

# Factors Affecting Fertility Intention Among People Living with HIV in Kunming, China

Yingwu Guo<sup>1,2</sup>, Yingrong Du<sup>1</sup>, Sanguan Lerkiatbundit<sup>3</sup>, Jun Liu<sup>1</sup>, Jingsong Bai<sup>1</sup>, Yongrui Yang<sup>1</sup>, Yin Yang<sup>1</sup>, Aihui Wu<sup>1</sup>, Virasakdi Chongsuvivatwong<sup>2</sup>

<sup>1</sup>Department of Infectious Diseases, Third People's Hospital of Kunming City, Kunming, People's Republic of China; <sup>2</sup>Department of Epidemiology, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla, Thailand; <sup>3</sup>Department of Social and Administrative Pharmacy, Faculty of Pharmaceutical Sciences, Prince of Songkla University, Hat Yai, Songkhla, Thailand

Correspondence: Virasakdi Chongsuvivatwong, Email [cvirasak@medicine.psu.ac.th](mailto:cvirasak@medicine.psu.ac.th)

**Background:** Survival and quality of life of people living with HIV (PLWH) have been improving. Understanding fertility intention among PLWH is critical in helping them accomplish their pregnancy goals while significantly lowering the risk of HIV transmission. The purpose of this study was to identify factors based on the theory of planned behavior (TPB) that may explain fertility intention among PLWH.

**Methods:** A survey was conducted in face-to-face interviews based on TPB, and the latent variables were devised and tested for their potential influences on fertility intentions in 487 reproductive-aged PLWH at antiretroviral treatment clinics in Kunming, China. Analysis was mainly based on the structural equation model.

**Results:** About 38.4% of the respondents answered that they were likely to have a/another child in the next three years. Our hypothesized factors could explain 53.7% of the total variance of fertility intention. The 20- to 35-year-old group had a higher fertility intention. Perceived partner expectations toward fertility were the strongest predictors of fertility intention followed by beliefs in the support of the two-child policy. In contrast, the three components of attitudes, subjective norm, and perceived behavioral control did not influence fertility intention.

**Conclusion:** In this HIV endemic area of China, fertility intended by PLWH is a matter of the couple that is also influenced by the national population fertility policy.

**Keywords:** people living with HIV, fertility intention, theory of planned behavior

## Background

Availability of antiretroviral treatment (ART) has a positive effect on fertility intentions among people living with HIV (PLWH).<sup>1-3</sup> Reproductive-aged PLWH are critical stakeholders since they bear the threat of HIV. Furthermore, a lack of sexual health education and restricted access to sexual and reproductive health services among young adults lead to increased sexual risk behaviors and unintended births.<sup>4,5</sup> Attitudes, social norms, and perceived behavioral control (PBC) responded negatively to fertility intention due to concerns about HIV transmission.<sup>6-8</sup> HIV-positive status may cause PLWH to have negative fertility intentions because of uncertainty surrounding their future, childcare for an orphaned child after their death, and risk of infection to the newborn.<sup>9,10</sup> Moreover, women with HIV are more reluctant than men with HIV to have a/another child despite often holding more positive reproductive attitudes.<sup>11</sup> Thus, a more thorough understanding of what motivates fertility intentions among PLWH is an important area of concern that has practical applications for creating a safe reproductive environment. Psychological, social, and cultural factors, and in particular the pressure of family members or the need to perpetuate family lineage, also play key roles in how HIV affects reproductive decisions.<sup>12-14</sup>

Previous researchers have shown that having a positive psychological status about an issue can be irrelevant to intention.<sup>15,16</sup> Recently, fertility needs among PLWH have received attention from academia. Much research on having children has been conducted in Western countries and Africa using qualitative research methods. However, much less is known about the intention to have children among PLWH in Asian countries. Western societies stress individualism, but

Eastern societies are based on interdependence or collectivism. Therefore, social norms may exert a strong effect on fertility intention in Eastern cultures.<sup>17,18</sup> Previous studies in Vietnam and Thailand found that fertility intention was expressed by the interests of the family, social pressure, continuity, or heredity.<sup>19–21</sup> It is not clear how psychosocial determinants of individuals influence fertility intention in China. This study aimed to test the influences of the socio-demographic characteristics, relevant beliefs, attitudes, subjective norms, PBC, and fertility intention on PLWH.

## Materials and Methods

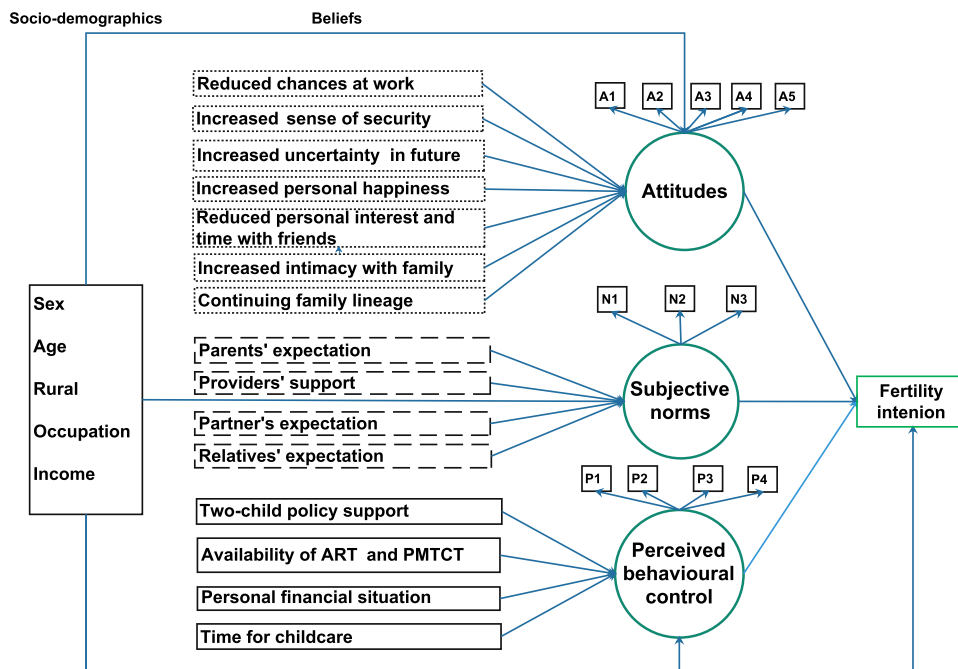
### Theoretical Framework

The hypothesized model of fertility intention in this study was based on the Theory of Planned Behavior (TPB), which is a popular social and psychological model of human behavior.<sup>22</sup> The TPB model adopts attitudes, subjective norms, and perceived control as having a direct positive effect on fertility intention (Figure 1).<sup>23,24</sup> We included five demographic variables, namely sex, age, registered residence, employment status, and household monthly income, as having a direct effect on fertility intention and also an indirect effect through attitudes, subjective norms, and perceived control as suggested in systematic reviews of the literature.<sup>25–27</sup>

“Attitudes” were modeled as a latent variable with 5 observed variables (A1-A5). It was hypothesized to be affected by seven behavioral beliefs in the dotted frames (Figure 1). This study identified salient behavioral beliefs (such as having a child could increase a person’s happiness and intimacy within their family) from a systematic review.<sup>25</sup> “Subjective norms” were included in the model as a latent variable with 3 observed variables (N1-N3). Subjective norms were influenced by four normative beliefs in the dashed frames including the expectations of important referents (partners, parents, providers, and relatives). “Perceived behavioral control” (PBC) was a latent variable with 4 observed variables (P1 through P4). PBC was modeled to be affected by four control beliefs in the solid frames. These normative beliefs and control beliefs were identified from in-depth interviews with a group of PLWH at the ART clinic.

### Study Setting and Subjects

Kunming City was selected as the study site because it is one of the areas in China with a serious HIV epidemic. Data collection was performed at the Infectious Disease Department of Kunming Infectious Disease Hospital, which serves



**Figure 1** Theoretical framework for fertility intention among PLWH. Dotted line box = Behavioral beliefs; dashed line box= Normative beliefs; solid line box= Control beliefs.

more than 10,000 clients per year. The subjects of this study were females aged 20–40 years and males aged 20–50 years who were on ART for at least 12 months and had undetectable levels of viral loads. Those who could not communicate in Mandarin, did not have stable heterosexual partners, or could not conceive for any reason were excluded. Stratified random sampling was used to select participants at a female to male ratio of 1:1. The study was approved by the Ethics Committee of Prince Songkhla University (REC-63-208-18-1) and the Research Ethics Review Committee of the Third People's Hospital of Kunming (2020072001).

## Sample Size Estimation

We determined the sample size using the Structural Equation Model Sample Size Calculator.<sup>28,29</sup> In the process of data analysis, a variable with one observed variable was treated as a latent variable with a single observed variable. Therefore, there were 24 latent variables in the model including three with multiple observed variables (attitudes, subjective norms, and PBC), and 21 with a single observed variable (5 demographic factors, 7 behavioral beliefs, 4 normative beliefs, 4 control beliefs, and fertility intention). With 24 latent variables, 33 observed variables, an expected effect size of 0.3, type I error at 0.05, and the desired statistical power level of 0.8, the required sample sizes were 237 to detect an effect of one variable in the model on another and 576 to test the overall fit of the model to empirical data.

## Instruments

The questionnaire collected demographic data and variables shown in [Figure 1](#). Codes and copy of the survey are in [Supplemental Appendix Table 1–3](#).

**Scales for Attitudes and Behavioral Beliefs:** Questions on attitudes towards fertility intention (5 items or A1-A5 in [Figure 1](#)) measured subjective evaluation of having a/another child on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Seven behavioral beliefs were each assessed with a question on expected outcomes of having a/another child and another on outcome evaluation (ie, the impact of the consequences). Both were rated on a five-point Likert scale (1 = not at all important, 5 = very important; 1 = not at all likely, and 5 = very likely, respectively). The product of expected outcomes and its corresponding outcome evaluation was a belief score (range from 1 to 25). Higher values implied that participants had more favorable beliefs about the particular outcomes of having a/another child.

**Scales for Subjective Norms and Normative Beliefs:** Questions on subjective norms contained three items (N1 to N3 in [Figure 1](#)) asking for the subjects' perceptions of social pressure to have a/another child, for example, "Most of the people who influence me a lot hold an attitude towards fertility." Each item was evaluated using a five-point scale (1 = strongly disagree, 5 = strongly agree). Higher scores reflected a greater perception that fertility was accepted as normal or desirable. Normative beliefs were assessed using four items of normative expectations of specific referent groups and four items of motivation to comply (with those groups) on a five-point Likert scale (1 = strongly disapprove, 5 = strongly approve and 1 = not at all important, 5 = very important, respectively). The score of each normative expectation was multiplied by its corresponding motivation to comply and became a normative belief score (ranging from 1–25). Higher scores reflected a greater perception of a particular significant other expecting participants to have a/another child.

**Scales for PBC and Control Beliefs:** Questions on PBC (4 items or P1 to P4 in [Figure 1](#)) measured the participants' self-efficacy to have a/another child on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). Control beliefs were assessed by four items on participants' beliefs on the presence of facilitating or impeding factors on having a/another child and the perceived power of these factors. Both were measured on five-point Likert scales (1 = not at all important, 5 = very important and 1 = very difficult, 5 = very easy, respectively). The score of each item on facilitating or impeding factors was multiplied by its corresponding power of control to give a weighted control belief score for a particular factor (ranging 1–25). Higher scores reflected the greater perceived presence of a particular control factor towards having a/another child.

**Fertility Intention:** Fertility intention was measured by a single item, "How likely am I going to have a/another child within the next three years?" on a five-point scale ranging from definitely not to definitely yes.

Socio-demographics: Five binary demographic variables were included in the model (ie, sex, age, registered residence, employment status, and household monthly income). The reference groups were being male, age >35, living in urban areas, being employed, and having a household income greater than 10,000 Chinese Yuan (CNY) per month.

## Translation and Verification of the Instrument

The questionnaire was initially developed in English and independently translated into Chinese by two bilingual native Chinese speakers. A professional translator compared the two versions and corrected any discrepancies. The two translators, who were both native Chinese speakers, independently performed back translation of the Chinese version to the English version. The original and back-translated versions of the questionnaires were compared to guarantee accuracy and completeness. All translated versions were compared to the originals for semantic, idiomatic, experiential, and conceptual comparability, and the Chinese translation was finalized with consultation with an experienced team consisting of epidemiologists and doctors with extensive experience in HIV treatment and scale development in medical practice. The cognitive briefing was conducted on 35 respondents who completed the translated questionnaire and were interviewed about their thoughts on each item and the reasons behind their responses. The information was used to revise the questionnaire.

## Data Collection

The principal researcher contacted the administrators of the ART clinics to obtain their consent for their clients to join this study. The researcher also asked eligible patients for their informed consent to join this study. They were informed that anonymity was assured to protect their privacy. All information that could identify the participants was kept confidential. The participants were interviewed face-to-face using a structured questionnaire. The interview took 15–30 minutes.

## Statistical Analysis

Structural equation modeling (SEM) in the lavaan package of the R statistical software was used to analyze the data.<sup>30,31</sup> Univariate skewness and kurtosis of all observed variables, except for binary demographic variables were within acceptable ranges (ie, less than 2 and 7, respectively).<sup>32</sup> The Robust Maximum Likelihood Estimation was used because the tested model included binary demographic variables.<sup>33</sup> We used a confirmatory factor analysis (CFA) to test the measurement model of the hypothesized model (Figure 1). The fit indices in the study and their cut-off values were the Chi-squared test ( $p > 0.05$ ), Comparative Fit Index (CFI  $> 0.90$ ), Tucker-Lewis index (TLI  $> 0.90$ ), Root Mean Square Error of Approximation (RMSEA  $< 0.07$ ) and its 90% confident interval, and Standardized Root Mean Square Residual (SRMSR  $< 0.07$ ).<sup>34–38</sup> The measurement model was modified based on modification indices (MIs) and theoretical considerations to gain an acceptable fit.<sup>39,40</sup> Subsequently, the hypothesized model according to Figure 1 was fitted using the same procedures as that in the measurement model. The level of significance in this study was set at a  $p$ -value  $< 0.05$ .

## Results

A total of 516 questionnaires were distributed. Twenty-nine questionnaires were excluded due to a large amount of incomplete data. The responses from 487 PLWH (93%) were used in the data analysis. Half of the participants were females (50.3%) with ages ranging from 20 to 50 years. Rural residents were represented by 62.8% of the participants. The percentage of unemployed participants was 63.7% while 57.1% reported a low monthly income ( $< 10,000$  CNY). Overall, 38.4% of the respondents answered that they were likely to have a/another child in the next three years.

## Measurement Model

The measurement model of the hypothesized model showed an acceptable fit to the data based on CFI, RMSEA and SRMR ( $\chi^2 = 596.80$ ,  $df = 240$ ,  $p < 0.001$ ; CFI = 0.948; TLI = 0.885; RMSEA = 0.059 (90% CI 0.053–0.065); SRMR = 0.031). However, TLI indicated a poor fit of the model. The model was modified by deleting two observed variables of PBC because of factor loading less than 0.50 and its redundant content. The modified model had an acceptable fit ( $\chi^2 = 271.96$ ,  $df = 150$ ,  $p < 0.001$ ; CFI = 0.980; TLI = 0.941; RMSEA = 0.043 (90% CI 0.035–0.052); SRMR = 0.023). Model fit indices of this measurement model were summarized in [Supplemental Appendix Table 4](#).

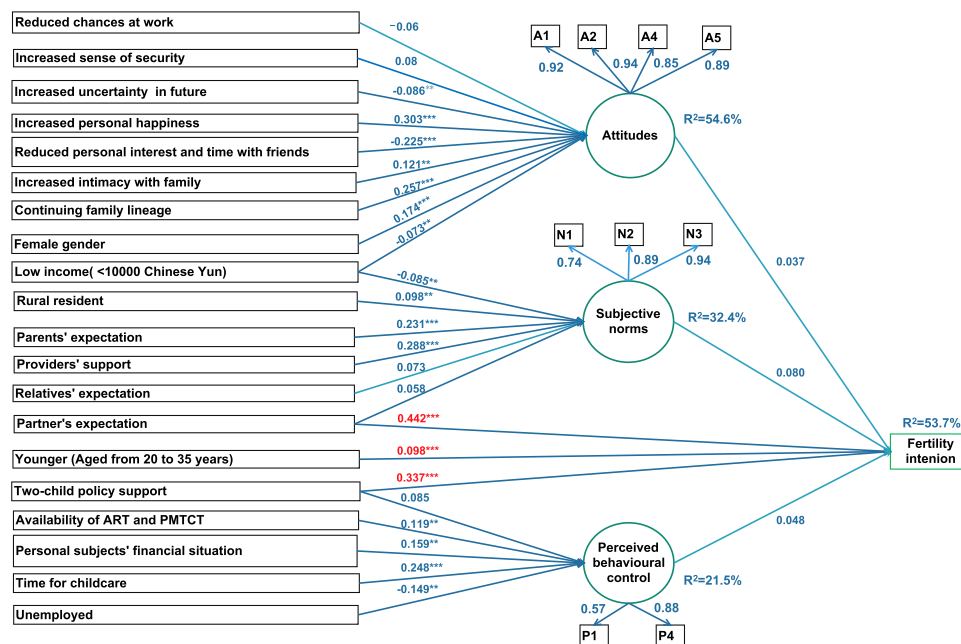
Cronbach’s alpha for multi-item variables (attitudes, subjective norm, and PBC) ranged from 0.62 to 0.80. Their composite reliabilities, based on the McDonald’s omega ranging from 0.87 to 0.88, were considered satisfactory (>0.7).<sup>41</sup> Standardized factor loadings in latent variables with multiple observed variables (attitudes, subjective norm, and PBC) were from 0.55 to 0.92 which implied convergent validity. The other variables in the model had one indicator, and their factor loadings were set to 1.0. The sizes of the factor correlations among attitudes, subjective norm, and PBC were low to moderate (range 0.39–0.42). Absolute values of the correlations among all variables in the model were between 0.010 and 0.59. The result implied divergent validity of the variables in the model.

The participants had favorable attitudes toward having a/another child (4.2 [0.68], range 1–5), and high perceived subjective norms for the behavior (4.3 [0.18] range 1–5). They perceived that it was easy to have a/another child if they intended to do so with a mean PBC of 4.2 [0.61] (out of 5).

### Structural Model

The model in Figure 1, following the deletion of three observed variables as mentioned in the previous section, showed an overall moderate fit to the data ( $\chi^2 = 609.49, df = 195, p < 0.001$ ; CFI = 0.932; TLI = 0.849; RMSEA = 0.069 (90% CI 0.063–0.076); SRMR = 0.062). However, TLI was lower than 0.90 that indicated a poor fit of the model. Based on the size of the modification index and theoretical considerations, we added two paths: from perception on partner’s expectation to fertility intention and from perceived supportive effect of the two-child policy to fertility intention. The modified model showed an acceptable fit ( $\chi^2 = 417.01, df = 193, p < 0.001$ ; CFI = 0.963; TLI = 0.917; RMSEA = 0.051 (90% CI 0.045–0.058); SRMR = 0.055). The fit parameters of structural model were summarized in Supplemental Appendix Table 4.

Figure 2 and Supplemental Appendix Table 5 and 6 show the modified model with significant path coefficients. The variables in the model explained 54.6, 32.4, 21.5, and 53.7% of the variance in attitudes towards having a/another child, relevant subjective norms, PBC, and fertility intention, respectively. Surprisingly, the three main concepts from the TPB (ie, attitudes towards having a/another child, relevant subjective norms, and PBC) showed no significant effects on fertility intention with the standardized coefficients ( $\beta$ ) of 0.037, 0.080, and 0.048, respectively ( $p > 0.05$ ). This implies that some important factors were not included in the model. Future studies should identify these factors to better



**Figure 2** Psychological and socio-demographic characteristics predicting fertility intention among PLWH. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ ; Squared multiple correlation, Red coefficients: Direct significant correlation between predictors and outcome. **Note:** non-significant paths were not shown in the figure to reduce the complexity.

understand the phenomena. In this study, attitudes, subjective norms, and PBC showed no direct effects on fertility intention, implying that they did not mediate the effects on other variables in the model. The strongest predictor of fertility intention among Chinese PLWH was a perception of a partner's expectation ( $\beta = 0.442, p < 0.001$ ), followed by perceived supportive effect of the two-child policy ( $\beta = 0.337, p < 0.001$ ), and being younger (aged 20–35 years;  $\beta = 0.098, p < 0.003$ ). The average score on fertility intention among the respondents aged 20–35 years ( $3.50 \pm 1.09$  out of the full score of 5) was higher than that of respondents aged >35 years ( $2.96 \pm 1.22$ ).

Attitudes towards having a/another child among Chinese PLWH showed significant positive relationships to perceived happiness and life satisfaction from having a/another child ( $\beta = 0.303, p < 0.001$ ), desire to continue family lineage ( $\beta = 0.257, p < 0.001$ ), being female ( $\beta = 0.174, p < 0.001$ ), and belief in increased intimacy among family members ( $\beta = 0.125, p < 0.023$ ). The mean of attitudes toward having a/another child among females ( $16.83 \pm 2.87$  out of the full score of 20) was higher than that of males ( $16.38 \pm 2.60$ ). Attitudes also had significant negative relationships with belief that having a/another child would jeopardize personal interest and time with friends ( $\beta = -0.225, p < 0.001$ ), perception of increased uncertainty in life ( $\beta = -0.086, p < 0.016$ ) and having the lower-income ( $\beta = -0.073, p < 0.039$ ). The mean of attitudes among respondents with an income <10,000 CNY per month ( $16.4 \pm 2.76$  out of the full score of 20) was lower than that of respondents with an income >10,000 CNY per month ( $16.88 \pm 2.71$ ).

The strongest predictors of subjective norm on having a/another child was the expectation of health professionals ( $\beta = 0.288, p < 0.001$ ), followed by the expectation of their parent ( $\beta = 0.231, p < 0.001$ ), living in a rural area ( $\beta = 0.098, p < 0.025$ ), and having the lower-income ( $\beta = -0.085, p < 0.043$ ). Those living in rural residents reported a slightly higher level of subjective norms on having a/another child ( $12.84 \pm 1.71$  out of the full score of 15) than those living in urban residents did ( $12.55 \pm 1.73$ ). The mean of subjective norms among those with less than 10,000 CNY per month ( $12.71 \pm 1.73$  out of the full score of 15) was lower than that of respondents with more than 10,000 CNY per month ( $13.00 \pm 1.67$ ).

PBC was influenced by four variables including time for taking care of a child ( $\beta = 0.248, p < 0.001$ ), personal financial situation ( $\beta = 0.159, p < 0.013$ ), being unemployed ( $\beta = -0.149, p < 0.005$ ), and availability of HIV medications and prevention of mother-to-child HIV transmission (PMTCT) ( $\beta = 0.119, p < 0.015$ ). The unemployed respondents reported a lower level of PBC on having a/another child ( $8.4 \pm 1.19$  out of the full score of 10) than the employed respondents did ( $8.61 \pm 1.27$ ).

## Discussion

This study found that fertility intention among Chinese PLWH was significantly related to beliefs in the partner's expectations, two-child policy, and being young (aged 20–35 years). The TPB-based constructs including attitudes, subjective norms, and PBC were not a significant predictor of fertility intention. This finding contradicted the findings of Laschinger et al,<sup>42</sup> the Dippel et al study on teenage pregnancy,<sup>43</sup> and the Amutah et al study on women living with HIV.<sup>44</sup> However, most female subjects in two of these studies<sup>45,46</sup> did not reveal their HIV status and hence their referents' opinions about childbearing following HIV diagnosis could not be assessed.

Our findings suggested that the partner's expectation was a good predictor of fertility intention. On the other hand, we found significant effects from the influences of parents and health providers on subjective norms but not on fertility intention. It was reported that family expectations are a predominant factor in having children.<sup>47</sup> However, in our PLWH sample, fertility intention was the couple's matter that was not much influenced by social norms. Oosterhoff et al<sup>48</sup> found that, in Vietnam, parents influenced the intention of PLWH to have children, whereas the provider, partner, and other relatives did not. Feyissa<sup>49</sup> found that a provider's support influenced fertility intention among PLWH in Western Ethiopia. Another study, however, indicated that despite a strong desire and intent to have a child, PLWH living in urban areas of Ontario, Canada were less likely to have fertility behavior due to a lack of family support.<sup>50</sup> A possible explanation for the mixed results is that the relevance of important referents might vary in different cultures.

Our findings suggested that the government's two-child policy was associated with fertility intention. According to data from the Seventh National Census, China's total fertility rate of reproductive-aged women in 2020 was 1.3,<sup>51</sup> which was significantly below the UN Population Division's 2019 World Population Prospects estimate of 1.8.<sup>52</sup> Therefore, the Chinese government announced the implementation of a new three-child policy.<sup>53</sup> The belief in supportive effect of the

policy on having another child showed the strongest influence on fertility intention among Chinese PLWH, compared to other factors. Since we did not have non-HIV couples in our study, whether this policy also had the same influence on the general population in the study community was not known.

Young age ( $\leq 35$  years) was found to have a stronger fertility intention. This finding was consistent with that in previous studies in East Africa,<sup>54</sup> South Africa and Tanzania,<sup>55</sup> and Rwanda<sup>56</sup> but not with Central Brazil<sup>57</sup> and Northwest Ethiopia.<sup>58</sup> The variation may be linked to the availability of ART among the younger age group.<sup>1</sup>

Since this was a cross-sectional study, any interpretation on causality must be made with caution. Data were collected from Yunnan province, which is one of the poorest in China with diversity in ethnic groups. Generalization of the results to other PLWH in other areas must be done with caution.

## Conclusions

The findings that fertility intention was strongly influenced by beliefs of partner's expectation, support from the two-child policy, and younger age. These factors should be considered in future support of fertility intention in PLWH.

## Institutional Review Board Statement

This study was approved by the Ethics Committee of Prince of Songkla University (REC-63-208-18-1) and the Research Ethics Review Committee of the Third People's Hospital (2020072001). In this study, pseudonyms were used to protect the identity of the participants.

## Data Sharing Statement

All pertinent information is contained inside the text and its accompanying information files.

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## Disclosure

The authors declared no conflicts of interest.

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