

# UCLA

## UCLA Previously Published Works

### Title

Depression and anxiety among HIV-positive men who have sex with men and men who have sex with women in China

### Permalink

<https://escholarship.org/uc/item/6rv8427m>

### Journal

AIDS Care, 32(3)

### ISSN

0954-0121

### Authors

Aunon, Frances M  
Simoni, Jane M  
Yang, Joyce P  
et al.

### Publication Date

2020-03-03

### DOI

10.1080/09540121.2019.1683803

Peer reviewed

## Depression and anxiety among HIV-positive men who have sex with men and men who have sex with women in China

Frances M. Aunon, Jane M. Simoni, Joyce P. Yang, Chengshi Shiu, Wei-Ti Chen, Sarah R. Edmunds, Megan Ramaiya, Joy Cheng & Hongxing Zhao

To cite this article: Frances M. Aunon, Jane M. Simoni, Joyce P. Yang, Chengshi Shiu, Wei-Ti Chen, Sarah R. Edmunds, Megan Ramaiya, Joy Cheng & Hongxing Zhao (2020) Depression and anxiety among HIV-positive men who have sex with men and men who have sex with women in China, *AIDS Care*, 32:3, 362-369, DOI: [10.1080/09540121.2019.1683803](https://doi.org/10.1080/09540121.2019.1683803)

To link to this article: <https://doi.org/10.1080/09540121.2019.1683803>



Published online: 31 Oct 2019.



Submit your article to this journal [↗](#)



Article views: 184



View related articles [↗](#)




View Crossmark data [↗](#)



Citing articles: 2 View citing articles [↗](#)



## Depression and anxiety among HIV-positive men who have sex with men and men who have sex with women in China

Frances M. Aunon <sup>a</sup>, Jane M. Simoni<sup>a</sup>, Joyce P. Yang<sup>b</sup>, Chengshi Shiu<sup>c</sup>, Wei-Ti Chen<sup>c</sup>, Sarah R. Edmunds<sup>a</sup>, Megan Ramaiya<sup>a</sup>, Joy Cheng<sup>d</sup> and Hongxing Zhao<sup>e</sup>

<sup>a</sup>Department of Psychology, University of Washington, Seattle, Washington, USA; <sup>b</sup>Department of Psychology, University of San Francisco, San Francisco, CA, USA; <sup>c</sup>School of Nursing, University of California, Los Angeles, Los Angeles, USA; <sup>d</sup>Kaiser Permanente San Leandro Medical Center, San Leandro, California, USA; <sup>e</sup>Beijing Ditan Hospital, Capital Medical University, Beijing, People's Republic of China

### ABSTRACT

China is experiencing an emerging HIV epidemic among men who have sex with men (MSM). Minority stress theory posits that marginalized populations experience additional stress, which influences experiences of psychological distress and health outcomes. This study aimed to understand psychological distress of MSM relative to men who have sex with women (MSW) in an urban Chinese setting. Cross-sectional survey data were collected from 162 HIV-positive Chinese men receiving HIV treatment at Beijing's Ditan Hospital. Multiple linear regression with imputation was used to identify correlates of psychological distress. Relative to MSW, MSM were younger, more educated, and less likely to be in a relationship or have children. While both groups reported clinically elevated levels of depression and anxiety, sexual behavior was not associated with either outcome. Higher endorsement of depression symptomology was associated with worse reported physical health ( $\beta = -1.37, p < .05$ ) and greater endorsement of maladaptive coping ( $\beta = 2.39, p < .05$ ), whereas higher endorsement of anxiety symptomology was associated with greater endorsement of adaptive coping ( $\beta = 0.78, p < .05$ ), diminished physical health ( $\beta = -0.86, p < .05$ ), and a high school or greater level of education ( $\beta = 4.13, p < .05$ ). These findings suggest that interventions targeting coping strategies may address psychological distress among HIV-positive Chinese men.

### ARTICLE HISTORY

Received 22 January 2019  
Accepted 10 October 2019

### KEYWORDS

HIV; MSM; depression; anxiety; coping; China

### Background

The HIV epidemic in China is rapidly growing among men who have sex with men (MSM; National Health and Family Planning Commission of the People's Republic of China, 2015). The proportion of all new HIV infections attributable to sexual transmission between Chinese men increased from 2.5% to 21.4% between 2007 and 2014 (National Health and Family Planning Commission of the People's Republic of China, 2015). HIV prevalence estimates among Chinese MSM have also increased from 1.4% to 7.4% between 2001 and 2014, (Wu, Rou, & Cui, 2004; Chow, Wilson, Zhang, Jing, & Zhang, 2011), with the true HIV prevalence estimated to be as high as 18% (National Health and Family Planning Commission of the People's Republic of China, 2015).

Globally, people living with HIV/AIDS (PLWHA) are disproportionately affected by psychological distress, including depression, anxiety, trauma, and substance use (Uthman, Magidson, Safren, & Nachega, 2014; Mayer et al., 2012). This psychological distress is important to consider as it often co-occurs with engagement in

behaviors associated with higher risk of HIV acquisition and transmission (Batchelder, Safren, Mitchell, Iyardic, & O'Clérigh, 2017). In addition, MSM who are HIV-positive may experience disproportionately more psychological distress (Batchelder et al., 2017). The cumulative stress of being HIV-positive and a sexual minority has been shown to elevate the risk for adverse health outcomes, including non-adherence to medications and inconsistent utilization of health care services, increased viral load, decreased quality of life and increased HIV risk behaviors (Rueda et al., 2016; Song, Yan, Lin, Wang, & Wang, 2016).

Minority stress theory provides a framework to explain why MSM may be more impacted by psychological distress. Minority stress theory posits that psychological distress results from both external stressors, like societal conditions, and internalized stressors, like the concealment of identity (Meyer, 2003). Meyer (2003, 1995) suggests that MSM may experience increased psychological distress compared to men who have sex with women (MSW) due to their stigmatized status in a predominantly heteronormative society. Indeed,

ample research has demonstrated that compared to MSW, MSM report a higher prevalence of depression (Heywood & Lyons, 2016), anxiety disorder (Heywood & Lyons, 2016; Bostwick, Boyd, Hughes, & McCabe, 2010), mood disorder (Bostwick et al., 2010), and suicidal ideation and suicide attempts (Mustanski, Andrews, Herrick, Stall, & Schnarrs, 2014). Survey studies in China echoed these trends, estimating a 46% prevalence of depression among Chinese MSM (Yan et al., 2014), compared to 3% in the general population (Chen et al., 2017), highlighting the disproportionate burden of psychological distress among MSM (Choi, Steward, Miège, Hudes, & Gregorich, 2016; Steward, Miede, & Choi, 2013).

Coping resources, like social support, may insulate individuals from the effect of minority stress on psychological distress (Hatzenbuehler, McLaughlin, & Xuan, 2012). A recent study among sexual minority young adults suggested that increased social support contributed to decreased cortisol reactivity to stressors (Burton, Bonanno, & Hatzenbuehler, 2014). Moreover, some evidence suggests that social support may have particular importance for MSM; a stronger negative association was identified between social support and depression symptomatology for sexual minority males than sexual minority females or heterosexual participants (Hatzenbuehler et al., 2012). One recent study among HIV-positive men in China found that those who had more social support felt more resilient and reported less suicidal ideation compared to those who reported less social support (Li, Tucker, Holroyd, Zhang, & Jiang, 2017), highlighting the importance of positive social interactions in the development of resiliency. Similar relationships were identified with coping skills; maladaptive coping styles were positively correlated with psychological distress, while adaptive coping styles were negatively correlated with psychological distress (Meng & D'Arcy, 2016).

Although it is clear that MSM in China bear a disproportionate fraction of the HIV burden (National Health and Family Planning Commission of the People's Republic of China, 2015), few studies have aimed to understand psychological distress among MSM in China and fewer still that examine psychological distress and coping resources in this population compared to MSW (Su et al., 2017).

In the current study, we examined psychological distress and coping resources among MSM and MSW in a sample of urban, HIV-positive Chinese men. In line with minority stress theory, we hypothesized that MSM would display greater levels of depression and anxiety symptomatology relative to MSW. We also expected that social support and adaptive coping would be significantly associated with lower levels of psychological distress.

## Methods

### Procedures

Data were collected in 2012 from HIV-positive patients at an outpatient HIV primary care clinic at Ditan Hospital in Beijing, China, which provided the majority of HIV care in the region. Clinic staff referred interested adults to research staff who explained the purpose, procedures, potential risks and benefits, and obtained written informed consent. Participants were eligible for inclusion if they were a minimum of 18 years old, Mandarin-speaking, and were receiving HIV-related care on-site. Participants evidencing psychological or cognitive impairment with the potential to interfere with study participation were excluded from the study. Institutional Review Boards at the University of Washington, Yale University and Beijing Ditan Hospital approved all study procedures. The survey was self-administered with paper-and-pencil at the Beijing Ditan Hospital when participants came for regularly scheduled appointments. Participants received minor monetary compensation (~\$15 USD) in exchange for participation.

### Measures

In addition to basic socio-demographic variables (i.e., age, relationship status, children, education level, and employment), we assessed the variables described below. Validated Mandarin-language versions of measures were used, when available.

#### Physical health

To assess physical health, we included the physical health subscale of the World Health Organization Quality of Life measure (WHOQOL-BREF; World Health Organization, 1996). The WHOQOL-BREF includes 26 items and has been widely used in China (Chang et al., 2017). The physical health subscale comprises seven items assessing discomfort, energy and fatigue, mobility, sleep, work capacity, activities of daily living, and dependence on medicinal substances and medical aids. Each item is rated on a 5-point Likert scale, with higher scores indicating a higher quality of physical health. Cronbach's alpha of the physical health subscale in the current sample was 0.389, which may be explained by the wide array of behaviors assessed (Skevington, Lotfy, & O'Connell, 2004).

#### Depression symptoms

We included the Beck Depression Inventory Revised (BDI-II), a 21-item measure assessing psychological and somatic manifestations of depressive symptoms over the prior two weeks (Beck, Steer, & Brown, 1996).

Each item is scored on a 4-point scale from 0 to 3, with higher scores indicating endorsement of more severe symptoms. Scores were summed, with summary scores of 14–19 representing mild, 20–28 moderate, and 29–63 severe depression symptoms. The validated Mandarin translation was used for this study (Byrne, Stewart, & Lee, 2004; Byrne, Stewart, Kennard, & Lee, 2007). Cronbach's alpha in the current sample was 0.912.

### **Anxiety symptoms**

Anxiety symptoms were measured through the Zung Self-Rating Anxiety Scale (SAS) (Zung, 1971), which is widely used to measure anxiety in China (Ye et al., 2013; Yin et al., 2015). The SAS includes 20 items on a 4-point Likert scale, with symptom endorsement ranging from 1 (a little of the time) to 4 (most of the time). Raw scores were summed and scaled to 25–100. Summed scores below the clinical cut off of 45 are considered normative, with higher scores indicating higher levels of anxiety. The SAS has been translated into Mandarin and validated (Wu, 2005). Cronbach's alpha in the current sample was 0.922.

### **Social support**

Social support and coping styles were the two coping resources evaluated. The Medical Outcomes Study – Social Support Scale (MOS-SSS) was used to assess the perceived availability of social support. The MOS-SSS includes 19 items on a 5-point Likert scale, representing receiving support from 1 (none of the time) to 5 (all of the time) (Sherbourne & Stewart, 1991). An overall support index is obtained by averaging the items; higher scores indicate more social support. Four subscales assess the perceived availability of affective, tangible, emotional and informational support, and positive social interaction. Subscale scores for these four domains are obtained by averaging item scores. The scale has been clinically validated in China (Yu et al., 2015). Cronbach's alpha in the current sample was 0.969.

*Coping styles.* Styles of coping were assessed using the Brief COPE, a 28-item measure based on a 4-point Likert scale containing 2 items representing each of the 14 coping styles (Carver, 1997). Scales represented frequency of coping style, from 1 (I haven't been doing this at all) to 4 (I've been doing this a lot) (Carver, 1997). This has been translated to Chinese and validated in China (Su et al., 2015). Following the indicated protocol, a 2-component factor analysis was conducted using data from the sample representing more “adaptive” coping styles (active coping, instrumental support, reframe, planning, acceptance, emotional support, and planning) ( $\alpha = .747$ ), and “maladaptive” coping styles (denial, substance use, disengagement, and self-blame) ( $\alpha = .507$ ). Three forms

of coping (self-distraction, venting, and religion) did not fall into either domain and were excluded from analyses.

### **Sex of sexual partners**

Participants were asked whether their sex partners over the last month were all female, some male/some female, or all male.

### **Analyses**

We restricted the analyses to the 162 participants self-identifying as male. For our analyses, we grouped men based on the sex of their sexual partners. The men who reported having sex only with women (MSW) were thus compared to the men who reported having sex with men (MSM), whether or not they also had sex with women.

We conducted descriptive and bivariate analyses for socio-demographic variables and measures of psychological distress and coping resources. Next, linear regression models were used to determine the association of sex of sex partners with depression and anxiety symptoms, controlling for social support and coping strategies. Socio-demographic variables were also included in the model if they significantly differed between MSM and MSW in bivariate analyses and were not highly correlated with another predictor ( $r < 0.80$ ).

Of the male participants, 31 did not respond to the item about the gender of their sex partners, precluding their classification as either MSM or MSW. In order to retain these participants in analyses, we ran multiple imputations in R using Amelia (Blackwell, Honaker, & King, 2017), a statistical software package designed to impute missing data. This package assigns values for missing data based on the participant's scores on all the variables significantly correlated with missingness on the item assessing sex of sexual partners and the key outcome variables (depression and anxiety). Summary scores for depression and anxiety symptoms were then calculated within the imputed datasets.

Further analyses were conducted to assess whether social support, adaptive coping, and maladaptive coping moderated the relationship between sex of sexual partners and psychological distress.

## **Results**

### **Socio-demographic description**

Socio-demographic characteristics of the sample are presented in Table 1. Among the full sample of 162 men included in this analysis, mean age was 37 years ( $SD =$

**Table 1.** Socio-demographics, psychological distress, and coping resources of Chinese MSM and MSW living with HIV/AIDS (unadjusted).

	TOTAL (n = 162)	MSW (n = 38)	MSM (n = 93)	X <sup>2</sup> or t-test	Missing data (n = 31)
<i>Socio-demographics</i>					
Age (years)	M (SD) 37.02 (9.50)	M (SD) 41.25 (9.10)	M (SD) 35.55 (9.61)	-3.94**	M (SD) 36.43 (8.37)
Committed Relationship	% 31.9% (51/160)	% 68.4% (36/38)	% 19.4% (18/93)	29.12**	% 24.1% (7/29)
Has Children	39.4% (63/160)	73% (27/37)	28.0% (26/93)	22.21**	33.3% (10/30)
Educated (More than HS)	68.8% (110/160)	47.4% (18/38)	78.5% (73/93)	12.32**	65.5% (19/29)
Employed	64.2% (102/159)	34.2% (13/38)	72.0% (67/93)	7.21**	60.7% (17/28)
Physical Quality of Life	22.71 (5.09)	21.26 (6.18)	23.80 (4.64)	2.30*	21.26 (4.80)
<i>Psychological Distress</i>					
Depression (BDI)	17.02 (11.29)	29.16 (14.02)	15.53 (10.14)	1.84†	17.63 (10.26)
Affective Subscale	9.88 (7.30)	11.50 (8.60)	9.11 (6.93)	1.66†	10.19 (6.50)
Somatic Subscale	7.19 (4.88)	8.66 (6.17)	6.42 (4.15)	2.05*	7.68 (4.78)
Anxiety (SAS)	43.30 (8.73)	45.18 (11.19)	43.01 (7.74)	-1.04	42.00 (8.38)
<i>Coping Resources</i>					
Perceived Social Support (MOS-SSS)	2.28 (0.95)	1.95 (.99)	2.41 (0.91)	-2.58**	2.27 (0.94)
Adaptive Coping (Brief COPE)	18.15 (3.81)	14.84 (3.53)	18.7 (3.65)	-2.49**	18.06 (3.91)
Maladaptive Coping (Brief COPE)	6.37 (1.56)	6.47 (1.74)	6.38 (1.46)	0.33	6.24 (1.69)

\* $p < .05$ . \*\* $p < .01$ . † $p < .10$ .

9.5). Thirty-two percent were currently married or had a steady partner, and less than half had children (39%). Nearly 70% had at least a high-school education and 65% were employed.

Clear socio-demographic differences emerged between MSM and MSW. Relative to MSW, MSM were younger (mean age of 41.3 versus 35.6 years old) and less likely to be in a relationship (68% versus 19%) or have children (73% versus 28%). Compared to MSW, MSM were also more educated (47% versus 79% had at least a high-school education) and more than twice as likely to be employed (34% versus 72%).

### Psychological distress

On average, participants reported mild depression symptomatology, with an elevated BDI-II score (17.02,  $SD = 11.3$ ); affective (9.88,  $SD = 7.3$ ) and somatic (7.19,  $SD = 4.9$ ) subscales scores were also elevated. Overall, the men indicated moderate levels of anxiety, averaging 43.30 ( $SD = 8.7$ ) on the SAS.

Unadjusted comparisons between MSM and MSW on key psychological distress and coping variables (presented in Table 1) were difficult to interpret given the large socio-demographic variation between the two groups. Consequently, adjusted comparisons for depression and anxiety controlling for key socio-demographic differences are presented in Table 2.

Results for the depression outcome model are presented in Table 2. BDI-II scores did not differ between MSM and MSW. However, higher BDI-II scores were associated with worse reported physical quality of life ( $\beta = -1.37$ ,  $p < .05$ ) and greater endorsement of maladaptive coping ( $\beta = 2.39$ ,  $p < .05$ ).

Results for the anxiety outcome model are presented in Table 2. Mirroring the depression model, sex of sexual partners was not a significant correlate of anxiety scores. However, higher SAS scores were associated with greater endorsement of adaptive coping ( $\beta = 0.78$ ,  $p < .05$ ), diminished physical quality of life ( $\beta = -0.86$ ,  $p < .05$ ), and a high school or greater level of education ( $\beta = 4.13$ ,  $p < .05$ ).

The impact of sex of sexual partners on psychological distress was unaffected by social support and coping. (Data not shown.)

### Discussion

Overall, men receiving HIV treatment at Beijing Ditan Hospital reported elevated levels of depression and

**Table 2.** Predictors of depression and anxiety using multiple imputation.

	Model 1: Depression Estimate (S.E.)	Model 2: Anxiety Estimate (S.E.)
Sexual Behavior	0.85 (1.38)	-0.95 (1.37)
Age (years)	-0.01 (0.006)	-0.02 (.006)*
At least high school level of education	1.99 (1.49)	4.13 (1.42)*
Employed	-2.33 (1.35)	-0.85 (1.31)
In Relationship	2.96 (1.72)	1.12 (1.65)
Has Children	0.77 (1.62)	0.39 (1.60)
Social Support	-0.06 (0.84)	0.30 (0.84)
Adaptive Coping	-0.09 (0.20)	0.78 (0.19)*
Maladaptive Coping	2.39 (0.46)*	0.03 (0.44)
Physical Quality of Life	-1.37 (0.16)*	-0.86 (0.15)*
Constant	33.08 (5.12)*	46.60 (4.94)*
Model	Linear	Linear
N	162	162
In-sample mean absolute error (MAE)	5.4%	5.7%
In-sample root mean squared error (RMSE)	6.7%	7.0%

\* $p < .05$ .

anxiety. However, our data did not support our minority stress theory-informed hypothesis that MSM would endorse higher levels of psychological distress relative to MSW (Meyer, 2003). Instead, our findings suggest that sex of sexual partners was not significantly associated with increased endorsement of depression or anxiety symptoms. Rather, maladaptive coping and poorer physical quality of life were associated with increased endorsement of depression. Younger, more educated men with poorer physical quality of life and more adaptive coping skills were more likely to endorse anxiety symptoms.

One possible explanation for the lack of difference in psychological distress between MSM and MSW is that variables related to socio-demographic differences may have insulated MSM from the negative effects of minority stress. Because MSM in our sample were younger, more educated and more likely to be employed, it is possible that this group has enhanced contact with financial and social resources known to buffer against the adverse health consequences associated with an HIV diagnosis (Li et al., 2017). In bivariate analyses, MSM demonstrated significantly higher rates of social support and adaptive coping compared to MSW, however these differences became insignificant when included with other predictors in the multivariate models.

Another possible explanation for the lack of difference in psychological distress between MSM and MSW is that the stigma of being HIV-positive could be overwhelming the degree to which stigma related to the sex of sexual partners influences psychological distress. HIV-related stigma is pervasive in China and has been demonstrated to have a significant impact on psychological distress and health outcomes (Li, Hsieh, Morano, & Sheng, 2016). For our study, it is possible that internalized stress of disclosing their HIV status acted as an internal process contributing to elevated anxiety and depression symptoms (Meyer, 2003). Alternatively, MSW who are HIV-positive might not have the support networks available to MSM, so an HIV diagnosis may serve as a more significant stressor to MSW than sexual minorities who have a shared, and more supportive, social environment. Finally, it is also possible that the stress of having HIV may have overridden other concerns, including the stigma related to the sex of their sexual partners. We anticipated that coping resources like adaptive coping styles and social support would be negatively correlated with psychological distress (Hatzenbuehler et al., 2012). Consistent with our hypothesis, we found that maladaptive coping was positively associated with higher depression symptomatology. However, while we expected maladaptive

coping symptoms to be associated with anxiety, we found that adaptive coping was positively associated with higher endorsement of anxiety symptoms. It is possible that adaptive coping strategies could have appropriately elevated anxiety to motivate engagement in care (Amirkhanian et al., 2018). While moderately elevated anxiety levels have been found to be adaptive, depression at any level is generally associated with less engagement in care (Bhatia, Hartman, Kallen, Graham, & Giordano, 2011).

Social support was not significantly associated with endorsement of depression or anxiety symptoms in our sample. Other studies have found particular subscales of social support to be more salient than others for PLWHA in China (Yang et al., 2015), but we did not have sufficient power to test subscales individually. These findings highlight the importance of considering coping resources among Chinese PLWH and the need for more data to understand the underlying mechanisms through which coping strategies impact psychological distress among this population.

We also had a methodological challenge of addressing missingness in survey responses. Nearly 20% of the sample refused to answer the survey item about the gender of their last sexual partners. We were hesitant to exclude these men from analysis since we hypothesized many of these men were sexual minorities and may have been reluctant to disclose potentially stigmatizing information. We suspected missingness was differential and thus violated the assumption of random missingness required for accurate statistical inference using listwise deletion (Allison, 2001), so we imputed data for the participants who did not indicate the gender of their current sex partners in analyses (Blackwell et al., 2017). Multiple imputation is generally less biased and more efficient than listwise deletion (Little & Rubin, 2002; King, Honaker, Joseph, & Scheve, 2001). While multiple imputation is recommended to infer sexual behavior (Canchola, Neilands, & Catania, 2002), others caution researchers to consider the source of non-random missingness and potential bias in analyses (Sterne et al., 2009).

Our study is subject to some limitations. Data were cross-sectional and self-reported, and the sample is likely not representative of all HIV-positive men in China. Sex of sexual partners was inferred based on the self-reported sex of their most recent sexual partners, which may not have been representative of their normal partners. The absence of a stigma measure precluded our ability to test the mediating role of internalized or experienced stigma on psychological distress and coping, a potential key explanatory variable. Further, the absence of clinical data such as ART adherence, viral load and CD4 count

precluded the examination of the association of psychological distress and these biomarkers of health outcomes. It would be beneficial for future studies to simultaneously incorporate these variables in order to more rigorously examine the role of psychological variables on HIV risk behaviors and other health outcomes in this population. While this study was not powered to examine such differences, future studies may explore differences in psychological distress and coping between men who only have sex with men and MSM who are married to a woman, as men who are married may experience difficulties accessing social support available to the gay community. Finally, while these findings are not generalizable across all PLWH, this research sheds light on important socio-cultural facets of the HIV epidemic in China.

In conclusion, HIV-positive men engaged in treatment in Beijing, China reported elevated levels of psychological distress, whether or not they were a sexual minority. Maladaptive coping was associated with increased endorsement of depression symptoms, while adaptive coping skills were associated with increased endorsement of anxiety symptoms. Poorer physical quality of life was associated increased psychological distress. These findings suggest that developing and implementing interventions enhancing adaptive coping skills may lessen the psychological distress experienced by HIV-positive men in China. In particular, it is possible that coping interventions could selectively target HIV-positive men who are physically ill. Future studies should aim to more rigorously characterize the associations among psychological distress and coping resources in conjunction with comprehensive measures of stigma, ART adherence, and physical health among HIV-positive Chinese men. Such work is needed to address to address the overall health of men living with HIV in China and ultimately improve the men's quality of life and treatment outcomes.

### Disclosure statement

No potential conflict of interest was reported by the authors.

### Funding

This work was supported by the National Institute of Mental Health (K24 MH093243) and the National Institute of Allergy and Infectious Diseases (NT32 AI07140).

### ORCID

Frances M. Aunon  <http://orcid.org/0000-0003-3377-7994>

### References

- Allison, P. D. (2001). *Missing data; Series: Quantitative applications in the social sciences*. Thousand Oaks, CA: Sage Publications.
- Amirkhanian, Y. A., Kelly, J. A., DiFranceisco, W. J., Kuznetsova, A. V., Tarima, S. S., Yakovlev, A. A., & Musatov, V. B. (2018). Predictors of HIV care engagement, antiretroviral medication adherence, and viral suppression among people living with HIV infection in St. Petersburg, Russia. *AIDS & Behavior*, 22(3), 791–799. doi:10.1007/s10461-016-1638-9
- Batchelder, A. W., Safren, S., Mitchell, A. D., Iyadic, I., & O'Clérigh, C. (2017). Mental health in 2020 for men who have sex with men in the United States. *Sexual Health*, 14(1), 59–71. doi:10.1071/SH16083
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for Beck Depression inventory-II*. San Antonio, TX: Psychological Corporation.
- Bhatia, R., Hartman, C., Kallen, M. A., Graham, J., & Giordano, T. P. (2011). Persons newly diagnosed with HIV infection are at high risk for depression and poor linkage to care: Results from the steps study. *AIDS & Behavior*, 15(6), 1161–1170. doi:10.1007/s10461-010-9778-9
- Blackwell, M., Honaker, J., & King, G. (2017). A unified approach to measurement error and missing data: Overview and applications. *Sociological Methods & Research*, 46(3), 303–341. doi:10.1177/0049124115585360
- Bostwick, W. B., Boyd, C. J., Hughes, T. L., & McCabe, S. E. (2010). Dimensions of sexual orientation and the prevalence of mood and anxiety disorders in the United States. *American Journal of Public Health*, 100(3), 468–475. doi:10.2105/AJPH.2008.152942
- Burton, C. A., Bonanno, G. L., & Hatzenbuehler, M. L. (2014). Familial social support predicts a reduced cortisol response to stress in sexual minority young adults. *Psychoneuroendocrinology*, 47, 241–245. doi:10.1016/j.psyneuen.2014.05.013
- Byrne, B. M., Stewart, S. M., Kennard, B. D., & Lee, P. W. H. (2007). The Beck Depression inventory-II: Testing for measurement equivalence and factor mean differences across Hong Kong and American adolescents. *International Journal of Testing*, 7(3), 293–309. doi:10.1080/15305050701438058
- Byrne, B. M., Stewart, S. M., & Lee, P. W. H. (2004). Validating the Beck Depression inventory-II for Hong Kong community adolescents. *International Journal of Testing*, 4(3), 199–216. doi:10.1207/s15327574ijt0403\_1
- Canchola, A., Neilands, B., & Catania, A. (2002). Imputation strategies for sexual orientation using SAS PROC MI. In Tenth Annual Western Users of SAS Software Conference, San Diego.
- Carver, C. S. (1997). You want to measure coping but your protocol's too long: Consider the Brief COPE. *International Journal of Behavioral Medicine*, 4, 92–100.
- Chang, Y. Y., Wang, L. Y., Liu, C. Y., Chien, T. J., Chen, J., & Hsu, C. H. (2017). The effects of a mindfulness meditation program on quality of life in cancer outpatients. *Integrative Cancer Therapies*. [Epub]. doi:10.1177/1534735417693359
- Chen, Y., Bennett, D., Clarke, R., Guo, Y., Yu, C., Bian, Z., ... Chen, Z. (2017). Patterns and correlates of major depression in Chinese adults: A cross-sectional study of 0.5 million



- men and women. *Psychological Medicine*, 47(5), 958–970. doi:10.1017/S0033291716002889
- Choi, K. H., Steward, W. T., Miège, P., Hudes, E., & Gregorich, S. E. (2016). Sexual stigma, coping styles, and psychological distress: A longitudinal study of men who have sex with men in Beijing, China. *Archives of Sex Behavior*, 45(6), 1483–1491. doi:10.1007/s10508-015-0640-z
- Chow, E. P., Wilson, D. P., Zhang, J., Jing, J., & Zhang, L. (2011). Human immunodeficiency virus prevalence is increasing among men who have sex with men in China: Findings from a review and meta-analysis. *Sexually Transmitted Disease*, 38, 845–857. doi:10.1097/OLQ.0b013e31821a4f43
- Hatzenbuehler, M., McLaughlin, K. A., & Xuan, Z. (2012). Social networks and risk for depressive symptoms in a national sample of sexual minority youth. *Social Science & Medicine*, 75(7), 1184–1191. doi:10.1016/j.socscimed.2012.05.030
- Heywood, W., & Lyons, A. (2016). HIV and elevated mental health problems: Diagnostic, treatment, and risk patterns for symptoms of depression, anxiety, and stress in a national community-based cohort of gay men living with HIV. *AIDS & Behavior*, 20(8), 1632–1645. doi:10.1007/s10461-016-1324-y
- King, G., Honaker, J., Joseph, A., & Scheve, K. (2001). Analyzing incomplete political science data: An alternative algorithm for multiple imputation. *American Political Science Review*, 95, 49–69.
- Li, Z., Hsieh, E., Morano, J. P., & Sheng, Y. (2016). Exploring HIV-related stigma among HIV-infected men who have sex with men in Beijing, China: A correlation study. *AIDS Care*, 28(11), 1394–1401. doi:10.1080/09540121.2016.1179713
- Li, H., Tucker, J., Holroyd, E., Zhang, J., & Jiang, B. (2017). Suicidal ideation, resilience, and healthcare implications for newly diagnosed HIV-positive men who have sex with men in China: A qualitative study. *Archives of Sexual Behavior*, 46(4), 1025–1034. doi:10.1007/s10508-016-0894-0
- Little, R., & Rubin, D. (2002). *Statistical analysis with missing data* (2nd Ed). Hoboken, NJ: John Wiley & Sons.
- Mayer, K. H., Bekker, L. G., Stall, R., Grulich, A. E., Colfax, G., & Lama, J. R. (2012). Comprehensive clinical care for men who have sex with men: An integrated approach. *Lancet*, 380(9839), 378–387. doi:10.1016/S0140-6736(12)60835-6
- Meng, X., & D'Arcy, C. (2016). Coping strategies and distress reduction in psychological well-being? A structural equation modelling analysis using a national population sample. *Epidemiology and Psychiatric Science*, 25(4), 370–383. doi:10.1017/S2045796015000505.
- Meyer, I. H. (1995). Minority stress and mental health in gay men. *Journal of Health and Social Behavior*, 36(1), 38–56.
- Meyer, I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: Conceptual issues and research evidence. *Psychological Bulletin*, 129, 674–697.
- Mustanski, B., Andrews, R., Herrick, A., Stall, R., & Schnarrs, P. W. (2014). A syndemic of psychosocial health disparities and associations with risk for attempting suicide among young sexual minority men. *American Journal of Public Health*, 104(2), 287–294. doi:10.2105/AJPH.2013.301744
- National Health and Family Planning Commission of the People's Republic of China. (2015). 2015 China AIDS Response Progress Report. [http://www.unaids.org/sites/default/files/country/documents/CHN\\_narrative\\_report\\_2015.pdf](http://www.unaids.org/sites/default/files/country/documents/CHN_narrative_report_2015.pdf)
- Rueda, S., Mitra, S., Chen, S., Gogolishvili, D., Globerman, J., Chambers, L., ... Rourke, S. B. (2016). Examining the associations between HIV-related stigma and health outcomes in people living with HIV/AIDS: A series of meta-analyses. *BMJ Open*, 6(7), e011453. doi:10.1136/bmjopen-2016-011453
- Sherbourne, C. D., & Stewart, A. (1991). The MOS social support survey. *Social Science & Medicine*, 32(6), 705–714.
- Skevington, S. M., Lotfy, M., & O'Connell, K. A. (2004). The world health organization's WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial. A report from the WHOQOL group. *Quality of Life Research*, 13(2), 299–310.
- Song, B., Yan, C., Lin, Y., Wang, F., & Wang, L. (2016). Health-related quality of life in HIV-infected men who have sex with men in China: A cross-sectional study. *Medical Science Monitor*, 22, 2859–2870.
- Sterne, J. A., White, I. R., Carlin, J. B., Spratt, M., Royston, P., Kenward, M. G., ... Carpenter, J. R. (2009). Multiple imputation for missing data in epidemiological and clinical research: Potential and pitfalls. *British Medical Journal*, 338(b2393), doi:10.1136/bmj.b2393
- Steward, W. T., Miede, P., & Choi, K. H. (2013). Charting a moral life: The influence of stigma and filial duties on marital decisions among Chinese men who have sex with men. *PLoS One*, 8, e71778.
- Su, X., Lau, J., Mak, W., Choi, K. C., Feng, T., Chen, X., ... Cheng, J. (2015). A preliminary validation of the Brief COPE instrument for assessing coping strategies among people living with HIV in China. *Infectious Diseases of Poverty*, 4(41), doi:10.1186/s40249-015-0074-9
- Su, X., Zhou, A. N., Li, J., Shi, L. E., Huan, X., Yan, H., & Wei, C. (2017). Depression, loneliness, and sexual risk-taking among HIV-negative/unknown men who have sex with men in China. *Archives of Sexual Behavior*, E-pub. doi:10.1007/s10508-017-1061-y.
- Uthman, O. A., Magidson, J. F., Safren, S. A., & Nachega, J. B. (2014). Depression and adherence to antiretroviral therapy in low-, middle- and high-income countries: A systematic review and meta-analysis. *Current HIV/AIDS Report*, 11, 291–307. doi:10.1007/s11904-014-0220-1
- World Health Organization. (1996). Quality of Life group: WHOQOL-BREF Introduction. Administration and Scoring. Field Trial version.
- Wu, W. Y. (2005). Self-rating anxiety scale. In Z. J. Zhang (Ed.), *Behavioral medicine inventory manual* (pp. 213–214). Beijing, Chinese: The Chinese Medicine Electronic Audio and Video Publishing House.
- Wu, Z., Rou, K., & Cui, H. (2004). The HIV/AIDS epidemic in China: History, current strategies and future challenges. *AIDS Education & Prevention*, 16(3 Suppl A), 7–17.
- Yan, H. M., Wong, F. Y., Zheng, T., Ning, Z., Ding, Y. Y., Nehl, E. J., ... He, N. (2014). Social support and depressive symptoms among 'money' boys and general men who have sex with men in Shanghai, China. *Sexual Health*, 11(3), 285–287.
- Yang, J. P., Leu, J., Simoni, J. M., Chen, W. T., Shiu, C. S., & Zhao, H. (2015). Please don't make me ask for help": Implicit social support and mental health in Chinese individuals living with HIV. *AIDS Behavior*, 19(8), 1501–1509.
- Ye, R. F., Geng, Q. S., Chen, J., Liming, Q. U., Zhang, M., Chungling, D., ... Li, H. (2013). Comparison of three scales

- to detect anxiety in general hospital outpatients: HADS, SAS and HAMA. *Chinese Journal of Behavioral Medicine and Brain Science*, 22, 271–273.
- Yin, W., Pang, L., Cao, X., McGoogan, J. M., Liu, M., Zhang, C., ... Rou, K. (2015). Factors associated with depression and anxiety among patients attending community-based methadone maintenance treatment in China. *Addiction*, 110(Suppl 1), 51–60.
- Yu, Y., Yang, J. P., Shiu, C. S., Simoni, J. M., Xiao, S., Chen, W. T., ... Wang, M. (2015). Psychometric testing of the Chinese version of the medical outcomes study social support survey among people living with HIV/AIDS in China. *Applied Nursing Research*, 28(4), 328–333. doi:10.1016/j.apnr.2015.03.006.
- Zung, W. W. K. (1971). A rating instrument for anxiety disorders. *Psychosomatics*, 12(6), 371–379.