stage transition

Predictive effects of psychosocial factors at W2 on stage transition between W2 and W3 were shown in Table 4.8. The coefficients represent the effects of each psychosocial factor on the log odds ratio of each specific transition pattern compared to being static at W2 stage. Knowledge, perceived rewards, and perceived costs of parental HIV disclosure at W2 were not predictive of stage transitions between W2 and W3. Action self-efficacy increased the OR of progression from pre-intention to intention (OR = 2.00, 95% CI 1.16, 3.47) compared to being static at pre-intention. Action planning increased the OR of progression from pre-intention to intention (OR = 2.00, 95% CI 1.20, 3.37) and decreased the OR of regression from intention to pre-intention (OR = 0.43, 95% CI 0.18, 0.99). Details of stage-specific coefficients were summarized in Table 4.11.

Table 4.11 Predictive effects of psychosocial factors at W2 on stage transition between W2 and W3 (odds ratio)

<table>
<thead>
<tr>
<th></th>
<th>Pre-intention to intention</th>
<th>Pre-intention to action</th>
<th>Intention to pre-intention</th>
<th>Intention to action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>2.05, p = 0.16</td>
<td>1.49, p = 0.52</td>
<td>0.48, p = 0.12</td>
<td>13.6, p = 0.23</td>
</tr>
<tr>
<td>Rewards</td>
<td>1.51, p = 0.42</td>
<td>1.92, p = 0.33</td>
<td>0.58, p = 0.33</td>
<td>4.85, p = 0.40</td>
</tr>
<tr>
<td>Costs</td>
<td>1.97, p = 0.23</td>
<td>0.54, p = 0.46</td>
<td>0.59, p = 0.33</td>
<td>72.2, p = 0.25</td>
</tr>
<tr>
<td>Action self-efficacy</td>
<td>2.01, p = 0.013</td>
<td>1.99, p = 0.17</td>
<td>0.70, p = 0.20</td>
<td>0.38, p = 0.35</td>
</tr>
<tr>
<td>Action planning</td>
<td>2.01, p = 0.008</td>
<td>2.44, p = 0.12</td>
<td>0.43, p = 0.047</td>
<td>2.12, p = 0.40</td>
</tr>
</tbody>
</table>

Discussion

Guided by the HAPA, this study tested the roles psychosocial factors play in the theory-based parental HIV disclosure intervention. At 6-month after the intervention, a statistically significant intervention effect was detected for disclosure knowledge, action self-efficacy, and action planning but not for disclosure outcome expectancy. Stage-
specific predictive effects of action self-efficacy and action planning on HIV disclosure stage transitions were detected.

Contrary to our hypothesis that the intervention will increase the rewards and decrease the costs of parental HIV disclosure, no intervention effect was detected. One major explanation is the measurement of outcome expectancy (Adams, Norman, Hovell, Sallis, & Patrick, 2009). First, the “right” items generated by researchers can make respondents aware of costs and rewards they may not have otherwise considered. Second, participants’ initial inaccurate understanding of parental HIV disclosure (e.g., a one-time “yes-no” event) may have already shifted to the more accurate “age-appropriate process” proposed by our intervention. Therefore, the corresponding costs and rewards may relate to different conceptualizations of HIV disclosure.

Among the four previous parental HIV disclosure interventions, two evaluated intervention effects on psychosocial factors, especially disclosure self-efficacy (Conserve et al., 2017). Similar to our findings, Murphy et al., found a statistically significant improvement in disclosure self-efficacy 3 months after the intervention, which persisted to 9 months (Murphy et al., 2011). Simoni et al. detected a significant improvement in self-efficacy as soon as 4 weeks after the intervention, which persisted after 13 weeks (Murphy et al., 2011). In terms of the measurement, the Simoni study measured self-efficacy with two items (how prepared/ready do you feel about making a decision on whether, when, and how to disclose your HIV status to your child?; and ‘How prepared/ready do you feel about carrying out the decision you made on whether, when, and how to disclose your HIV status to your child?’). The Murphy study measured self-efficacy with a 9-item scale which had high internal consistency (Cronbach’s alpha =
0.90). Similar to the measure used in this study, participants’ confidence in deciding the child’s developmental readiness, making an age-appropriate plan, conduct disclosure, as well as deal with disclosure consequences (e.g., child’s emotional response, personal questions on HIV) were measured. These results suggest that parental HIV disclosure action self-efficacy can be improved within a relatively short time period.

Stage-specific predictive effects of psychosocial factors were found. Specifically, motivational factors such as knowledge and outcome expectancy were not predictive of stage transitions. Studies guided by the transtheoretical model have revealed that the total pros scale reveals no significant differences between the Contemplation/Preparation (corresponds to the intention stage) and Action/Maintenance (corresponds to the action stage) stages (Kroll, Keller, Scholz, & Perren, 2011). More widely known as decisional balance, outcome expectancy is a multidimensional construct with more than two broad categories of pros and cons. The literature proposes four categories each for pros and cons (gains/losses for self or significant others, self-approval/disapproval or approval/disapproval from significant others) (Prochaska et al., 1994). Considering analyzing the potential receiver is a key component in HIV disclosure, further research is needed to distinguish the weighing of costs and rewards for parents themselves and the children. Moreover, the decisional balance literature suggests that in terms of behavior change, people not only weight the costs and rewards of the new behavior (i.e., HIV disclosure), but also the old behavior (i.e., non-disclosure) (S. E. Collins, Carey, & Otto, 2009). Therefore, more complicated outcome expectancy measures are needed to capture the multidimensionality of the construct.
Previous studies proposed self-efficacy as a universal facilitator of stage transitions as it predicts transitions between more than two stages (e.g., pre-intention to action) and in both directions (i.e., progression and regression) (Schüz et al., 2008; Schwarzer et al., 2007; Wiedemann et al., 2008). Our results suggest that the stage-specific action self-efficacy was only predictive of pre-intention to intention progression, but not the progression from pre-intention to action. Moreover, action self-efficacy was not preventive of stage regression from intention. One possible explanation, as supported by a recent meta-analysis of studies applying the HAPA in health behavior contexts, was that action self-efficacy is influential in intention formation but not intention violation (Zhang, Zhang, Schwarzer, & Hagger, 2019). Also, as few people made the pre-intention to action transition, our ability to detect the predictive effects were limited by the small group size.

HAPA posits the importance of action planning for the translation of behavioral intentions into behavior, not the formation of behavioral intentions. Our results indicate that action planning facilitated pre-intention to intention progression and prevented the intention to pre-intention regression. Therefore, participants in both the pre-intention and the intention stages would benefit from action planning. Previous research on other health behaviors showed that planning processes are important throughout all stages of change (Armitage, 2006; Schüz, Sniehotta, Wiedemann, & Seemann, 2006; F F Sniehotta, Araujo Soares, & Dombrowski, 2007). Another explanation is the difference between action planning and coping planning. According to HAPA, action planning emphasizes making when, where, and how plans while coping planning focuses on overcoming obstacles by “anticipating personal risk situations (i.e. situations that endanger the
performance of intended behavior)” (Sniehotta, Schwarzer, Scholz, & Schüz, 2005).

Given that parents face many barriers specifically in terms of the intention-to-action translation, more research on the role of coping planning in promoting intention to action transition is called for.

Several limitations exist in this study which may influence the interpretation of our findings. First, we assumed no measurement error regarding HIV disclosure stage. However, theoretically impossible backward stage transition out of the action stage was observed in this study, suggesting potential misclassification bias. Second, due to the measurement issue mentioned earlier, the outcome expectancy measures might not be able to accurately capture participants’ perception of parental HIV disclosure as a process. Third, child age has been identified as one of the most consistent and influential predictor of parental HIV disclosure. However, we were unable to test whether stage-specific predictors differ by child age due to relatively low stage transition probabilities.

Despite these limitations, this study has significant implications for future studies. First, the breakdown in the conceptual theory of the program in terms of outcome expectancy indicates the need for further studies developing more accurate and complete measures that capture the construct multidimensionality. Second, considering psychosocial factors such as self-efficacy and planning predicted HIV disclosure stage transition, the inclusion of such factors as intervention components is warranted. The identification of such predictors also allows matching future interventions to psychologically defined HIV disclosure stages (i.e., stage-specific interventions). Third, as the traditional volitional psychosocial factors such as self-efficacy and planning were found to influence intention formation but not intention translation, more studies are
needed to examine psychosocial factors predicting intention to action progression.

Fourth, further attention should be paid to participants who made pre-intention to action transition in terms of both study design (i.e., follow-up time interval) and data analysis (i.e., collapsing with adjacent pre-intention to intention progression).
CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 SUMMARY OF THE DISSERTATION STUDY

Using three waves (baseline, 6-month, 12-month) of secondary longitudinal data among 791 PLH participating in an RCT of a theory-based parental HIV disclosure intervention, this dissertation study evaluated intervention effects on parental HIV disclosure process and disclosure-related psychosocial factors. Guided by the HAPA model, the dissertation study focused on three objectives as below:

Study objective 1. This study adds to the literature of HIV disclosure by showing that HIV disclosure can be operationalized as a process with 3 different stages: pre-intenders who don’t have disclosure intention, intenders who have disclosure intention but haven’t disclosed, and actors who have disclosed. Using a multi-group first-order Markov chain method, this study examined intervention effects on stage transition between months 6 and 12. Results indicated that this theory-based intervention yielded different effects for PLH at different initial stages of HIV disclosure. Specifically, pre-intenders responded most to the intervention while no statistically significant intervention effect was detected for intenders.

Study objective 2. Using a proportional Latent Chang Score (LCS) method, this study found a statistically significant intervention effect on disclosure knowledge, action self-efficacy, and action planning as soon as 6 months after the intervention. Moreover, the intervention kept improving disclosure action planning between 6 months and 12
months follow-ups. However, no intervention effect was detected on outcome expectancy measured by perceived costs and rewards of parental HIV disclosure.

Study objective 3. Traditional motivational factors such as knowledge and outcome expectancy were not predictive of HIV stage transitions, while differential effects of traditional volitional factors such as self-efficacy and planning were found for pre-intenders and intenders. Action self-efficacy promoted pre-intention to intention progression but did not prevent intention to pre-intention regression. Action planning showed both a promoting effect on intention formation and a protective effect on intention regression. No factor hypothesized in this study was found to influence the intention to action transition.

5.2 INTERPRETATION OF STUDY FINDINGS

In terms of intervention effect on stage transition, our results suggested that the intervention promoted progression from pre-intention to action, but not from pre-intention to intention. Intervention effect on such non-sequential stage transition can have three possible explanations. First, as mentioned earlier, was the measurement error which has the highest impact on the smallest response category (i.e., the pre-intenders) (Bassi et al., 2000). Second, the intervention may promote pre-intenders to skip the intention stage and go directly to the action stage within the 6 months (i.e., stage skipping). Third, the intervention may promote a quicker sequential transition from pre-intention to intention to action within 6 months. In terms of measurement error, more validation is needed to come up with an accurate HIV disclosure stage measure. In addition, further studies comparing the transition structure models with and without constraints on stage skipping may help better understand whether such abrupt transition is possible. Finally,
considering the follow-up window of 6 months may be too wide to capture the quick transition, tighter follow-ups are needed to differentiate quick sequential transition from stage skipping.

Regarding disclosure-related psychosocial factors, statistically significant intervention effects were detected as early as the first follow-up at month 6. Lack of intervention effect on outcome expectancy may be due to the measurement of such a construct. First, the “right” items generated by researchers can make respondents aware of costs and rewards they may not have otherwise considered. Second, outcome expectancy is a multidimensional construct. Besides the two broad dimensions of costs and rewards, whether such costs and rewards refer to oneself or significant others (in this case, the child) should be considered. Recently, an outcome expectancy scale for partner HIV disclosure identified five factors that were detected for both the costs and rewards (Cao, Mo, & Lau, 2019). Moreover, the weighing of costs and rewards not only depends on the targeted new behavior (i.e., disclosure) but also the old behavior (i.e., non-disclosure). The dimensionality of HIV disclosure outcome expectancy needs to be examined and validated in further studies.

5.3 LIMITATIONS

Several limitations exist in this study which may influence the interpretation of our findings. First, the item measuring HIV disclosure stage has not been validated previously. Misclassification error may exist as theoretically impossible backward stage transition out of the action stage was observed among more than half of participants (64/119). Second, the literature suggests that outcome expectancy is a multidimensional construct with four categories each for the costs and rewards (gains/losses for self or
significant others, self-approval/disapproval or approval/disapproval from significant others). Therefore, the two broad dimensions of costs and rewards may not fully capture the multidimensionality. Third, child age has been identified as one of the most consistent and influential predictor of parental HIV disclosure, both in terms of the likelihood of disclosure and the depth. Due to relatively low stage transition probabilities for certain patterns, we were not able to examine whether intervention effects, as well as stage-specific predictors, differ by child age group. Finally, process evaluation was not conducted within this dissertation.

5.4 IMPLICATIONS

Despite these limitations, results from this dissertation study have significant implications for future research. First, the inclusion of intermediate outcome variables in the evaluation of HIV disclosure interventions which “aim more to diminish distress than achieve a specific behavioral outcome” is warranted (Simoni et al., 2015). The inclusion of such psychosocial factors not only enables us to capture the short-term intervention effects but also helps elucidate how such intermediate outcome variables relate to more distal outcomes (in this case, disclosure stage transition). as argued in HAPA, the influence of psychosocial factors is stage-specific. However, as the stage transition can be reversive (e.g., from pre-intention to intention, or from intention to pre-intention), whether the psychosocial factors can influence both directions is not clarified. For example, action self-efficacy is theoretically influential on intention formation, but whether it can both promote pre-intention to intention progression and prevent intention to pre-intention regression is not clear. Our results indicate that disclosure action self-efficacy may only promote disclosure intention formation, but not prevent intention
regression. This suggests action self-efficacy may be beneficial only for the pre-intenders. Action planning, although theoretically influential only for intention translation, was found to promote disclosure intention formation as well as prevent the regression from intention to pre-intention. This suggests action planning can be beneficial both for the pre-intenders and intenders.

Traditional stage-matched interventions guided by HAPA propose different intervention components based on participants’ stages. Pre-intenders are assumed to benefit more from motivational treatment focusing on risk communication, outcome expectancies, and action self-efficacy. Intenders are assumed to benefit more from volitional treatment focusing on coping self-efficacy, planning, and action control.

Regarding parental HIV disclosure, our results suggest that the inclusion of action planning, a volitional treatment component usually addressed for intenders, may also benefit the pre-intenders. The inclusion of action self-efficacy, a motivational treatment component usually addressed for pre-intenders, may be needed only for the pre-intenders.

5.5 FUTURE DIRECTIONS

Future studies are needed for better measurement of HIV disclosure stage and disclosure-related psychosocial factors. Moreover, the theoretical transition patterns of HIV disclosure stage should be further examined. In addition, HIV disclosure stage is not the endpoint of intervention evaluation. The evaluation of parental HIV disclosure interventions may benefit from the consideration of the DPM embedded in the family setting.

In terms of stage measurement, HIV disclosure was operationalized as a process with 3 stages based on the HAPA model in this study. Finer-graded differentiations as,
for example, in the TTM, which assumes 5 stages, can be meaningful with regard to the differentiation of disclosure depth (e.g., partial vs. full) but have not been examined in this study. Moreover, within the 3-stage HAPA, researchers suggested that planning could be postulated as a moderator to further differentiate those who are at the intention stage (Sutton, 2008). It is possible that planning can be set as another stage separate from intention. Whether such finer-grained differentiations are meaningful for HIV disclosure stage should be examined in further studies.

In terms of disclosure action self-efficacy, the social cognitive theory emphasizes that it should be tailored to a specific behavior under specific conditions (Bandura, 1997). Although we have considered specific tasks across the HIV disclosure process (e.g., deciding a child’s developmental readiness, making an age-appropriate plan, conducting disclosure, as well as deal with disclosure consequences), the “condition” component was not taken care of. As suggested by research regarding partner HIV disclosure, formative elicitation studies are needed to derive realistic situations regarding disclosure (Kalichman et al., 2001).

The social cognitive theory argued that a true stage model is comprised of an ordered set of stages through which one must pass to reach the behavioral destination (Bandura, 1994). Therefore, the skipping of stages is not theoretically allowed. However, as one of the most widely used stage models, TTM assumes that stage transition can be cyclical. Studies have found that individuals are most likely to skip the preparation stage in TTM and try to move directly from contemplation into action (Britto et al., 2016; Rodkjaer, Sodemenn, Ostergaard, & Lomborg, 2011). As the HAPA is conceptualized as a 2-stage or 3-stage model, limited research has been conducted to examine whether stage
skipping is possible in HAPA. Most studies guided by HAPA have collapsed the transition patterns into static, regression, and progression without differentiating the adjacent stage transition from stage skipping (Zhang et al., 2019). Short-period follow-ups in longitudinal studies and qualitative studies may further help elucidate whether people move sequentially through the ordered stages within a short time or skip the intention stage.

As argued in the DPM, besides the decision-making process, HIV disclosure process also includes the outcome process through which the disclosure event influences long-term individual (e.g., psychological and behavioral health), dyadic (e.g., intimacy and trust), and social contextual (e.g., stigma) outcomes. Therefore, the disclosure event should not be the endpoint of evaluation regarding parental HIV disclosure interventions. Further evaluation needs to be conducted regarding whether and how the HIV disclosure stage transition patterns influence both parents’ and children’s wellbeing, the dyadic parent-child relationship and family functioning, as well as HIV-related stigma.

Finally, based on the family-based method, parental HIV disclosure happens in a family setting rather than at the interpersonal level (i.e., between the HIV-positive parent and the child) (Fisher & Weihs, 2000). Therefore, father-mother dyad also plays an important role in parental HIV disclosure. Firdawsi et al. (2014) posited a socio-ecological model describing factors affecting parental HIV disclosure, where the presence of and the relationship with the partner, the HIV status of partner, as well as partner HIV disclosure, have been listed as key family-level components influencing parental HIV disclosure (Firdawsi, 2014). Moreover, although parental HIV disclosure was mostly led by the HIV-positive parent himself/herself, more studies viewing parental
HIV disclosure at the family level are needed to shed light on what individuals (e.g., healthcare providers, the positive parent, another caregiver, another family member) or teams (e.g., a parent-HCP team) can best convey parental HIV disclosure.

5.6 CONCLUSION

This dissertation study serves as a starting point of operationalizing HIV disclosure as a process of 3-stages using the HAPA. Consistent with the HAPA, stage-specific intervention effects were detected. Action self-efficacy and action planning were detected as two key psychosocial factors influencing HIV disclosure stage transition. Further studies are needed to operationalize HIV disclosure stage under the guidance of the DPM embedded in the family setting.
REFERENCE


APPENDIX A

SENSITIVITY ANALYSIS

As parameters involving between-level variables are not allowed to vary across classes, the model treating c1 as a grouping variable cannot be used. Instead, intervention was treated as a between-level categorical latent variable and used as a grouping variable in data analysis. In the within part of the model, the random intercepts are shown in the picture as filled circles at the end of the arrows pointing to c1 and c2. They were referred to the cluster-level random effects as c1b and c2b (shown in the circles on the between level). The random intercepts have no variance within the classes of the between-level categorical latent variable “Intervention”. Individual-level factors were included as within-level covariates influencing stage membership at W2.

Figure A.1 Multilevel Markov chain model
Results from the multilevel Markov Chain model were shown in Table A.1. Marginally significant intervention effects were detected for stage transition from pre-intention to action compared to staying static at pre-intention.

Table A.1 Intervention effects on stage transition (multilevel model)

<table>
<thead>
<tr>
<th>W2 stage</th>
<th>W3 stage</th>
<th>Successful transition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-intention</td>
<td>Intention</td>
</tr>
<tr>
<td>Unadjusted model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-intention</td>
<td>Ref</td>
<td>0.98(0.39, 2.47)</td>
</tr>
<tr>
<td>Intention</td>
<td>0.70(0.30, 1.63)</td>
<td>Ref</td>
</tr>
<tr>
<td>Adjusted model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-intention</td>
<td>Ref</td>
<td>1.01(0.41, 2.53)</td>
</tr>
<tr>
<td>Intention</td>
<td>0.71(0.31, 1.62)</td>
<td>Ref</td>
</tr>
</tbody>
</table>

To model the intervention effect on psychosocial factors, a two-level latent change score model was conducted (Figure A.2). In the within part of the model, the filled circles at the end of the arrows from the within factors (M) to items. They represent random intercepts that are referred to as items 1-3 in circles in the between part of the model. In the between part of the model, the random intercepts are continuous latent variables that vary across clusters represented by factors bM1 – bM3. Latent change scores were also decomposed into within (LCS21 and LCS32) and between (bLCS21 and bLCS32) levels. In this model, the residual variances of the factor indicators in the between part of the model were fixed at zero. As the intervention was assigned to the clinics, it was treated as a between-level variable. Individual-level factors such as parents’ and children’s age and gender were included as within-level covariates influencing M1.
Figure A.2 Structural modeling setup for the multilevel proportional latent change score (LCS) model
Intervention effects on psychosocial factors based on the multilevel proportional LCS model were summarized in Table A.2. Noticeably, the multilevel model for action planning failed to converge.

Table A.2 Intervention effects on psychosocial factors (multilevel model)

<table>
<thead>
<tr>
<th></th>
<th>Coefficients (95 % CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>W1 to W2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>0.141(0.04, 0.242)</td>
<td>0.006</td>
</tr>
<tr>
<td>Rewards</td>
<td>-0.009(-0.077, 0.059)</td>
<td>0.787</td>
</tr>
<tr>
<td>Costs</td>
<td>0.089(-0.027, 0.206)</td>
<td>0.134</td>
</tr>
<tr>
<td>Action self-efficacy</td>
<td>1.199(0.792, 1.606)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>W2 to W3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge</td>
<td>0.013(-0.097, 0.123)</td>
<td>0.816</td>
</tr>
<tr>
<td>Rewards</td>
<td>-0.04(-0.114, 0.034)</td>
<td>0.293</td>
</tr>
<tr>
<td>Costs</td>
<td>0.053(-0.049, 0.155)</td>
<td>0.310</td>
</tr>
<tr>
<td>Action self-efficacy</td>
<td>1.051(0.554, 1.548)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
APPENDIX B

MPLUS CODES

TITLE: MINPUT – Intervention effect on stage membership and stage transition

DATA: File = C:\Users\wendi\Dropbox\Dissertation\Proposal\LCA-3stg.csv;

VARIABLE:

NAMES ARE ID1 b c clinic status ageW1 A01W1 marital route cd4grp chdagegrp sex ef1 ef2 ef3 r1 r2 r3 att1 att2 att3 difratio difeff difatt;

USEVARIABLES ARE ID1 b c clinic status ageW1 female single divorce comsex blood other cd200 cd350 cd500 mid old girl ;

idvariable=ID1;

missing = all(-999);

CATEGORICAL ARE b c;

classes are cb(3) cc(3) ;

cluster=clinic;

define:
female = 0;
if (A01W1 eq 2) then female = 1;
single = 0;
if (marital eq 2) then single = 1;
divorce = 0;
if (marital eq 3) then divorce = 1;
comsex=0;
if (route eq 2) then comsex = 1;
blood=0;
if (route eq 3) then blood = 1;
other=0;
if (route eq 4) then other = 1;

if (cd4grp eq 1) then cd200 = 1;
if (cd4grp eq 2) then cd350 = 1;
if (cd4grp eq 3) then cd500 = 1;
mid=0;
if (chdagegrp eq 2) then mid = 1;
old=0;
if (chdagegrp eq 3) then old = 1;
girl = 0;
if (sex eq 2) then girl = 1;
CENTER ageW1 (GRANDMEAN);

ANALYSIS: TYPE = mixture complex;
ALGORITHM=INTEGRATION;
INTEGRATION=MONTECARLO;
STARTS = 400 40;
PROCESSORS = 2;

model:
%overall%
[cc#1@-15 cc#2@-15];
cc#1 on cb#1 (b11 );
cc#1 on cb#2 (b12 );
cc#2 on cb#1 (b21);
cc#2 on cb#2 (b22);
cb on status ageW1 female mid old girl single divorce comsex blood other
cd200 cd350 cd500;

model cb:
%cb#1%
cc#1 on status (g11);
cc#2 on status (g21);

%cb#2%
cc#1 on status (g12);
cc#2 on status (g22);

%cb#3%
cc#1 on ;
cc#2 on ;

model cb:
%cb#1%
[b$1@15];
[b$2@20];
%cb#2%
[b$1@-15];
[b$2@15];
%cb#3%
[b$1@-20];
MODEL CONSTRAINT:
new(log11_x0 log12_x0 log21_x0 log22_x0
p11_x0 p12_x0 p13_x0
p21_x0 p22_x0 p23_x0
log11_x1 log12_x1 log21_x1 log22_x1
p11_x1 p12_x1 p13_x1
p21_x1 p22_x1 p23_x1
lo_fwd_12 lo_fwd_13 lo_fwd_1 lo_bwd_21 lo_fwd_23 lo_noback_2 );

!coefficients in the control group
log11_x0 = b11-15;
log12_x0 = b21-15;
log21_x0 = b12-15;
log22_x0 = b22-15;
p11_x0 = exp(log11_x0) / (exp(log11_x0) + exp(log12_x0) + 1);
p12_x0 = exp(log12_x0) / (exp(log11_x0) + exp(log12_x0) + 1);
p13_x0 = 1 / (exp(log11_x0) + exp(log12_x0) + 1);
p21_x0 = exp(log21_x0) / (exp(log21_x0) + exp(log22_x0) + 1);
p22_x0 = exp(log22_x0) / (exp(log21_x0) + exp(log22_x0) + 1);
p23_x0 = 1 / (exp(log21_x0) + exp(log22_x0) + 1);

!coefficients in the intervention group
log11_x1 = b11 + g11-15;
log12_x1 = b21 + g21-15;
log21_x1 = b12 + g12-15;
log22_x1 = b22 + g22-15;
p11_x1 = exp(log11_x1) / (exp(log11_x1) + exp(log12_x1) + 1);
p12_x1 = exp(log12_x1) / (exp(log11_x1) + exp(log12_x1) + 1);
p13_x1 = 1 / (exp(log11_x1) + exp(log12_x1) + 1);
p21_x1 = exp(log21_x1) / (exp(log21_x1) + exp(log22_x1) + 1);
p22_x1 = exp(log22_x1) / (exp(log21_x1) + exp(log22_x1) + 1);
p23_x1 = 1 / (exp(log21_x1) + exp(log22_x1) + 1);
log odds ratio comparing two groups
lo_fwd_12 = log((p12_x1 / p11_x1) / (p12_x0 / p11_x0));
lo_fwd_13 = log((p13_x1 / p11_x1) / (p13_x0 / p11_x0));
lo_fwd_1 = log(((1-p11_x1) / p11_x1) / ((1-p11_x0) / p11_x0));
lo_bwd_21 = log((p21_x1 / p22_x1) / (p21_x0 / p22_x0));
lo_fwd_23 = log((p23_x1 / p22_x1) / (p23_x0 / p22_x0));
lo_noback_2 = log(((p22_x1 + p23_x1) / p21_x1) / ((p22_x0 + p23_x0) / p21_x0));

OUTPUT: TECH1 TECH8 TECH10 TECH15 CINTERVAL;
TITLE: MINPUT – Intervention effect on psychosocial factors

DATA: File = C:\Users\wendi\Dropbox\Dissertation\Proposal\LCA-3stgitemsW3.csv;

VARIABLE:

NAMES ARE ID1 b c clinic status ageW1 A01W1 marital route cd4grp chdagegrp sex ef1 ef2 ef3 r1 r2 r3 att1 att2 att3 difratio difeff difatt 
Att_i1W1 Rew_i1W1 Att_i2W1 Att_i3W1 Att_i4W1 Att_i5W1 
Rew_i3W1 Rew_i4W1 Rew_i5W1 Cos_i1W1 Cos_i2W1 Cos_i3W1 Cos_i4W1 
Eff_i1W1 Eff_i2W1 Eff_i3W1 Eff_i4W1 Eff_i5W1 Eff_i6W1 Eff_i7W1 Eff_i8W1 
Eff_i9W1 Att_i1W2 Rew_i1W2 Att_i2W2 Att_i3W2 Att_i4W2 Att_i5W2 
Rew_i3W2 Rew_i4W2 Rew_i5W2 Cos_i1W2 Cos_i2W2 Cos_i3W2 Cos_i4W2 
Eff_i1W2 Eff_i2W2 Eff_i3W2 Eff_i4W2 Eff_i5W2 Eff_i6W2 Eff_i7W2 Eff_i8W2 
Eff_i9W2 Att_i1W3 Rew_i1W3 Att_i2W3 Att_i3W3 Att_i4W3 Att_i5W3 
Rew_i3W3 Rew_i4W3 Rew_i5W3 Cos_i1W3 Cos_i2W3 Cos_i3W3 Cos_i4W3 
Eff_i1W3 Eff_i2W3 Eff_i3W3 Eff_i4W3 Eff_i5W3 Eff_i6W3 Eff_i7W3 Eff_i8W3 
Eff_i9W3;

USEVARIABLES ARE ID1 clinic status Att_\_ Att_i5W3 ageW1 female mid old girl;
idvariable=ID1; 
missing = all(-999);
cluster=clinic;

DEFINE:
female = 0;
if (A01W1 eq 2) then female = 1;
mid=0;
if (chdagegrp eq 2) then mid = 1;
old=0;
if (chdagegrp eq 3) then old = 1;
girl = 0;
if (sex eq 2) then girl = 1;

CENTER ageW1 (GRANDMEAN);

ANALYSIS: TYPE = complex;
ALGORITHM=INTEGRATION;
INTEGRATION=MONTECARLO (10);
STARTS = 100 10;
PROCESSORS = 3;

MODEL:
att1 by Att_i1W1@1;
att1 by Att_i2W1 (1);
att1 by Att_i3W1 (2);
att1 by Att_i4W1 (3);
att1 by Att_i5W1 (4);

att2 by Att_i1W2@1;
att2 by Att_i2W2 (1);
att2 by Att_i3W2 (2);
att2 by Att_i4W2 (3);
att2 by Att_i5W2 (4);

att3 by Att_i1W3@1;
att3 by Att_i2W3 (1);
att3 by Att_i3W3 (2);
att3 by Att_i4W3 (3);
att3 by Att_i5W3 (4);

Att_i1W1 with Att_i1W2 Att_i1W3 ;
Att_i2W1 with Att_i2W2 Att_i2W3 ;
Att_i3W1 with Att_i3W2 Att_i3W3;
Att_i4W1 with Att_i4W2 Att_i4W3;
Att_i5W1 with Att_i5W2 Att_i5W3;

Att_i1W3 with Att_i1W2;
Att_i2W3 with Att_i2W2;
Att_i3W3 with Att_i3W2;
Att_i4W3 with Att_i4W2;
Att_i5W3 with Att_i5W2;

[Att_i1W1@0];
[Att_i1W2@0];
[Att_i1W3@0];
[Att_i2W1@0];
[Att_i2W2@0];
[Att_i2W3@0];
[Att_i3W1@0];
[Att_i3W2@0];
[Att_i3W3@0];
[Att_i4W1@0];
[Att_i4W2@0];
[Att_i4W3@0];
[Att_i5W1@0];
[Att_i5W2@0];
[Att_i5W3@0];

att1 att2@0 att3@0;
[att1 att2@0 att3@0];
!Diff score
difatt1 by att2@1;
difatt2 by att3@1;

!Autoregression
att2 ON att1@1;
att3 on att2@1;

!Proportional change
difatt1 on att1(b);
difatt2 on att2(b);

difatt1 on status;
difatt2 on status;
att1 with status;

OUTPUT: STDYX TECH1 SAMPSTAT SVALUES CINTERVAL;