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Authors

Li, Li
Liang, Li-Jung
Lin, Chunqing
[et al.](#)

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Li Li¹, Li-Jung Liang¹, Chunqing Lin¹, Guoping Ji², and Yongkang Xiao²

Abstract

HIV seropositive individuals and their heterosexual partners/spouses, either seropositive or seronegative, are facing several mental health challenges. The objective of this study was to examine gender differences in depressive symptoms among HIV-positive concordant and HIV-discordant couples. We identified heterosexual couples from participants of a randomized controlled trial conducted in Anhui province, China. A total of 265 couples, comprising 129 HIV+ male/HIV- female couples, 98 HIV- male/HIV+ female couples, and 38 HIV-positive concordant couples, were included in the analyses. We collected data using the computer-assisted personal interview method. We used a linear mixed-effects regression model to assess whether gender differences in depressive symptoms varied across couple types. HIV-positive women reported a significantly higher level of depressive symptoms than their partners/spouses. HIV-positive women with HIV-positive partners had higher depressive symptoms than those with HIV-negative partners, whereas HIV-positive men reported similar levels of depressive symptoms regardless of their partners' serostatus. Among the concordant couples, those with the highest annual family income showed the greatest gender differences in depressive symptoms. We suggest that family interventions should be gender- and couple-type specific and that mental health counseling is warranted not only for HIV-positive women but also for HIV-negative women in an HIV-affected relationship.

Keywords

HIV, gender, serostatus, couples, mental health, depressive symptoms

Globally, the number of new HIV infections attributed to heterosexual contact and the number of HIV-affected couples is increasing (Sugimoto et al., 2014; United Nations Program on HIV/AIDS, 2010). In China, there were a total of 437,000 reported HIV cases by the end of 2013 (National Health and Family Planning Commission of the People's Republic of China [NHFPC], 2014). Heterosexual transmission is the primary mode of transmission in the country, accounting for 69.4% of the total reported cases in 2013 (NHFPC, 2014). The Ministry of Health of People's Republic of China (2010) estimated that about one third of heterosexual HIV transmissions occur between spouses in China. Although presently most new cases of HIV transmission among heterosexuals occur through sexual contact, in certain regions of China (in Anhui and Henan Provinces, in particular), a sizable proportion of people living with HIV (PLH) was infected through infusion of contaminated blood products during paid plasma donation before regulatory protections were put into place in the 1990s (Ji, Detels, Wu, & Yin, 2006; Wu, Rou, & Detels, 2001). Irrespective of transmission mode, HIV may pose numerous mental health challenges to

HIV-infected individuals and their partners/spouses (Aljasssem et al., 2014; Eller et al., 2014). While unprotected sexual behaviors and the rate of seroconversion have been well documented in the literature (Wang et al., 2012), relatively little attention has been paid to the mental health status among HIV-affected couples.

The seropositive member and the seronegative member in a relationship may face different mental health challenges. Studies have indicated that the seropositive member usually experiences shock, denial, guilt, shame, and difficulties in

¹ Semel Institute for Neuroscience and Human Behavior, University of California at Los Angeles, Los Angeles, CA, USA

² Anhui Provincial Center for Disease Control and Prevention, Hefei, Anhui, China

Corresponding Author:

Li Li, Semel Institute for Neuroscience and Human Behavior, University of California at Los Angeles, 10920 Wilshire Blvd., Suite 350, Los Angeles, CA 90024, USA.

Email: lilili@ucla.edu

status disclosure following the diagnosis of HIV (Casale, Wild, Cluver, & Kuo, 2015; L'Akoa, Noubiap, Fang, Ntone, & Kuaban, 2013; Mavhandu-Mudzusi, Lelaka, & Sandy, 2014; Pence, 2009; Sherr, Clucas, Harding, Sibley, & Catalan, 2011). In HIV-positive concordant couples, both partners are suffering additional mental health challenges related to financial constraints and occupational concerns, future uncertainties, and doubled societal stigma as well as added disease burden (Bhagwanjee et al., 2013; Gordon-Garofalo & Rubin, 2004; Talley & Ann Bettencourt, 2010). The seronegative partner, although not physically affected by HIV, also bears devastating psychological burdens such as fear of transmission, stress associated with caretaking, anger associated with betrayal (if their partner acquired HIV through extra-relational sex), and concern about the partner's deteriorating health as well as anticipated loss (Beyeza-Kashesya et al., 2009; Gordon-Garofalo & Rubin, 2004; Rispel, Cloete, Metcalf, Moody, & Caswell, 2012). The mental health challenges may compromise treatment adherence, may heighten HIV transmission risk for couples affected by HIV/AIDS (Bradley, Remien, & Dolezal, 2008; Wyatt, Loeb, Williams, Davis, & Zhang, 2012), and warrant further investigation with different types of couples.

Gender is another important factor associated with mental health challenges faced by people affected by HIV/AIDS (Gupta et al., 2010; Lichtenstein, Laska, & Clair, 2002). A strong correlation between female gender and depressive symptoms has been documented in the literature, among populations with and without HIV/AIDS (Kockler & Heun, 2002; C. H. Lai, 2011; Lichtenstein et al., 2002; Pereira & Canavarro, 2011; Romans, Tyas, Cohen, & Silverstone, 2007). Previous literature has also consistently indicated that Chinese women bear greater mental health burdens than men (Hou, Cerulli, Wittink, Caine, & Qiu, 2015; Phillips et al., 2009), primarily due to women's lower education, unemployment, financial dependence, and limited available social support (Hou et al., 2015; Lu et al., 2008). A study conducted in rural China attributed the gender differences to the fact that some women are more sensitive to rejection, criticism, and separation, which are key factors of depression (He et al., 2015). In HIV-affected heterosexual couples, gender was reported to be the most significant predictor of psychological distress (Kennedy, Skurnick, Foley, & Louria, 1995; Perry & Fisherman, 1993). Both HIV-positive and HIV-negative women had more distress than their male partners, irrespective of the male partner's serostatus (Kennedy et al., 1995). A study conducted in Thailand also reported that women living with HIV reported significantly higher levels of depressive symptoms than their male counterparts, regardless of their partners' HIV status (Li, Liang, Lee, & Farmer, 2012). The complex interplay between the serostatus of couples, gender, and depressive symptoms has to be understood within the specific cultural context. The collectivist Chinese culture focuses more on interdependent group values than on individualistic autonomy (Zang, Guida, Sun, & Liu, 2014). Both

seropositive and seronegative spouses in a collectivist culture may bear additional psychological burdens, as the whole family may face marginalization, shame, and disgrace due to the HIV status of one family member (Li et al., 2008). In addition, Confucianism, which has been the dominant thought in traditional Chinese culture for more than 2,000 years, instills the concept of male superiority over women (*nan zun nv bei*) in a heterosexual relationship (Leung, 2003). According to the teachings of Confucianism, husbands are supposed to work and support the family, while wives should stay at home as caregivers (Gao et al., 2014). Wives are expected to be obedient and submissive to their husbands (Chan & Tan, 2004). The taboo against extramarital sex also is stronger for women than for men in China (Hong, Yamamoto, Chang, & Lee, 1993). Such deeply rooted beliefs widen the gender inequality in the Chinese society and complicate the intersection of HIV/AIDS, gender, and mental health.

Our current study was based on the theory of gender and power and the affective, biological, and cognitive (ABC) model (Connell, 1987; Hyde, Mezulis, & Abramson, 2008). The ABC model integrates ABC factors into a vulnerability-stress model (Hyde et al., 2008). Using the ABC model as a theoretical framework, we examined the gender differences in depressive symptoms in China among three types of heterosexual couples: HIV+ male/HIV- female discordant couples, HIV- male/HIV+ female discordant couples, and HIV+ male/HIV+ female concordant couples. We addressed the following three research questions in this study: (1) whether gender differences in depressive symptoms varied across different types of couples, (2) whether the differences in the depressive symptoms that HIV-positive women reported when they were in discordant relationships differed from those who were in HIV-positive concordant relationships, and (3) whether we observed a similar effect for HIV-positive men. The ABC model suggests that cognitive vulnerability interacts with negative life events, such as HIV infection, to increase depressive symptoms or trigger a diagnosable episode of depression. The theory of cognitive vulnerability for depression posits that individuals with certain negative cognitive styles have greater chances of developing depression when they encounter negative or stressful life events (Abramson & Alloy, 2006). Sensitivity to rejection, criticism, and separation among rural Chinese women increases their cognitive vulnerability (He et al., 2015).

The model provides a framework for understanding that even when women and men experience the same stressors, women may be more likely than men to develop depressive symptoms because of gender differences in biological responses to stressors, self-concepts, or coping styles (Abramson & Alloy, 2006). We expected that women would report a higher level of depressive symptoms than men in both HIV-positive concordant and discordant couples and that HIV-positive men and women would report a higher level of depressive symptoms when they were in concordant relationships than in discordant relationships.

Connell (1987) claims that women's lack of social power makes them more vulnerable than men to specific major traumas or negative life events. Previous research has noted that gender disparities remain problematic and are concentrated in poor rural areas in China where the patrilineal family system and the traditional attitude of male superiority over women still continue (Hannum, Kong, & Zhang, 2009; Li, 2004; Leung, 2003). Due to the family-oriented culture in China, we expected that the pattern of gender disparity in depressive symptoms would differ by family characteristics. In particular, family income, as an indicator of available resources to combat the illness, may modify the association between gender, HIV status, and depressive symptoms. Connell's (1987) theory of gender and power claims that in the context of heterosexual relationships, some women face inequities in the distribution of power, thus limiting women's control over decision-making. Families with higher household income give men higher status, thus widening the inequality of power in the relationship. We expected that the gender differences in depressive symptoms would widen, as family income increased in both HIV-positive concordant and discordant couples.

Method

Participants

We used the baseline data from a randomized controlled trial (ClinicalTrials.gov registration #NCT01762553) that aimed at improving general health and family relationships of HIV-affected families in rural China. In this trial, we assessed the efficacy of a family intervention for HIV-affected families, including parents living with HIV and adult family members to improve their long-term health, mental health, and behavioral adjustment of their children. The intervention focused on a family's capacity to overcome the impacts of living with HIV. A detailed description of the intervention pilot has been previously reported (Li et al., 2011). The current study was different from the larger study in that the current study included only married and cohabitating heterosexual couples. The majority of existing HIV infections in the study area, Anhui Province, were caused by paid plasma donations in the last century (Ji et al., 2006; Wu et al., 2001). Plasma donation was a popular way to supplement income in central China during the early to mid-1990s. Some plasma collection stations collected the whole blood, removed the plasma, and injected the pooled red blood cells intravenously into the donors, so that donors could donate more often without developing anemia. HIV-1 antibody tests were not required before 1995 and were not performed at any local plasma collection center (Wu et al., 2001). Reuse of tubing and mixing during collection and reinfusion caused an HIV outbreak among former plasma donors until the practice was stopped in 1996 (Wu et al., 2001). PLH participants in the study were recruited from the local clinics where they

usually receive routine checkups and care. The inclusion criteria for the study are (1) being 18 years old or older, (2) being a resident of one of the selected villages, and (3) having at least one child in the family. To be eligible for inclusion, family members had to be at the aged 18 or older, had lived with the PLH, and had knowledge of the serostatus of the PLH. The recruited PLH were asked to invite one of his or her family members to participate in the study, preferably a spouse. If there were two PLHs in a household (usually a husband and a wife), they were both recruited as PLH participants and an additional family member was also recruited from the household. A total of 475 families affected by HIV from 32 villages of Anhui participated in the intervention trial. For the purpose of this study, we identified and included only married and cohabitating heterosexual couples, either HIV-positive concordant or discordant, from the baseline. From the 475 participating families, 265 couples met the selection criteria and were included in the study.

Procedures

For the larger study, we collected baseline data from late 2011 to early 2013. The research staff explained to each participant the study purpose, procedure, potential risks and benefits, and guaranteed confidentiality and voluntary nature of their participation. We obtained written informed consent from each participant prior to the start of data collection. Following informed consent, participants completed an assessment using the computer-assisted personal interview method. Instead of collecting data on paper questionnaires, trained interviewers used laptop computers to read the assessment questions to the participant and entered their answers directly into a computer database. All of the assessments were conducted in a private room behind a closed door, such as in an office, in a village clinic, or at the participants' home, as preferred by the participants. The average time of the assessment was about 50 min. The participants received 50 yuan (US\$8.30) as compensation for their time spent in the assessment. The study protocol and materials were reviewed and approved by the institutional review boards of participating institutes in China and the United States. Any underlying research materials related to the article will be made available upon request to the corresponding author.

Measures

Depressive symptoms. Depressive symptoms were measured using the shortened version of the Zung Self-Rating Depression Scale (Zung, 1965). The Zung Depression Scale is widely used in research as a tool to measure the level of depressive symptoms (World Health Organization, 2015). Internal consistency of the scale was acceptable in the original study (Cronbach's $\alpha = .73$; Zung, 1972). We validated the scale in our previous pilot study among PLH and their family members in Anhui Province (Li, Liang, Ding, & Ji,

2011). The scale consists of six negatively worded items (such as “I feel down-hearted and blue,” “I get tired for no reason,” and “I have trouble sleeping at night”) and three positively worded items (such as “I feel hopeful about the future”). Participants were asked how often they experienced each of the 9 items. Response categories ranged from 1 (*a little of the time*) to 4 (*most of the time*). The overall score was a continuous variable constructed by summing the 9 items with the three positively worded items reverse coded. A higher overall score indicated a higher level of depressive symptoms (Cronbach’s $\alpha = .82$ for the current study).

Demographic characteristics. We collected the participants’ individual demographic characteristics including gender, year of birth, and years of education. Age was computed by subtracting the reported year of birth from the assessment year. Family characteristics included the number of children, the number of family members, and family annual income.

Data Analysis

Descriptive statistics and a frequency distribution for individual and family characteristics were summarized by the couple types. To account for the clustering structure (because the participants were clustered within villages), these characteristics were compared between couple types using a Cochran–Mantel–Haenszel test (Agresti, 2012) and a random-effects model for categorical and continuous variables, respectively. We used linear mixed-effects regression models with village- and family-level random effects to address the first two research questions. Two levels of random effects, village- and family-level random intercepts, were included to account for dependence within villages and multiple members within families. Covariates included in the model were participant’s age, gender, couple type, family characteristics (number of family members, number of children, and family annual income), and Gender \times Couple type interaction. Model comparisons of interest were conducted through model contrasts. The estimated mean score of depressive symptoms by gender and couple type from the adjusted regression model was presented using bar graph. To address the third research question, we first categorized the family characteristics (e.g., family income) into quartiles. Next, we added the categorical family characteristics to the main regression model (described above) as an additional factor and also included the additional two-way and three-way interaction terms. All statistical analyses were carried out with the SAS System for Windows Version 9.3 (SAS Institute Inc., 2013).

Results

Sample Characteristics

Of the 265 couples included in the study, 227 (86%) were discordant couples (129 HIV+ male/HIV– female discordant couples and 98 HIV– male/HIV+ female discordant

couples) and 38 (14%) were HIV-positive concordant couples. The majority (87%) of the PLH participants in this study were infected through former plasma donation. Table 1 presents participant and family characteristics by couple type. Male participants in the HIV– male/HIV+ female couple group (50 ± 9.6) and concordant group (49 ± 7.0) were on average older than those in the HIV+ male/HIV– female couple group (47 ± 8.4 , $p = .020$). The average age for women was 1–2 years younger than males; the average ages were 45, 49, and 47 for the female participants in the HIV+ male/HIV– female couple, HIV– male/HIV+ female couple, and HIV-positive concordant couple, respectively ($p = .016$). More than half of the couples reported their family annual income as 10,000 yuan (US\$1,606) or lower and less than 20% of the couples reported their family annual income as 20,000 yuan (US\$3,212) or higher. The majority of HIV– male/HIV+ female couples (61%) and 47% of concordant couples had only one child, whereas 43% of HIV+ male/HIV– female couples had two children. More than 40% of HIV+ male/HIV– female couples had four or fewer family members, as most concordant couples (79%) had a large family size (i.e., five or more members per family).

Gender Differences in Depressive Symptoms

Adjusted depressive symptoms from the main regression model are presented by gender and couple type in Figure 1. The estimated level of depressive symptoms reported by PLH, both men and women, was higher than that reported by the HIV-negative men and women. The HIV-positive women had significantly higher levels of depressive symptoms than their spouses, regardless of their serostatus. The level of depressive symptoms reported by the HIV-negative men was lower than that reported by the HIV-negative women (18.1 vs. 20.3, $p = .002$).

Table 2 presents the gender differences ($\pm SE$) in depressive symptoms across couple types and shows gender-specific differences in depressive symptoms between discordant and concordant relationships from the adjusted regression models. The mean level of depressive symptoms reported by HIV-positive women was significantly higher than that reported by their partners regardless of his serostatus (4.44 ± 1.09 and 4.90 ± 0.68 for partner with and without HIV, respectively; p values $< .0001$). Among discordant couples, the mean level of depressive symptoms reported by HIV-positive male participants with HIV-negative female partners was significantly higher than that reported by HIV-negative male participants with HIV-positive female partners (2.79 ± 0.70 , $p < .0001$). HIV-positive men with HIV-positive partners reported higher level of depressive symptoms than HIV-negative men with HIV-positive partners (2.49 ± 1.01 , $p = .014$). Similarly, the level of depressive symptoms reported by HIV-positive female participants with HIV-negative partners was significantly higher than that

Table 1. Individual and Family Characteristics by Type of Couple.

	Male+/Female- 129 couples (n = 258) Number (%)	Male-/Female+ 98 couples (n = 196) Number (%)	Male+/Female+ 38 couples (n = 76) Number (%)
Background characteristics			
Individual characteristics			
Age			
Male			
40 or younger	38 (29.5)	19 (19.4)	5 (13.2)
41–50	54 (41.9)	34 (34.7)	20 (52.6)
51–60	28 (21.7)	30 (30.6)	11 (29.0)
61 or older	9 (7.0)	15 (15.3)	2 (5.3)
Mean ^a (SD)	46.7 (8.36)	49.9 (9.64)	49.0 (7.04)
Female			
40 or younger	42 (32.6)	20 (20.4)	5 (13.2)
41–50	54 (41.9)	36 (36.7)	22 (57.9)
51–60	26 (20.2)	35 (35.7)	10 (26.3)
61 or older	7 (5.4)	7 (7.1)	1 (2.6)
Mean ^b (SD)	45.2 (8.56)	48.5 (9.05)	47.3 (5.97)
Education			
Male			
None	16 (12.4)	10 (10.2)	7 (18.42)
1–6	81 (62.8)	53 (54.1)	22 (57.9)
>6	32 (24.8)	35 (35.7)	9 (23.7)
Female			
None	70 (54.3)	56 (57.1)	24 (63.2)
1–6	49 (38.0)	34 (34.7)	13 (34.2)
>6	10 (7.8)	8 (8.2)	1 (2.6)
Family characteristics			
Family income			
5,000 yuan (US\$803) or lower	29 (22.5)	22 (22.5)	13 (35.1)
5,000–10,000 yuan (US\$803–US\$1,606)	44 (34.1)	27 (27.6)	7 (18.9)
10,000–20,000 yuan (US\$1,606–US\$3,212)	31 (24.0)	34 (34.7)	10 (27.0)
20,000 yuan (US\$3,212) or higher	25 (19.4)	15 (15.3)	7 (18.9)
Number of children			
One	53 (41.1)	60 (61.2)	18 (47.4)
Two	55 (42.6)	25 (25.5)	14 (36.8)
Three or more	21 (16.3)	13 (13.3)	6 (15.8)
Number of family members			
Four or less	53 (41.1)	46 (35.7)	8 (21.1)
Five to six	46 (46.9)	33 (33.7)	15 (39.5)
Six or more	30 (23.3)	19 (19.4)	15 (39.5)

^{a,b}Significant age difference among three couple types within gender ($p = .020$ and $.016$ for male and female, respectively).

reported by HIV-negative female participants with HIV-positive partners (2.69 ± 0.70 , $p = .0001$).

For both men and women in relationships with positive partners, being HIV positive (i.e., being in a seroconcordant relationship) was associated with higher levels of depressive symptoms than being HIV negative (i.e., being in a serodiscordant relationship). In particular, for couples with HIV-positive women, the HIV-positive husbands reported significantly higher levels of depressive symptoms than the HIV-negative husbands (2.49 ± 1.01 , $p = .014$). For couples with HIV-positive men, the HIV-positive wives reported significantly higher depressive symptoms than the HIV-negative wives (4.73 ± 0.97 , $p < .0001$). The difference in depressive symptoms reported by HIV-positive women with

HIV-positive husbands was significantly higher than those with HIV-negative husbands (2.03 ± 1.01 , $p = .0447$), whereas HIV-positive men reported similar levels of depressive symptoms regardless of their partners' serostatus (-0.31 ± 0.97 , $p = .753$).

Gender Differences in Depressive Symptoms by Family Income

We also assessed whether the gender differences in depressive symptoms across different types of couples (by serostatus) were influenced by their family characteristics. Results from the regression model indicated that family annual income was the only family characteristic that was

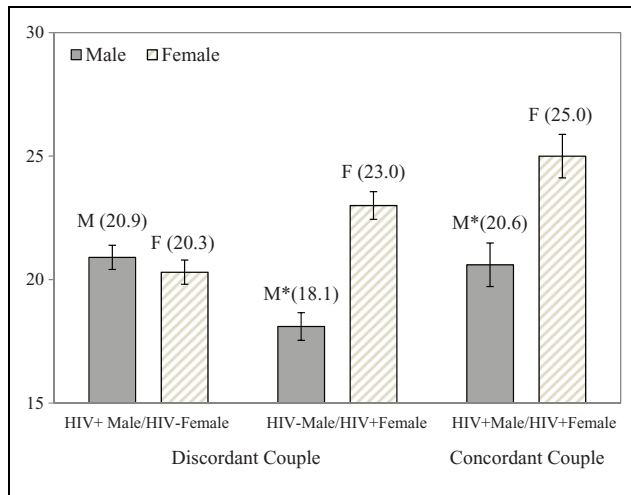


Figure 1. Adjusted mean with error bars for depressive symptoms by gender across couple types. Estimated means from the adjusted analysis are listed in parentheses.

Table 2. Adjusted Differences in Depressive Symptoms by Couple Type and Gender.

N = 530; 265 Couples	Estimate (SE)	p
Between gender (male–female)		
HIV+ male/HIV– female discordant couple	0.59 (0.59)	.3179
HIV– male/HIV+ female discordant couple	–4.90 (0.68)	<.0001
HIV+ male/HIV+ female concordant couple	–4.44 (1.09)	<.0001
Within gender		
Male		
HIV+ male/HIV– female discordant couple	2.79 (0.70)	<.0001
HIV– male/HIV+ female discordant couple	REF	
HIV+ male/HIV+ female concordant couple	2.49 (1.01)	.0140
HIV+ male/HIV+ female vs. HIV+ male/HIV– female	–0.31 (0.97)	.7532
Female		
HIV+ male/HIV– female discordant couple	REF	
HIV– male/HIV+ female discordant couple	2.69 (0.70)	.0001
HIV+ male/HIV+ female concordant couple	4.73 (0.97)	<.0001
HIV+ male/HIV+ female vs. HIV– male/HIV+ female	2.03 (1.01)	.0447

Note. Adjusted from participant's age and family characteristics (number of family members, number of children, and family income). There were a total of 530 participants in the sample, including 265 men and 265 women.

significantly associated with depressive symptoms ($p = .0002$). Thus, we examined whether annual family income was associated with the pattern of gender disparities in depressive

symptoms. Table 3 presents the estimated gender differences in depressive symptoms by couple type and family annual income. We observed significant gender differences in the HIV-negative male/HIV-positive female couples regardless of their family annual income levels. For the HIV-discordant couples, the pattern of gender disparity was consistent with the findings from the main analysis reported in Table 2. For the HIV-positive concordant couples, the gender disparities became greater as the family annual income increased; the differences were statistically significant for the highest two quartiles (p values = .009 and .002 for the third and highest quartiles, respectively). HIV-positive women reported worse depressive symptoms than their HIV-positive husbands in all income categories; however, the estimated difference was the highest in the highest income quartile (male vs. female mean: 17.2 vs. 25.0, $p = .002$).

Discussion

Consistent with previous literature, in the current study, women in general reported a higher level of depressive symptoms than men (Aljassem et al., 2014; Eller et al., 2014; Morrison et al., 2002). Women's greater vulnerability to depressive symptoms has long been documented worldwide even without the influences of HIV (Kockler & Heun, 2002; C. H. Lai, 2011; Romans et al., 2007). Various biological, psychological, and social reasons for such gender differences have been offered in the literature, including hormonal regulation, more experience with negative life events, and women's lower social status and power (Keita, 2007; Nazroo & Edwards, 1998; Nolen-Hoeksema, Larson, & Grayson, 1999). The theory of gender and power may explain women's susceptibility to depression beyond an individual perspective (Connell, 1987). According to this theoretical framework, gender differences can be characterized by three major structures: (1) the sexual division of labor in which women are often segregated in unpaid work, such as caring for the sick and housework; (2) the sexual division of power, for instance, less education and greater financial reliance on men limit women's control over healthy behaviors; and (3) the social norms that attach women's HIV infection to impurity and immorality (Connell, 1987; Wingood & DiClemente, 2000). The theory of gender and power is relevant to the gender culture in China. Gender inequality in education, although improved, still exists: When the family resource is restrained, most parents tend to keep daughters at home to do household chores and/or agricultural work and prioritize education of sons (Zeng, Pang, Zhang, Medina, & Rozelle, 2013). Even in modern China, some women face discrimination in labor markets because employers assume women will take maternity leave and bear family-caring responsibilities that will interfere with work performance (Pearson, 1995). The gender wage gaps are wider in urban China, as compared to European countries and several Asian countries (Maurer-Fazio, Rawski, & Zhang, 1999). We believe all of these

Table 3. Adjusted Gender Differences in Depressive Symptoms by Couple Type and Family Income.

Family Annual Income	Couple Type	Male–Female Estimate (SE)	<i>p</i>
Lowest quartile (5,000 yuan/US\$803 or lower)	HIV+ male/HIV– female discordant couple	–0.22 (1.23)	.8616
	HIV– male/HIV+ female discordant couple	–7.91 (1.42)	<.0001
Second quartile (5,000–10,000 yuan/US\$803–US\$1,606)	HIV+ male/HIV+ female concordant couple	–2.47 (1.84)	.1805
	HIV+ male/HIV– female discordant couple	1.42 (1.00)	.1576
	HIV– male/HIV+ female discordant couple	–3.69 (1.28)	.0043
Third quartile (10,000–20,000 yuan/US\$1,606–US\$3,212)	HIV+ male/HIV+ female concordant couple	–3.18 (2.51)	.2067
	HIV+ male/HIV– female discordant couple	0.95 (1.19)	.4252
	HIV– male/HIV+ female discordant couple	–4.00 (1.14)	.0005
Highest quartile (20,000 yuan/US\$3,212 or higher)	HIV+ male/HIV+ female concordant couple	–5.55 (2.10)	.0089
	HIV+ male/HIV– female discordant couple	–0.40 (1.33)	.8102
	HIV– male/HIV+ female discordant couple	–4.54 (1.72)	.0087
	HIV+ male/HIV+ female concordant couple	–7.79 (2.51)	.0022

Note. Adjusted from participant's age, number of family members, and number of children. The Couple \times Gender interaction in the adjusted model was significant ($p < .0001$); no other interaction terms were found to be significant.

factors may contribute to the higher levels of depressive symptoms in Chinese women.

In the current study, we found that in HIV-affected relationships, women's seropositive status was associated with a greater elevation in the level of depressive symptoms, as compared to men. There are several potential explanations for this finding. First of all, HIV infections, which are often linked to risky sexual behaviors, are less tolerated in women than in men, especially in male-dominated cultures such as China. Therefore, women living with HIV face additional challenges, including greater societal stigma and shame compared to their male counterparts (Asiedu & Myers-Bowman, 2014). This is especially true in China (Hong et al., 1993; Ruan, Luo, & Ho, 2004). Second, Hill and Needham (2013) suggested that women and men respond to stressful conditions (such as HIV infection) in different ways. In response to stress, women tend to develop internal symptoms such as depression, somatization, affective, or anxiety disorders, while men are more likely to externalize the stress and develop symptoms such as aggression or substance abuse disorders (Hill & Needham, 2013; Slopen, Williams, Fitzmaurice, & Gilman, 2011). Last, depressive symptoms could be further magnified by women's lack of access to critical information, resources, and support to cope with the disease (Krishnan et al., 2008; Mello, Segurado, & Malbergier, 2010).

An interesting finding of the study was that female PLH had a higher level of depressive symptoms if the spouse was seropositive; however, male PLH reported similar level of depressive symptom regardless of his spouse's serostatus. We speculate that the disparity could be explained by the sexual division of labor and gender-specific roles in a family. In Asian culture, men (who are usually more educated) are expected to engage in income-generating work, which is more valued and recognized than household work (Espiritu, 2007; Vithayachockitikhun, 2006). Most women depend heavily on their male partners for their own survival and that of their children.

A male family members' illness can directly affect the family's already compromised productivity and income and bring additional psychological burdens to the whole family. However, women are traditionally envisioned as the caregivers for the family, who are responsible for household work and for caring for children, elderly, and sick family members (Brody et al., 2014; D. W. Lai, Luk, & Andruske, 2007; Sugiura, Ito, Kutsumi, & Mikami, 2009). The family-caring role is considered less essential than men's breadwinning role; hence, the HIV infection of the female partner would not significantly heighten the husband's depressive symptoms. From the biological perspective, such gender differences in depressive responses by spouses' serostatus could be explained by the higher level of understress oxytocin released in women than men (Sanders, Freilicher, & Lightman, 1990), which leads to enhanced emotional empathy (Hurlemann et al., 2010). More empathetic women may be more affected by the physical and emotional consequences in relation to their partners' HIV-positive status; this speculation needs further investigation.

In the current study, HIV-positive concordant couples reported a higher level of depressive symptoms than that of discordant couples. A serious disease such as HIV/AIDS is a major burden for a family both economically and emotionally; it poses additional challenges to a family when more than one family member is infected. It is worth noting that the gap between men and women became wider among the HIV-positive concordant couples with a higher family income, as compared to those with a lower family income. One possible interpretation is that a higher family economic status may be translated into better access to resources in various aspects of life, including material goods, nutrition, health care, and social services (Kendall, 2011). These resources may alleviate depressive symptoms in men more than in women, due to the fact that men are more likely to suffer from psychological burdens associated with finance restraint (Matud, 2004; Tamres, Janicki, & Helgeson, 2002).

Limitations

The findings of this study should be interpreted in light of several limitations. First, the cross-sectional design of the study made it impossible to assess temporal relations between HIV infection and depressive symptoms; nor may we derive any causal relationships between depressive symptoms, HIV serostatus, and gender. Second, the fact that the majority of the study participants were infected through plasma donations limited the generalizability of the study findings. In addition, eligibility and selection criteria for PLH to have at least one child and at least one family member who knew of their HIV status restricted the generalizability of the study. Third, the study findings were limited to Chinese couples within similar family-oriented cultures. Although several potential confounders, such as age, gender, and income, were incorporated into the analyses, some other factors were not included, such as duration of the relationship, leaving a possibility for uncontrolled confounding. Fourth, as the study was based on self-reported depressive symptoms, rather than depression, the findings may not be equivalent to clinically diagnosed depression. The measure of depressive symptoms used in this study was general in nature, thus one could not distinguish if the reported level of depressive symptoms was specifically HIV related. Fifth, the theory of gender and power and the ABC model provided important conceptual frameworks for this study; we could not, however, assess all the relevant components such as affective, biological, or cognitive factors in this study. Last, the participants in this study were part of a larger study, and the results should be considered within that context (Li, Lin, Liang, & Ji, 2016).

Practice Implications

The implications of this work for interventionists, clinicians, researchers, and mental health practitioners are far reaching. The knowledge that HIV-positive women with HIV-positive partners had higher depressive symptoms than those with HIV-negative partners should be incorporated into future prevention programs that focus on the mental health of heterosexual couples living with HIV. Optimal mental health may facilitate HIV-positive women's ability to participate in timely evaluations of medical complications and treatment options. Our findings underscore the importance of gender-based interventions with greater efforts needed to address the women's vulnerability for depression, regardless of their HIV-serostatus.

Clinicians might use these results to inform their treatment and care for HIV-affected heterosexual couples. It is important for practitioners to increase their awareness about the need to promote the role of men as caregivers in HIV-affected families and to provide adequate support to their spouses. Greater mental health counseling is warranted, not only for women living with HIV, but also for women living in HIV-affected families. Women are often seen as the traditional family caregivers, yet

they may feel overwhelmed by the enormity of the tasks they face, and if they have children, the inherent uncertainties in HIV may undermine their capability to adjust and adapt. Clinicians and interventionists should help to increase their patients' awareness of coping mechanisms and pay attention to the double burden of mental health challenges faced by couples who are both HIV positive.

Conclusions

Our study showed that Chinese women are facing greater mental health challenges, compared to Chinese men. Studying gender differences in individual responses to HIV has implications for the continuum of care. Future programs should focus on women's increased susceptibility to negative mental health outcomes and address specific needs of women.

Authors' Note

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