

UNIVERSITY OF BIRMINGHAM

University of Birmingham
Research at Birmingham

Suicidal ideation and attempted suicide amongst Chinese transgender persons

Chen, Runsen; Zhu, Xuequan; Wright, Lucy; Drescher, Jack; Gao, Yue; Wu, Lijuan; Ying, Xin; Qi, Ji; Chen, Chen; Xi, Yingjun; Ji, Lanxin; Zhao, Huichun; Ou, Jianjun; Broome, Matthew R

DOI:

[10.1016/j.jad.2018.12.011](https://doi.org/10.1016/j.jad.2018.12.011)

License:

Creative Commons: Attribution-NonCommercial-NoDerivs (CC BY-NC-ND)

Document Version

Peer reviewed version

Citation for published version (Harvard):

Chen, R, Zhu, X, Wright, L, Drescher, J, Gao, Y, Wu, L, Ying, X, Qi, J, Chen, C, Xi, Y, Ji, L, Zhao, H, Ou, J & Broome, MR 2019, 'Suicidal ideation and attempted suicide amongst Chinese transgender persons: National population study', *Journal of Affective Disorders*, vol. 245, pp. 1126-1134.
<https://doi.org/10.1016/j.jad.2018.12.011>

[Link to publication on Research at Birmingham portal](#)

Publisher Rights Statement:

Checked for eligibility 18/02/2019

Published in *Journal of Affective Disorders*

<https://doi.org/10.1016/j.jad.2018.12.011>

General rights

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

Take down policy

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact UBIRA@lists.bham.ac.uk providing details and we will remove access to the work immediately and investigate.

Highlights:

- First study to examine suicide and mental health in Chinese transgender population
- 56.4% participants reported a history of suicidal ideation
- 16.1% participants reported a history of a suicide attempt
- The prevalence rate is far greater than in Chinese community samples
- More than 50% respondents reported having suffered from major depressive disorder

Abstract

Background

This study aims to understand suicidal ideation and suicide attempts among transgender individuals through an in-depth analysis of a nation-wide population general survey in China.

Methods

Transgender Men (FTM) and Women (MTF) were investigated through a cross-sectional survey. A structured questionnaire was used to investigate participants' demographic information, perceived sexuality conflicts, childhood adversity and mental health conditions. Logistic regression models were utilized to investigate risk factors associated with suicidal ideation and suicide attempts in these groups. We also conducted a quasi-meta-analysis in order to compare the prevalence of suicidal ideation and attempted suicide between general and transgender population in China.

Results

There were a total of 1309 participants out of 2060 valid questionnaires across 32 provinces and municipalities in China took part in this survey. The lifetime prevalence of suicidal ideation and an attempt at suicide were 56.4% and 16.1%, respectively. This estimated prevalence rate is far greater than in Chinese community samples. For all transgender people, disliking biological sexuality, seeking sex reassignment surgery, having intense conflicts with parents, lifetime history of suffering from major depressive disorder, recent episode of depression, self-harm, and seeking mental health services were significantly associated with increased risk of suicidal ideation. An education level of high school or equivalent, being married and/or separated/divorced, having intense conflicts with parents, or self-harm and seeking mental health services, were all significantly associated with increased risk of suicide attempt.

Although most risk factors for FTM and MTF were equivalent across groups, differences were observed in both suicidal ideation and suicide attempt models.

Limitations

Cross-sectional study design and lack of follow-up data for the comparison are limitations of this study.

Conclusions

This is the first study to examine suicide within a Chinese transgender population. The clinical implication of these findings for Chinese mental health professionals are discussed. Also, the evidences from this study can be used to inform the practices of suicide prevention worker, policy maker working with transgender population.

Keywords: transgender, suicidal ideation, suicide attempt, Chinese, mental health

Suicidal ideation and attempted suicide amongst Chinese transgender persons: national population study

Short title: Suicide in a Chinese transgender population

Runsen Chen^{1,2,3,4}, Xuequan Zhu^{2,3}, Lucy Wright⁴, Jack Drescher^{5,6,7}, Yue Gao^{2,3}, Lijuan Wu⁸, Xin Ying⁹, Ji Qi⁹, Chen Chen¹⁰, Yingjun Xi^{2,3}, Lanxin Ji¹¹, Huichun Zhao¹², Jianjun Ou^{1*}, Matthew R. Broome^{4,13}

1. Department of Psychiatry, the Second Xiangya Hospital, Central South University, Changsha, Hunan; Mental Health Institute of the Second Xiangya Hospital, Central South University; Chinese National Clinical Research Center on Mental Disorders (Xiangya); Chinese National Technology Institute on Mental Disorders; Hunan Key Laboratory of Psychiatry and Mental Health, Changsha, Hunan 410011, China.
2. The National Clinical Research Center for Mental Disorders & Beijing key Laboratory of Mental Disorders, Beijing Anding Hospital, Capital Medical University, Beijing, China
3. Advanced Innovation Center for Human Brain Protection, Capital Medical University, Beijing, China
4. Department of Psychiatry, University of Oxford, UK
5. Department of Psychiatry, New York Medical College, New York, NY, USA
6. Center for Psychoanalytic Training and Research, Columbia University, NY, USA
7. New York University Postdoctoral Program in Psychotherapy and Psychoanalysis, New York, NY, USA
8. Department of Sociology, Peking University, Beijing, China
9. Beijing LGBT Center, China
10. Shanghai Key Laboratory of Forensic Medicine, Shanghai Forensic Service Platform, Academy of Forensic Science, Shanghai 200063, China
11. Center for Biomedical Imaging Research, Department of Biomedical Engineering, Tsinghua University, Beijing, China.
12. Central University of Finance and Economics, Beijing, China
13. Institute for Mental Health, University of Birmingham, Birmingham, UK

Runsen Chen and Xuequan Zhu contributed equally

*Correspondence concerning this article should be addressed to Jian-Jun Ou, M.D., Ph.D., Department of Psychiatry, the Second Xiangya Hospital, Central South University, Changsha, Hunan 410011, China. Mental Health Institute of the Second Xiangya Hospital, Central South University; Chinese National Clinical Research Center on Mental Disorders (Xiangya); Chinese National Technology Institute on Mental Disorders; Hunan Key Laboratory of Psychiatry and Mental Health, Changsha, Hunan 410011, China.

Abstract

Background

This study aims to understand suicidal ideation and suicide attempts among transgender individuals through an in-depth analysis of a nation-wide population general survey in China.

Methods

Transgender Men (TM) and Women (TW) were investigated through a cross-sectional survey.

A structured questionnaire was used to investigate participants' demographic information, perceived sexuality conflicts, childhood adversity and mental health conditions. Logistic regression models were utilized to investigate risk factors associated with suicidal ideation and suicide attempts in these groups. We also conducted a quasi-meta-analysis in order to compare the prevalence of suicidal ideation and attempted suicide between general and transgender populations in China.

Results

A total of 1309 participants across 32 provinces and municipalities in China took part in this survey, out of 2060 valid questionnaires. In this transgender population, the lifetime prevalence of suicidal ideation and an attempt at suicide were 56.4% and 16.1%, respectively. This estimated prevalence rate is far greater than in Chinese community samples. For all transgender people, disliking **birth-assigned sex**, seeking sex reassignment surgery, having intense conflicts with parents, lifetime history of suffering from major depressive disorder, a recent episode of depression, self-harm, and seeking mental health services were significantly associated with increased risk of suicidal ideation. An education level of high school or equivalent, being married and/or separated/divorced, having intense conflicts with parents, or self-harm and

seeking mental health services were all significantly associated with increased risk of suicide attempt. Although most risk factors for **TM and TW** were equivalent across groups, differences were observed in both suicidal ideation and suicide attempt models.

Limitations

The cross-sectional study design and lack of follow-up data are limitations of this study.

Conclusions

This is the first study to examine suicide within a Chinese transgender population. The clinical implications of these findings for Chinese mental health professionals are discussed. Also, the evidence from this study can be used to inform the practices of suicide prevention workers, and policy makers working with the transgender population.

Keywords: transgender, suicidal ideation, suicide attempt, Chinese, mental health

Introduction

Transgender is an umbrella term that refers to people whose gender identity or gender expression is different from their birth-assigned sex, which includes male to female (TM) and female to male (FTM) individuals. TM are persons who are assigned female at birth but self-identify as men, while FTM are persons assigned male at birth but identify as women, who may masculinize or feminize their bodies through surgery or hormone therapy. The term also includes gender nonconforming individuals (cross dressers or transvestites, drag queens and kings, and other gender-variant individuals such as genderqueer). The prevalence of suicidal ideation and attempts among the transgender population is extremely high in developed countries, such as Canada, Europe and the United States. The lifetime and past-year rate of suicide attempts range from 22% to 43%, and 9% to 10% respectively (Bauer et al., 2015; Clements-Nolle et al., 2006; Grant JM et al., 2011; McNeil J et al., 2012). In the transgender population, factors such as substance misuse, age, mental health problems, education level and income are also related to the probability of attempting suicide. Transgender people who fail to complete high school education are the most likely to attempt suicide, while those with an undergraduate education or higher have the lowest rates of attempted suicide (5). Previous studies of transgender communities have demonstrated that discrimination and violence are associated with higher psychological distress and depression, which increases the risk of an individual attempting suicide (6,7). Studies of transgender youth have found that gender-based discrimination or violence, and depression have a significant positive relationship with rates of transgender individuals attempting suicide (8,9).

Importantly, in a US survey conducted in 2008, trans women (TW) and trans men (TM) have a significantly higher prevalence of lifetime suicide attempts than the gender nonconforming population, since TW and TM most likely desire hormone therapy and surgical care for their transition (Haas et al., 2014). The results indicated that distress associated with the barriers to obtaining transition related health care elevated the prevalence of suicide attempts. Furthermore, according to a nation-wide, cross-sectional survey among TW and TM in Argentina (Marshall et al., 2016), 33% responders reported a history of attempted suicide in their lifetime. Lack of stable housing and internalized stigma due to the transgender identity were found to be the strong risk factors for suicide attempts.

In China, imperfect transgender medical treatment and a lack of relevant laws and regulations are major obstacles to successfully dealing with identifying as a transgender individual. It is difficult for the TW and TM population to complete gender reassignment surgery due to barriers to obtaining surgical information and a lack of surgical resources in China. Moreover, most of the relevant prerequisites outlined in surgical regulations are unreasonable or excessively demanding for recipients (Jiang et al., 2014). For instance, the individual must get approval from direct relatives, and obtain a clear criminal record from the public security office. These rules have raised criticisms regarding the infringement on an individual's autonomy and privacy. Regulations fail to follow the prevailing guidelines, and the regulations state that any operation that changes gender-linked traits shall be carried out in synchronization with, or subsequent to, gonadectomy, which is medically questionable. Each of these obstacles increase pressure and distress in the TW and TM population seeking gender reassignment surgery. Previous studies indicate that barriers to accessing medical transition care and hormonal treatment are strong risk factors for suicidal ideation and suicide attempt among transgender individuals (Colizzi et al., 2014; Rotondi et al., 2013). Greta (2015) found that social support,

protection from transphobia, and undergoing medical transition have the potential for protective effects on the high rates of suicidal ideation and suicide attempt in a Canadian **TW and TM population** (Bauer et al., 2015). However, the limitations of traditional social ideas in Chinese cultures and parents' misunderstanding of transgender children's demands are relevant (Colizzi et al., 2014). Chinese parents are often unable to accept transgender children, thus there is reason to believe Chinese transgender individuals often do not have sufficient family and social support, which may contribute to the high risk of suicide.

Although many previous studies investigated suicide related conditions in the general and clinical population (Chen et al., 2018b; Liu et al., 2017; Zhang et al., 2013), there remains a lack of studies examining suicide risk in the **TW and TM population** in China. Therefore, this study **was the first to** explore suicidal ideation and attempted suicide in the Chinese TW and TM population via an in-depth analysis of data from a nation-wide general survey conducted by the Beijing Lesbian Gay Bisexual Transgender (LGBT) center, Peking University and United Nations Development Program. Particularly, this study aimed to identify the key characteristics associated with lifetime suicidal ideation and suicide attempts, and explore differences between the **TW and TM** group. We also conducted a quasi-meta-analysis to explore the difference in rates of suicide ideation and attempted suicide between general and **TW and TM** populations in China.

Methods

Participants

Between January 2017 and September 2017, a cross-sectional general survey of a transgender population was conducted in China. The local ethics committee approved the study. Although sampling methods such as convenience sampling, respondent driven-sampling, and snowball-

sampling have proven to be effective sampling methods for recruiting LGBT people, small absolute numbers as well as social and structural barriers, including stigma and discrimination, complicate survey implementation (Best et al., 2015). Therefore, an online survey, similar to those used in previous studies (Bockting et al., 2013; Dickey et al., 2015; Rosser et al., 2007), was utilized in this study, which may help to alleviate barriers associated with self-identifying as LGBT. Snowball sampling also was used in this study. The method of approaching first-wave participants was contact from LGBT centers, educational institutions, and social networking platforms/media through phone calls, text messages or online recruitment advertisement. Participants were then asked to help identify further recruits (second and subsequent snowball waves). All participants remained anonymous, and written informed consent was obtained prior to participation.

Individuals with identities in accordance with TW or TM were recruited into the study, where TW is a self-defined woman who was assigned male at birth, and TM is a self-defined man who was assigned female at birth. Valid questionnaires were identified via the following criteria: 1) more than 95% of questions were completed; 2) IP address was not repeated; 3) time to complete the questionnaire was more than eight minutes (Minimum fill time). A series of methods were used to identify transgender individuals. First, the definition of transgender was described in the introduction of the questionnaire. Second, participants were asked to verify their identification with this definition of transgender. Third, a set of identity-related questions were included in the questionnaire, which include birth-assigned sex, self-defined sex, and whether participants' gender expression is different to that associated with their birth-assigned sex, against which the identity of transgender (TW or TM) was checked (Bockting et al., 2013).

Questionnaire

A structured questionnaire was constructed according to previous research findings and advice from the Beijing LGBT center. The expert consultation method was used to improve the reliability of the structured questionnaire. It was used to investigate participants' demographic information including their gender identity, living conditions, employment, marital status, children and relationships. Information about internal and external sexuality conflicts were also investigated, which included: 1) feelings towards birth-assigned sex; 2) seeking hormone therapy; 3) seeking gender reassignment surgery; 4) intense conflicts with parents due to sexuality; and 5) suffering discrimination or violence in public places due to sexuality. Additionally, one item of childhood adversity - whether individuals were insulted or bullied at school - was included in the questionnaire. Since multiple items in the questionnaire addressed single topics, these were merged and converted when conducting statistical analyses.

Current and previous mental health issues including self-harm and suicide were examined. The Center for Epidemiologic Studies Depression 9-item (CESD-9) scale, which has been validated in Chinese populations (Cronbach's alpha: 0.85~0.88; (He Jin., 2013)), was used to measure depressive symptoms during the past week. A score of 10-16 indicates tendency towards depression, and ≥ 17 indicates risk for MDD. History of major depressive disorder (MDD), self-harm, suicidal ideation, suicide attempts, and seeking mental health services were examined through dedicated items. Since self-esteem may mediate the effect of sexuality on self-harm or suicide (Diaz et al., 2001), the Chinese version of the Rosenberg Self-Esteem Scale was used to measure participants' self-esteem (Cronbach's alpha: 0.83~0.89; (Feifei Chen et al., 2015; Rosenberg, 1965).

Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences version 17.0 (SPSS Inc, Chicago, Illinois). Chi-square tests or Fisher's exact tests were used to compare differences

between classification variables across TW and TM groups. Analysis of variance was used to compare differences in continuous variables across TW and TM groups.

A quasi-meta-analysis was conducted to compare the prevalence of suicidal ideation and attempted suicide between general and transgender populations. A comprehensive literature search was conducted in the following databases: PubMed, Medline, PsycINFO, China journal Full-text database, and Wanfang Data using the words “suicide”, “suicide idea”, “suicide attempt”, “China”, “youth”, “college”, “China”, “Chinese”. Studies were included in the review if they met the following criteria: 1) the study either reported the prevalence of suicide ideation or suicide attempts, sufficient for calculating prevalence; 2) participants were aged 18-30 years; 3) the study was conducted in China; (**Table S1**). Prevalence was transformed as risk difference and the Review Manager 5.3 was employed to conduct subgroup analysis to explore differences between the general and transgender groups. Results were integrated in a random effect model.

Univariate logistic regression analysis was performed to explore the association between single variables and suicidal ideation or suicide attempt. Firstly, variables significantly associated with suicidal ideation or suicide attempt were identified as potential predictor variables (**Table S2** and **Table S3**). Then, forward stepwise logistic regression was performed to select potential predictor variables associated with suicidal ideation or suicide attempt to build predictive models. The threshold of variables entered and removed from the model was 0.05 and 0.15, respectively. Nagelkerke's R^2 was used to measure the variation in suicidal ideation or suicide attempt explained by predictive factors in the logistic regression (International Schizophrenia et al., 2009).

Results

Demographic and general findings in the transgender sample

In total, 5677 questionnaires were received online, though only 2060 (36.2%) questionnaires were identified as valid. Finally, 1309 (23.1%) participants from 32 provinces and municipalities across China were recruited in this survey, including 622 TM and 687 TW. About 85% participants were recruited from social networking platforms and media. Most participants were young (mean 23.31 ± 6.49 years old), had a high education level, and lived in the city. Current employment status differed among TM and TW, however there was no significant difference in the distribution of current annual income. Over 90% participants had never married, while more than half reported a current or previous relationship. More detailed information appears in **Table 1**.

Comparison of sexuality conflicts, childhood adversity and mental health within the transgender population

As in **Table 2**, approximately 80% of TM and TW individuals reported disliking their birth-assigned sex. Compared with TM, TW individuals were more likely to seek hormone therapy (87.8% Vs. 70.3%, $\chi^2 = 61.342$, $df = 1$, $p < 0.001$), gender reassignment surgery (77.8% Vs. 55.9%, $\chi^2 = 71.202$, $df = 1$, $p < 0.001$) and have intense conflicts with parents (90.4% Vs. 84.5%, $\chi^2 = 8.533$, $df = 1$, $p = 0.003$). Suffering discrimination or violence in public places was not rare, with about 27% of respondents having had this experience. More than half of respondents were insulted or bullied at school, with prevalence lower for TM than TW (65.4% Vs. 75.2%, $\chi^2 = 15.036$, $df = 1$, $p < 0.001$).

The difference in mental health between the two groups was significant. More than half of respondents reported having suffered from MDD at some point in their life, with TW more frequently affected than TM (71.5% Vs. 56.1%, $\chi^2 = 33.502$, $df = 1$, $p < 0.001$). TW were also

more likely to have a current risk of MDD than **TM**, which was measured using the CESD-9, (40.8% Vs. 27.7%, $\chi^2 = 33.435$, $df = 2$, $p < 0.001$). Self-esteem, as measured with RSES, was also different between the two groups, with high self-esteem more prevalent in **TM than TW** (12.9% Vs. 6.1%), while low self-esteem was more prevalent in **TW than TM** (5.4% Vs. 2.6%, Fisher's exact tests: test value = 23.040, $p < 0.001$).

Self-harm and suicide were serious problems for respondents. Self-harm was common in **TW**, and significantly higher than in **TM** (28.1% Vs. 20.6%, $\chi^2=9.840$, $df = 1$, $p = 0.002$). High incidence of suicidal ideation was found in both **TW and TM** (60.7% Vs. 51.5%, $\chi^2 = 11.152$, $df = 1$, $p = 0.001$). **TW** individuals were more likely to attempt suicide than **TM** (20.7% Vs. 11.0%, $\chi^2 = 22.587$, $df = 1$, $p < 0.001$). Similarly, more **TW** individuals sought mental health services than **TM** (34.4% Vs. 20.6%, $\chi^2 = 30.849$, $df = 1$, $p < 0.001$).

Comparison of suicide between general and transgender populations

A quasi-meta-analysis was conducted to further compare the prevalence of suicidal ideation and attempted suicide between general and transgender populations. Eighteen studies were included that reported the prevalence of suicidal ideation of a general population aged 18-30 years. The pooled prevalence of the general population was 12% (95%CI: 9%-14%), significantly lower than the transgender population (56%, 95%CI: 53%-59%) in this study. Eleven studies were included that reported the prevalence of attempted suicide of a general population aged 18-30 years. The pooled prevalence of the general population was 3% (95%CI: 2%-4%), also significantly lower than **the transgender population** (16%, 95%CI: 14%-18%) in this study (**Figure 1**).

Predictors of suicidal ideation in the transgender population

The regression models of suicidal ideation were fitted well for **TM** (Nagelkerke's $R^2 = 0.318$), **TW** (Nagelkerke's $R^2 = 0.413$) and the total (TM and TW) transgender population (Nagelkerke's $R^2 = 0.374$). In the model of **TM**, disliking **birth-assigned sex** (OR = 2.720, $p < 0.001$), seeking gender reassignment surgery (OR = 2.043, $p < 0.001$), tendency to depression (OR = 1.851, $p = 0.007$) and risk for MDD as measured by CESD-9 (OR = 3.512, $p < 0.001$), self-harm (OR = 4.563, $p < 0.001$) and seeking mental health services (OR = 2.277, $p = 0.002$) significantly predicted increased risk of suicidal ideation. About 23.8% variance could be explained by these variables (Cox & Snell $R^2 = 0.238$). Similarly, disliking **birth-assigned sex** (OR = 2.621, $p = 0.001$), current or past suffering from MDD (OR = 3.509, $p < 0.001$), tendency to depression (OR=2.865, $p < 0.001$), risk for MDD (OR=3.715, $p < 0.001$), self-harm (OR=4.317, $p < 0.001$) and seeking mental health services (OR=2.412, $p < 0.001$) significantly predicted increased risk of suicidal ideation in the model of **TW**. About 29.8% variance could be explained by these variables (Cox & Snell $R^2 = 0.298$). Additionally, disliking **birth-assigned sex** (OR=2.683, $p < 0.001$), seeking gender reassignment surgery (OR = 1.761, $p = 0.001$), intense conflicts with parents (OR=1.620, $p=0.028$), current or past suffering from MDD (OR = 1.908, $p < 0.001$), tendency to depression (OR=1.998, $p < 0.001$), risk for MDD (OR=3.194, $p < 0.001$), self-harm (OR = 4.088, $p < 0.001$) and seeking mental health services (OR = 2.147, $p < 0.001$) significantly predicted increased risk of suicide ideation for all respondents. About 27.6% variance could be explained by these variables (Cox & Snell $R^2 = 0.276$). (Table 3)

Predictors of attempted suicide in the transgender population

The suicide attempt regression models of **TM** (Nagelkerke's $R^2 = 0.288$), **TW** (Nagelkerke's $R^2 = 0.433$) and total population (Nagelkerke's $R^2 = 0.408$) were also fitted well. According to the model of **TM**, suffering discrimination or violence in public places (OR = 1.855, $p = 0.035$),

current or past suffering from MDD (OR = 2.781, $p = 0.007$), and self-harm behavior (OR = 9.113, $p < 0.001$) significantly predicted increased risk of suicide attempt. About 14.4% variance could be explained by these variables (Cox & Snell $R^2 = 0.144$). Being separated/divorced (OR = 10.925, $p = 0.002$), current or past suffering from MDD (OR = 6.930, $p < 0.001$), and self-harm (OR = 13.878, $p < 0.001$) significantly predicted increased risk of suicide attempt in model for TW. About 28.8% variance could be explained by these variables (Cox & Snell $R^2 = 0.288$). For all respondents, education level of high school or equivalent (OR = 3.173, $p = 0.014$), being married (OR = 3.337, $p = 0.019$) or being separated/divorced (OR = 3.517, $p = 0.016$), having intense conflicts with parents (OR = 1.598, $p = 0.019$), self-harm (OR = 11.274, $p < 0.001$) and seeking mental health services (OR = 1.645, $p = 0.013$) significantly predicted increased risk of suicide attempt. About 24.6% variance could be explained by these variables (Cox & Snell $R^2 = 0.246$) – see **Table 4**.

Discussion

Using a large, nation-wide online sample of transgender individuals (TW and TM) in China, this survey found that 56.4% of participants reported a history of suicidal ideation and 16.1% of participants reported a history of a suicide attempt. Of note, this estimated prevalence is far greater than most reported studies of suicide ideation and attempt in community samples in China, which report the prevalence of suicidal ideation and suicide attempt as 12% and 3%, respectively.

Focusing specifically on TW and TM individuals within the transgender population in this study, rates of suicidal ideation and suicide attempt are similar to those reported elsewhere (Grossman and D'Augelli, 2007; Herman et al., 2014; Maguen and Shipherd, 2010; Mathy,

2003). Consistent with previous studies, the present study found higher reported rates of suicidal ideation and suicide attempt in TW than TM individuals (Dickey et al., 2015; Maguen and Shipherd, 2010). Previous studies have in fact found higher rates of suicide attempt than reported here, though discrepancies may be explained when considering the present sample may consist primarily of transgender people from urban areas, who may have greater connections with transgender communities. These connections may provide a supportive environment, and greater access to quality mental health resources. In interpreting the results of this study, attention should be paid to the possible impact of these limitations in the sample composition, which may lead to an underestimation of dilemmas faced by transgender people on the one hand, and an overestimation of the degree of environmental support on the other. That is to say, the results of the present study may form an overly positive reflection of reality for many Chinese transgender individuals.

Importantly, this study sought to examine factors predicting suicidal ideation and suicide attempts in the Chinese transgender (TW and TM) population. Previous studies have reported that interpersonal conflict with sexual identity and orientation are important risk factors to explain the elevated rate of attempted suicide among LGBT populations (Clements-Nolle et al., 2006; Maguen and Shipherd, 2010; Paul et al., 2002; Waldo et al., 1998). Indeed, in a recent Philadelphia study of 176 transgender participants, 30.1% had attempted suicide and 67.35% of these respondents indicated that the suicide attempt was related to their transgender identity (Kenagy, 2005). In line with these findings, the present study found dislike for birth-assigned sex to be a major risk factor predicting suicidal ideation and suicide attempt among Chinese TW and TM.

In contrast, findings from this study did not support suggestions from previous studies that biological stressors such as hormones and gender reassignment surgery place transgender

people at elevated risk for suicide attempt (Colizzi et al., 2014; Rotondi et al., 2013). This study with a Chinese transgender sample did not find an association between seeking hormone therapy or gender reassignment surgery and suicide attempt. Instead, seeking gender reassignment surgery was found to be a high risk for suicide ideation only in the TM population. It is difficult for transgender individuals to obtain surgical information and there exists a lack of surgical resources to complete gender reassignment surgery in China (Jiang et al., 2014). TM who are seeking gender reassignment surgery face all these obstacles, which may explain an increase in psychological pressure and distress.

An additional factor significantly associated with suicidal ideation and suicide attempt was intense conflict with parents – reported by 90.4% of TW and 84.5% of TM in the present sample. In China, transgender individuals experience high social pressure to conform to Chinese society, which places emphasis on having children and continuing the family line. Collectivist Chinese culture encourages maintenance of social and familial harmony (Chen et al., 2018a; Xi et al., 2017), hence parents of transgender individuals may fear shame brought on their family by their children.

Furthermore, self-harm behaviours that are common in Chinese young people (Liu et al., 2016; Xin et al., 2016; Xin et al., 2017) significantly increased suicidal ideation and attempt for both TW and TM. While a previous study reported that TM appear more vulnerable to self-harm behaviors than TW (Peterson et al., 2017), the present study found that TW have significantly higher self-harm behavior than TM. A greater understanding of the risk factors underlying self-harm behaviors in transgender individuals is needed to explain this discrepancy. Though it was postulated that self-esteem may mediate the effect of sexuality on self-harm or suicide (Hawton et al., 2012; Kristen Clements-Nolle PhD et al.), there was no significant relationship between self-esteem and suicide in the Chinese transgender population studied here.

Particularly pertinent to policy makers and mental health professionals, seeking mental health services was a strong factor risk for suicidal ideation and suicide attempt in the Chinese transgender population studied here. This result is not consistent with previous studies: seeking mental health care was not associated with suicidal attempt in a US transgender population (Maguen and Shipherd, 2010). It does, however, suggest that Chinese mental health professionals should pay much more attention to patients who identify as transgender who are currently seeking mental health services, especially by conducting assessments focused upon suicide risk.

Current or prior MDD, tendency to depression, and risk for MDD were factors predictive of suicide risk in the present study. 64.2% of these transgender individuals reported a lifetime history of MDD, and 34.5% had a high risk of developing MDD. These results are consistent with previous studies reporting prevalence rates and highlighting psychological stressors such as depression as factors increasing the risk of a suicide attempt (Clements-Nolle et al., 2001; Jessica et al., 2007). For example Olson et al. (2015) assessed depression prevalence among 101 transgender youths, 25% of whom reported depression symptoms in the clinical range. A study in the US revealed the transgender population experience high levels of negative emotion because they face difficulties which may be exacerbated by a lack of legal protections for transgender individuals (Dickey et al., 2015). This situation is even more severe in China, where there are no laws protecting the rights of transgender groups, and community support is lacking (Burki, 2017).

It noteworthy that although most suicide risk factors for TM and TW were similar, differences were observed in both suicidal ideation and suicide attempt models. Transgender individuals face severe discrimination in China - more than two-thirds of 3500 Chinese people surveyed in 2013 reported they would not accept LGBT people (Burki, 2017). However, suffering

discrimination or violence in public places strongly predicted suicide attempt for TM but not TW. This finding is in line with a previous study that found TM who experienced gender-based victimization were more likely to attempt suicide than TW (Goldblum et al., 2012). Discrimination and violence are also risk factors for experiencing trauma and PTSD symptoms in transgender individuals (Mizock and Lewis, 2008). It is also well known that PTSD symptoms are a risk factor for suicide attempt (Gradus et al., 2010). This survey did not measure PTSD symptoms, which precluded a mediation analysis to understand the relationship between discrimination and violence, PTSD symptoms and suicide in transgender individuals, but this should be examined in future research.

In addition, being separated/divorced was a strong independent risk factor of suicide attempt for TW, but not TM. A previous study has suggested that divorce may cause or reinforce depression symptoms by destroying this significant relationship, which would previously have served as a source of social interaction and support (Lothstein, 1979). As a higher MDD rate was found in the TW relative to TM group, it may be that this explanation applies to the Chinese transgender population studied here, though future research is needed to ascertain whether this is the case.

Study Implications

This survey revealed that the Chinese transgender population (TW and TM) generally has very poor mental health, however only a small percentage of transgender people have sought mental health services. There exists a lack of LGBT training for Chinese counselors, which leads to transgender people encountering mental health professionals who may not understand their situations, feelings, and experiences. China's first national mental health legislation was published in 2012 and was adopted by the Standing Committee of the National People's Congress (Phillips et al., 2013), though this law did not include mental health care for LGBT

or transgender individuals. In order to improve the quality of mental health service utilization for the transgender population, it is urgently suggested that future national mental health legislation should include mental health care policies addressing transgender populations, such as developing and strengthening the LGBT practice training programs for mental health professionals. It is vitally important to improve psychiatry consultants' understanding of transgender groups, to train specific counseling skills, and provide transgender communities with more channels to gain psychological services, so as to better provide psychological support to transgender individuals and reduce their risk of depression, self-harm and suicide.

On the basis of this early stage research, mental health professionals should pay more attention to their patients if they self-identify as transgender, particularly when they demonstrate a limited educational background, are currently separated/divorced (especially important for **TW** individuals), are currently seeking mental health services, have intense conflicts with parents, have a history of self-harm behavior, or MDD. Mental health professionals should encourage transgender individuals to **actively seek treatment for** their mental health problems, such as treatment for depression and anxiety symptoms. They should offer psychological interventions such as individual and family therapy. Also, psychological trauma intervention should be considered for **TM** individuals exposed to discrimination or violence in public places, and future research should explore the relationship between traumatic events, PTSD symptoms and suicide in transgender individuals.

Limitations

Although there are some limitations of the survey sample, the sample size of this study is relatively large, enabling grouping of the sample based on current employment, annual income,

marital status, educational background, and gender identities, **between which** comparisons **could be made**. The study was a cross-sectional online survey and utilized snowball sampling, however, the recruited participants may not be representative of all **TW and TM** individuals. Those unable to access or use the Internet would not be included in the study, and the real-world identity of participants could not be checked. In interpreting the results of this suicide study, attention must be paid to the possible impact of utilizing participants primarily from urban locations, who generally have better access to support resources, and connections to the transgender community. Hence, the situation may be worse for many transgender individuals than this study reveals. The **expert consultation method was used to improve the reliability of the structured questionnaire, however, its internal consistency was not strictly examined**. Although the CESD-9 scale is well validated as a measure of current depression symptoms, it cannot replace a clinical assessment by a psychiatrist. Additionally, the suicidal ideation and suicide attempt data were collected by a structural questionnaire rather than measured by a **recognised suicide scale that includes** assessment of frequency and severity. **Finally, the present study did not examine the suicidal ideation and suicide attempts of a gender-nonconforming group, hence findings may not be generalizable to this subset of the transgender population.**

Conclusion

This is the first study examining suicide risk for transgender individuals in China. Research examining suicide in the Chinese transgender population is emerging, and future research and clinical funding in China **is warranted**. Although the understanding of LGBT issues is improving in Chinese society, there is currently no legislation to protect transgender rights (such as anti-discrimination) and hence LGBT organizations face operational difficulties. These issues may result in poorer mental health among transgender populations, as they face

severe discrimination, and lack resources and social support. Therefore, the present study serves as an important reference promoting the integration of transgender mental health services into the current national mental health legislation. It encourages the development of protection laws in order to improve mental health for the transgender population in China.

Reference:

- Bauer, G.R., Scheim, A.I., Pyne, J., Travers, R., Hammond, R., 2015. Intervenable factors associated with suicide risk in transgender persons: a respondent driven sampling study in Ontario, Canada. *BMC Public Health* 15, 525.
- Best, J., Tang, W.M., Zhang, Y., Han, L., Liu, F.Y., Huang, S.J., Yang, B., Wei, C.Y., Tucker, J.D., 2015. Sexual Behaviors and HIV/Syphilis Testing Among Transgender Individuals in China: Implications for Expanding HIV Testing Services. *Sex Transm Dis* 42, 281-285.
- Bockting, W.O., Miner, M.H., Swinburne Romine, R.E., Hamilton, A., Coleman, E., 2013. Stigma, mental health, and resilience in an online sample of the US transgender population. *Am J Public Health* 103, 943-951.
- Burki, T., 2017. Health and rights challenges for China's LGBT community. *Lancet* 389, 1286.
- Chen, R., Xi, Y., Wang, X., Li, Y., He, Y., Luo, J., 2018a. Perception of inpatients following remission of a manic episode in bipolar I disorder on a group-based Psychoeducation program: a qualitative study. *BMC Psychiatry* 18, 26.
- Chen, R.S., An, J., Ou, J.J., 2018b. Suicidal behaviour among children and adolescents in China. *Lancet Child Adolesc* 2, 551-553.
- Clements-Nolle, K., Marx, R., Guzman, R., Katz, M., 2001. HIV prevalence, risk behaviors, health care use, and mental health status of transgender persons: Implications for public health intervention. *American Journal of Public Health* 91, 915-921.
- Clements-Nolle, K., Marx, R., Katz, M., 2006. Attempted suicide among transgender persons: The influence of gender-based discrimination and victimization. *J Homosexual* 51, 53-69.
- Colizzi, M., Costa, R., Todarello, O., 2014. Transsexual patients' psychiatric comorbidity and positive effect of cross-sex hormonal treatment on mental health: Results from a longitudinal study. *Psychoneuroendocrino* 39, 65-73.
- Diaz, R.M., Ayala, G., Bein, E., Henne, J., Marin, B.V., 2001. The impact of homophobia, poverty, and racism on the mental health of gay and bisexual Latino men: findings from 3 US cities. *American journal of public health* 91, 927.
- Dickey, L.M., Reisner, S.L., Juntunen, C.L., 2015. Non-Suicidal Self-Injury in a Large Online Sample of Transgender Adults. *Prof Psychol-Res Pr* 46, 3-11.

Feifei Chen, Chongzeng Bi, Mengfei Han, 2015. The Reliability and Validity of the Chinese Version of the Revised-Positive version of Rosenberg Self-Esteem Scale. *Advances in Psychology*, 531-535.

Goldblum, P., Testa, R.J., Pflum, S., Hendricks, M.L., Bradford, J., Bongar, B., 2012. The Relationship Between Gender-Based Victimization and Suicide Attempts in Transgender People. *Prof Psychol-Res Pr* 43, 468-475.

Gradus, J.L., Qin, P., Lincoln, A.K., Miller, M., Lawler, E., Sorensen, H.T., Lash, T.L., 2010. Posttraumatic Stress Disorder and Completed Suicide. *Am J Epidemiol* 171, 721-727.

Grant JM, Mottet LA, Tanis J, Harrison J, Herman JL, M., K., 2011. Injustice at Every Turn: A Report of the National Transgender Discrimination Survey. National Center for Transgender Equality and National Gay and Lesbian Task Force, Washington, D.C.

Grossman, A.H., D'Augelli, A.R., 2007. Transgender youth and life-threatening behaviors. *Suicide Life Threat Behav* 37, 527-537.

Haas, A.P., Rodgers, P.L., Herman, J., 2014. Suicide attempts among transgender and gender non-conforming adults: findings of the national transgender discrimination survey. American Foundation for Suicide Prevention.

Hawton, K., Saunders, K.E., O'Connor, R.C., 2012. Self-harm and suicide in adolescents. *The Lancet* 379, 2373-2382.

He Jin., C.Z., Guo Fei., Zhang Jie., Yang Yunping., Wang Qian. , 2013. A short Chinese version of center for epidemiologic studies depression scale. *Chinese Journal of Behavioral Medicine and Brain Science* 12, 1133-1136.

Herman, J., Haas, A., Rodgers, P., 2014. Suicide attempts among transgender and gender nonconforming adults. The Williams Institute, UCLA, Los Angeles.

International Schizophrenia, C., Purcell, S.M., Wray, N.R., Stone, J.L., Visscher, P.M., O'Donovan, M.C., Sullivan, P.F., Sklar, P., 2009. Common polygenic variation contributes to risk of schizophrenia and bipolar disorder. *Nature* 460, 748-752.

Jessica, X., Julie, A.H., Judith, B., 2007. The health, health-related needs, and life course experiences of transgender Virginians. Virginia Commonwealth University Virginia.

Jiang, H., Wei, X., Zhu, X.H., Wang, H., Li, Q.F., 2014. Transgender patients need better protection in China. *Lancet* 384, 2109-2110.

Kenagy, G.P., 2005. Transgender health: Findings from two needs assessment studies in Philadelphia. *Health Soc Work* 30, 19-26.

Kristen Clements-Nolle PhD, M., Rani Marx PhD, M., Katz, M., Attempted Suicide Among Transgender Persons. *Journal of Homosexuality*.

Liu, J.B., Fang, Y.M., Gong, J.B., Cui, X.L., Meng, T.T., Xiao, B., He, Y.Q., Shen, Y.M., Luo, X.R., 2017. Associations between suicidal behavior and childhood abuse and neglect: A meta-analysis. *J. Affect. Disord.* 220, 147-155.

Liu, M.L., Ming, Q.S., Yi, J.Y., Wang, X., Yao, S.Q., 2016. Screen Time on School Days and Risks for Psychiatric Symptoms and Self-Harm in Mainland Chinese Adolescents. *Front. Psychol.* 7, 11.

Lothstein, L.M., 1979. The aging gender dysphoria (transsexual) patient. *Arch Sex Behav* 8, 431-444.

Maguen, S., Shipherd, J.C., 2010. Suicide risk among transgender individuals. *Psychology and Sexuality* 1, 34-43.

Marshall, B.D., Socías, M.E., Kerr, T., Zalazar, V., Sued, O., Arístegui, I., 2016. Prevalence and correlates of lifetime suicide attempts among transgender persons in Argentina. *Journal of homosexuality* 63, 955-967.

Mathy, R.M., 2003. Transgender identity and suicidality in a nonclinical sample: Sexual orientation, psychiatric history, and compulsive behaviors. *Journal of Psychology & Human Sexuality*, 47-65.

McNeil J, Bailey L, Ellis S, Morton J, M., R., 2012. *Trans Mental Health Study 2012*. Equality Network, Edinburgh, p.
http://www.scottishtrans.org/Uploads/Resources/trans_mh_study.pdf.

Mizock, L., Lewis, T.K., 2008. Trauma in Transgender Populations: Risk, Resilience, and Clinical Care. *Journal of Emotional Abuse* 8, 335-354.

Olson, J., Schragar, S.M., Belzer, M., Simons, L.K., Clark, L.F., 2015. Baseline physiologic and psychosocial characteristics of transgender youth seeking care for gender dysphoria. *Journal of Adolescent Health* 57, 374-380.

Paul, J.P., Catania, J., Pollack, L., Moskowitz, J., Canchola, J., Mills, T., Binson, D., Stall, R., 2002. Suicide attempts among gay and bisexual men: Lifetime prevalence and antecedents. *American Journal of Public Health* 92, 1338-1345.

Peterson, C.M., Matthews, A., Copps-Smith, E., Conard, L.A., 2017. Suicidality, Self-Harm, and Body Dissatisfaction in Transgender Adolescents and Emerging Adults with Gender Dysphoria. *Suicide Life-Threat* 47, 475-482.

Phillips, M.R., Chen, H.H., Diesfeld, K., Xie, B., Cheng, H.G., Mellso, G., Liu, X.H., 2013. China's New Mental Health Law: Reframing Involuntary Treatment. *Am J Psychiat* 170, 588-591.

- Rosenberg, M., 1965. Rosenberg self-esteem scale (RSE). Acceptance and commitment therapy. Measures package, 52.
- Rosser, B.R.S., Oakes, J.M., Bockting, W.O., Miner, M., 2007. Capturing the social demographics of hidden sexual minorities: An internet study of the transgender population in the United States. *Sexuality Research & Social Policy* 4, 50-64.
- Rotondi, N.K., Bauer, G.R., Scanlon, K., Kaay, M., Travers, R., Travers, A., 2013. Nonprescribed Hormone Use and Self-Performed Surgeries: "Do-It-Yourself" Transitions in Transgender Communities in Ontario, Canada. *American Journal of Public Health* 103, 1830-1836.
- Waldo, C.R., Hesson-McInnis, M.S., D'Augelli, A.R., 1998. Antecedents and consequences of victimization of lesbian, gay, and bisexual young people: a structural model comparing rural university and urban samples. *Am J Community Psychol* 26, 307-334.
- Xi, Y., Chen, R., Yan, F., Ma, X., Rakofsky, J.J., Tang, L., Guo, H., Wu, X., Li, X., Zhu, H., Guo, X., Yang, Y., Li, P., Cao, X., Li, H., Li, Z., Wang, P., Xu, Q., Tang, Y., Broome, M.R., 2017. Low post-traumatic stress disorder rate in Chinese in Beijing, China. *Asian J Psychiatr* 30, 79-83.
- Xin, X.H., Ming, Q.S., Zhang, J.B., Wang, Y.P., Liu, M.L., Yao, S.Q., 2016. Four Distinct Subgroups of Self-Injurious Behavior among Chinese Adolescents: Findings from a Latent Class Analysis. *PLoS One* 11, 15.
- Xin, X.H., Wang, Y.P., Fang, J.Q., Ming, Q.S., Yao, S.Q., 2017. Prevalence and Correlates of Direct Self-Injurious Behavior among Chinese Adolescents: Findings from a Multicenter and Multistage Survey. *J. Abnorm. Child Psychol.* 45, 815-826.
- Zhang, H.R., Wei, X.M., Tao, H.J., Mwansisya, T.E., Pu, W.D., He, Z., Hu, A.M., Xu, L., Liu, Z.N., Shan, B.C., Xue, Z.M., 2013. Opposite Effective Connectivity in the Posterior Cingulate and Medial Prefrontal Cortex between First-Episode Schizophrenic Patients with Suicide Risk and Healthy Controls. *PLoS One* 8, 8.

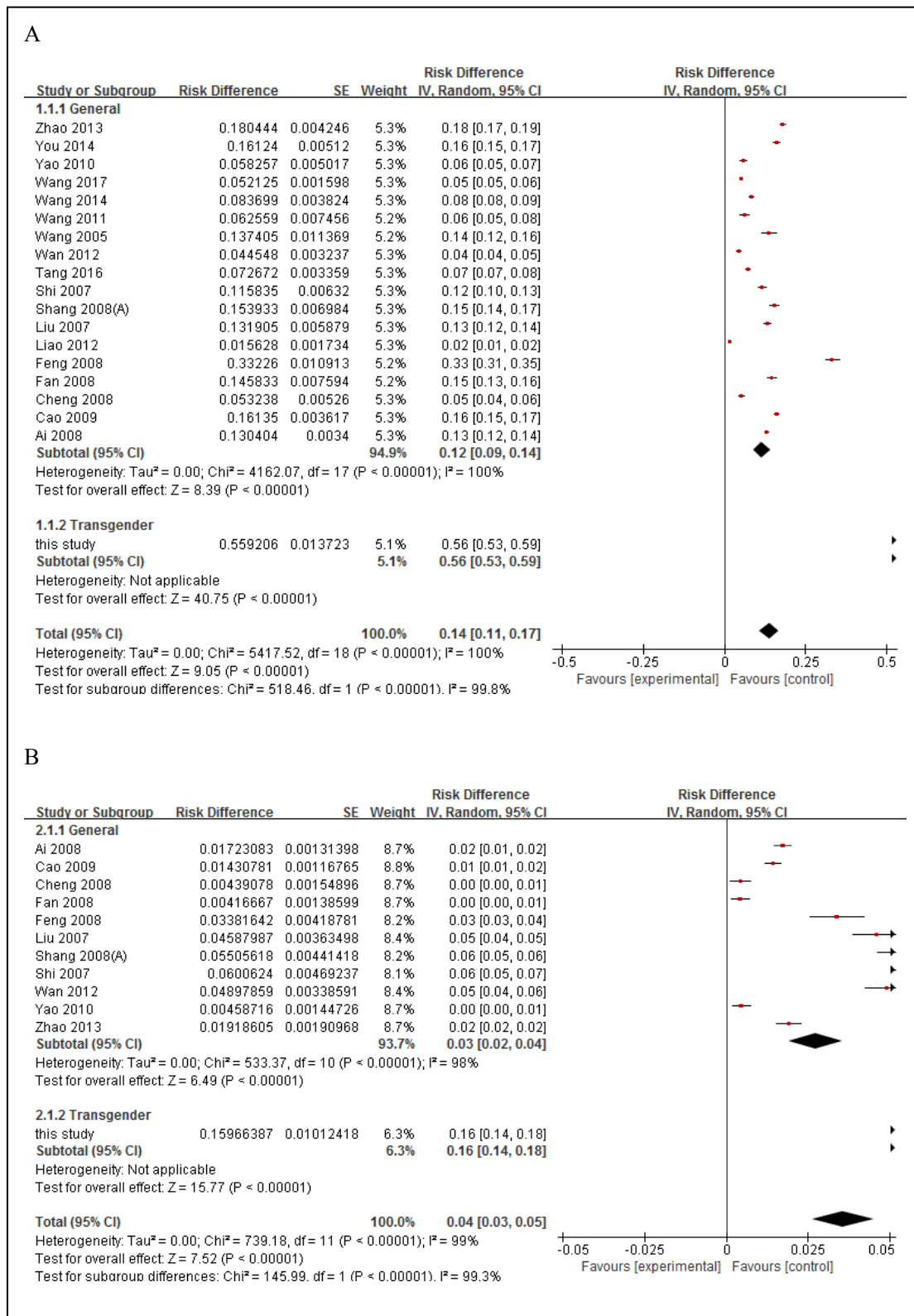


Figure 1. Quasi-meta-analysis for the prevalence comparison of suicidal ideation and attempted suicide between general and transgender population. (A) The pooled suicidal ideation prevalence of general population was 12% (95%CI: 9%-14%), significantly lower than transgender population (56%, 95%CI: 53%-59%) in this study; (B) The pooled attempted suicide prevalence of general population was 3% (95%CI: 2%-4%), significantly lower than transgender population (16%, 95%CI: 14%-18%) in this study.

Table 1 Recruitment and demographic details of study sample

	FTM (N=622)	MTF (N=687)	Test	df	P	Total (N=1309)
Source of recruitment, n (%)						
Social networking platforms and media	542(87.1)	595(86.6)	0.080	1	0.777	1137(86.9)
LGBT center and friends	80(12.9)	92(13.4)				172(13.1)
Age, years: mean (s.d.)	23.78 (6.51)	22.89 (6.44)	6.198	1	0.013	23.31(6.49)
Education, n (%)						
Less than high school	29(4.7)	76(11.1)	33.312	3	<0.001	105(8.0)
High school and equal	138(22.2)	202(29.4)				340(26.0)
Bachelor and equal	394(63.3)	363(52.8)				757(57.8)
Higher than master	61(9.8)	46(6.7)				107(8.2)
Residence, n (%)						
City	538(86.5)	554(80.6)	8.091	1	0.004	1092(83.4)
Town and county	84(13.5)	133(19.4)				217(16.6)
Current employment, n (%)						
Paid employment	302(48.6)	308(44.8)	13.983	2	0.001	610(46.6)
Not working	51(8.2)	102(14.8)				153(11.7)
Student	269(43.2)	277(40.3)				546(41.7)
Current annual income						
< ¥10,000	324(52.1)	365(53.1)	6.47	4	0.167	689(52.6)
¥10,000~24,999	58(9.3)	85(12.4)				143(10.9)
¥25,000~49,999	86(13.8)	100(14.6)				186(14.2)
¥50,000 ~ 99,999	86(13.8)	79(11.5)				165(12.6)
≥¥100,000	68(10.9)	58(8.4)				126(9.6)
Marital status, n (%) *						
Never married	590(94.9)	635(92.4)	18.000		<0.001	1225(93.6)
Married	11(1.8)	40(5.8)				51(3.9)
Separated/divorced	21(3.4)	12(1.7)				33(2.5)
Relationship, n (%)						
Current	211(33.9)	169(24.6)	47.639	2	<0.001	380(29.0)
Ever	219(35.2)	177(25.8)				396(30.3)
None	192(30.9)	341(49.6)				533(40.7)

* Fisher's exact tests

Table 2 Comparison of sexuality conflicts, childhood adversity and mental health

	FTM N (%)	MTF N (%)	Test	df	P	Total
Sexuality conflicts						
Disliking biological sexuality	496(79.7)	551(80.2)	0.043	1	0.835	1047(80.0)
Seeking hormone therapy	437(70.3)	603(87.8)	61.342	1	<0.001	1040(79.4)
Seeking gender reassignment surgery	348(55.9)	534(77.8)	71.202	1	<0.001	882(67.4)
Intense conflicts with parents	479(84.5)	470(90.4)	8.533	1	0.003	949(87.3)
Suffering discrimination or violence at public places	172(27.7)	187(27.3)	0.016	1	0.899	359(27.5)
Childhood adversity						
Insulted or bullied at school	407(65.4)	516(75.2)	15.036	1	<0.001	923(70.6)
Mental health						
Ever suffered from MDD	349(56.1)	491(71.5)	33.502	1	<0.001	840(64.2)
CESD-9						
None	277(44.5)	210(30.6)	33.435	2	<0.001	487(37.2)
Tendency to depression	173(27.8)	197(28.7)				370(28.3)
Risk for MDD	172(27.7)	280(40.8)				452(34.5)
RSES*						
Low self-esteem	16(2.6)	37(5.4)	23.040		<0.001	53(4.0)
Normal self-esteem	526(84.6)	608(88.5)				1134(86.6)
High self-esteem	80(12.9)	42(6.1)				122(9.3)
Self-harm	127(20.6)	191(28.1)	9.840	1	0.002	318(24.6)
Suicidal ideation	319(51.5)	413(60.7)	11.152	1	0.001	732(56.4)
Suicide attempt	68(11.0)	141(20.7)	22.587	1	<0.001	209(16.1)
Seeking mental health service	128(20.6)	236(34.4)	30.849	1	<0.001	364(27.8)

* Fisher's exact tests

Table 3 Estimates of odds ratio from stepwise logistic regression model for suicidal ideation

	Beta	SE	P	OR	95% CI	
					Lower	Upper
FTM						
Disliking biological sexuality	1.001	0.272	<0.001	2.720	1.597	4.634
Seeking gender reassignment surgery	0.714	0.205	<0.001	2.043	1.367	3.051
CESD-9						
None (ref)						
Tendency to depression	0.616	0.230	0.007	1.851	1.179	2.905
Risk for MDD	1.256	0.246	<0.001	3.512	2.168	5.687
Self-harm	1.518	0.284	<0.001	4.563	2.614	7.965
Seeking mental health service	0.823	0.261	0.002	2.277	1.364	3.801
MTF						
Disliking biological sexuality	0.963	0.296	0.001	2.621	1.467	4.683
Ever suffered from MDD	1.255	0.265	<0.001	3.509	2.087	5.901
CESD-9						
None (ref)						
Tendency to depression	1.053	0.285	<0.001	2.865	1.639	5.010
Risk for MDD	1.312	0.286	<0.001	3.715	2.122	6.505
Self-harm	1.463	0.310	<0.001	4.317	2.354	7.919
Seeking mental health service	0.880	0.250	<0.001	2.412	1.478	3.937
Total population						
Disliking biological sexuality	0.987	0.198	<0.001	2.683	1.819	3.957
Seeking gender reassignment surgery	0.566	0.164	0.001	1.761	1.276	2.431
Intense conflicts with parents	0.482	0.220	0.028	1.620	1.053	2.492
Ever suffered from MDD	0.646	0.161	<0.001	1.908	1.391	2.616
CESD-9						
None (ref)						
Tendency to depression	0.692	0.180	<0.001	1.998	1.404	2.844
Risk for MDD	1.161	0.190	<0.001	3.194	2.201	4.635
Self-harm	1.408	0.211	<0.001	4.088	2.704	6.181
Seeking mental health service	0.764	0.179	<0.001	2.147	1.513	3.047

Table 4 Estimates of odds ratio from stepwise logistic regression model for suicide attempt

	Beta	SE	P	OR	95% CI	
					Lower	Upper
FTM						
Suffering discrimination or violence at public places	0.618	0.293	0.035	1.855	1.044	3.295
Ever suffered from MDD	1.023	0.377	0.007	2.781	1.328	5.827
Self-harm	2.210	0.296	<0.001	9.113	5.098	16.290
MTF						
Marital status						
Never married (ref)						
Married	1.005	0.626	0.108	2.731	0.801	9.315
Separated/divorced	2.391	0.790	0.002	10.925	2.323	51.375
Ever suffered from MDD	1.936	0.523	<0.001	6.930	2.487	19.309
Self-harm	2.630	0.269	<0.001	13.878	8.188	23.520
Total population						
Education						
Less than high school	0.837	0.550	0.128	2.310	0.786	6.789
High school and equal	1.155	0.469	0.014	3.173	1.266	7.954
Bachelor and equal	0.446	0.453	0.325	1.562	0.643	3.792
Higher than master (ref)						
Marital status						
Never married (ref)						
Married	1.205	0.512	0.019	3.337	1.223	9.109
Separated/divorced	1.257	0.521	0.016	3.517	1.266	9.768
Intense conflicts with parents	0.469	0.199	0.019	1.598	1.081	2.361
Ever suffered from MDD	1.365	0.315	<0.001	3.915	2.113	7.254
Self-harm	2.423	0.207	<0.001	11.274	7.521	16.900
Seeking mental health service	0.497	0.200	0.013	1.645	1.111	2.434

Conflict of interest

None

Author statement

Contributions

Study design: WL, YX, QJ; Study implementation and data collection: WL, YX, QJ; Data analysis: OJ, CR, GY, XY, CC, LW; Data interpretation: OJ, CR, WL, GY, XY, CC, JL, LW; Manuscript preparation: OJ, CR, WL, YX, QJ, JL, GY, XY, CC, ZH, LW; All authors read and approved the final manuscript.

Acknowledgment

We thank all the participants participating in the study.

Role of the funding source

This work was supported by United Nations Development Programme (UNDP), Kingdom of Netherlands Embassy in China, National Natural Science Foundation of China (No. 81601197), Capital's Funds for Health Improvement and Research (CFH Project number: 2014-1-2121), National Natural Science Foundation of China (81501637) and Ministry of Finance, PR China (GY2015G-7). The funding body had no role in the design of the study and collection, analysis and interpretation of data and in writing the manuscript.

Table S1 The summary of studies used in the Quasi-meta-analysis

Citation	Age	Subgrouping indicator	Sample size	Prevalence(95%CI)	
				Suicidal ideation	Attempted suicide
Ai 2008 [1][11]	20.4±1.9	General	9808	0.13 [0.12, 0.14]	0.02 [0.01, 0.02]
Cao 2009 [1][2]	19.33±1.17	General	10344	0.16 [0.15, 0.17]	0.01 [0.01, 0.02]
Chen 2008 [1][3]	21.34±1.56	General	1822	0.05 [0.04, 0.06]	0.00 [0.00, 0.01]
Fan 2008 [1][4]	20.15±1.67	General	2160	0.15 [0.13, 0.16]	0.00 [0.00, 0.01]
Feng 2008 [1][5]	16-26(Range)	General	1863	0.33 [0.31, 0.35]	0.03 [0.03, 0.04]
Liao 2012 Error!					
Reference source not found.	18-39(Range)	General	5119	0.02 [0.01, 0.02]	0.05 [0.04, 0.05]
Liu 2007 [1][6]	21.18(mean)	General	3313	0.13 [0.12, 0.14]	-
Shang 2008 [1][8]	20.47±1.49	General	2670	0.15 [0.14, 0.17]	0.06 [0.05, 0.06]
Shi 2007 [1][9]	20.61±1.46	General	2564	0.12 [0.10, 0.13]	0.06 [0.05, 0.07]
Tang 2016 Error!					
Reference source not found.	21±1	General	5972	0.07 [0.07, 0.08]	-
Wan 2012 [1][10]	20.5±1.1	General	4063	0.04 [0.04, 0.05]	0.05 [0.04, 0.06]
Wang 2005 [1][12]	21.0±1.2	General	917	0.14 [0.12, 0.16]	-
Wang 2011 [1][13]	19.87±1.4	General	1055	0.06 [0.05, 0.08]	-
Wang 2014 [1][14]	21.3±2.2	General	5245	0.08 [0.08, 0.09]	-
Wang 2017 [1][15]	18(Median)	General	19338	0.05 [0.05, 0.06]	-
Yao 2010 [1][16]	15-34(Range)	General	2180	0.06 [0.05, 0.07]	0.00 [0.00, 0.01]
You 2014 [1][17]	19-26(Range)	General	5160	0.16 [0.15, 0.17]	-
Zhao 2013 [1][18]	21.05±1.44	General	8202	0.18 [0.17, 0.19]	0.02 [0.02, 0.02]

Reference

[1] Kuang L, Ai M, Wang MJ, Shen Y, Li DQ, et al. (2008) A study on suicide attempts and related factors of college students in Chongqing.

- Chin J Nerv Ment Dis 34: 594–597. PMID:24125605
- [2] Cao HY, Sun YH, Yao YS, Zhou CX, Yang LS (2009) Suicide behavior and its risk factors among medical undergraduates in Anhui province. *Chin J Sch Health* 30:38–39. PMID:18788521.
- [3] Chen YF, Kou CG, Zhang D (2008) Analysis on suicide tendency and its risk factors of undergraduate students. *Chin J Dis Control Prev* 12:450–453
- [4] Fan YG, Xiao Q, Wang Q, Li WX, Dong MX, et al. (2008) Study on the influencing factors related to suicide ideation among undergraduates in Anhui province. *Zhonghua Liu Xing Bing Xue Za Zhi* 29:241–244. PMID:18788521
- [5] Feng SS, Zhang XQ (2008) Suicidal Ideation and Its Influencing Factors of Undergraduates in Guangzhou. *Chin J Sch Health* 29:414–416
- [6] Liao ZH, Zhen H, Wang WQ, et al. (2012) The characteristics and risk factors of suicide ideation among person aged 18 years and older in Xiamen city. *Chin J Behave Med&Brain Sci* 21(9):840-843.
- [7] Liu QQ, Li H, Fang XY (2007) An Investigation of Suicidal Ideation and Suicide Attempts of Undergraduates in Yunnan Province with Their Self-esteem and Mental Health Status. *Chin J Health Psychol* 15:57–58.
- [8] Shang YX, Yan SZ, Zhu FP (2009) Study on the current status of suicidal ideation and depression and its influence factors among medical students. *Mod Prev Med* 36:3092–3094. PMID:23311805
- [9] Shi WJ, Ma SB, Wang SY (2007) Prevalence and Its influencing Factors of Attempted Suicide Among Students in Guangzhou. *Chin J Sch Health* 29:1083–1084.
- [10] Tang F, & Qin P. (2016). Social network, coping skill and suicidal ideation in college students. *Chinese Mental Health Journal*, 30(11), 869-875.
- [11] Wan YH, Gao R, Tao XY, Tao FB, Hu CL (2012) Relationship between deliberate self-harm and suicidal behaviors in college students. *Zhonghua Liu Xing Bing Xue Za Zhi* 33: 474–477. PMID:22883172
- [12] Wang J, Ge XM, Hu J, et al. An investigation of suicide attitude idea in undergraduates with mental health status. *Chin J of Behavioral Med Sci* 2005, 14(9):830-831.
- [13] Chen RR, Wang MX (2011) Study on the relationship between the exposure rate of the suicidal ideation and the self-control degree of the college students. *Foreign Med Sci (Section of Med geography)* 32:192–195.
- [14] Wang L, He C Z, Yu Y M, et al. Associations between impulsivity, aggression, and suicide in Chinese college students[J]. *BMC Public*

- Health,14,1(2014-06-03), 2014, 14(1):551.
- [15] Wang Y G, Chen S, Xu Z M, et al. Family history of suicide and high motor impulsivity distinguish suicide attempters from suicide ideators among college students. [J]. *Journal of Psychiatric Research*, 2017, 90:21-25.
- [16] Yao J, Huang YQ, Yuan Y, et al. The prevalence and related factors of suicide in persons aged 15 or over in Kunming City(in Chinese). *Chin Ment Health J*2010; 24: 536–540.
- [17] You Z, Song J, Wu C, et al. Effects of life satisfaction and psychache on risk for suicidal behaviour: a cross-sectional study based on data from Chinese undergraduates.[J]. *Bmj Open*, 2014, 4(3):e004096.
- [18] Zhao J, Zhao J, Xiao R, Yang XL, Zhang XY (2013) Suicide exposure and its modulatory effects on relations between life events and suicide risk in Chinese college students *Nan Fang Yi Ke Da Xue Xue Bao.* 33:1111–1116. PMID:23996747

Disliking biological sexuality	<0.001	4.093	2.638	6.350	<0.001	4.957	3.283	7.485	<0.001	4.511	3.343	6.087
Seeking hormone therapy	<0.001	2.534	1.772	3.623	<0.001	2.639	1.649	4.224	<0.001	2.724	2.061	3.600
Seeking gender reassignment surgery	<0.001	3.343	2.399	4.659	<0.001	2.667	1.837	3.871	<0.001	3.112	2.446	3.961
Intense conflicts with parents	0.002	2.068	1.296	3.300	<0.001	2.989	1.649	5.418	0.016	2.506	1.738	3.615
Suffering discrimination or violence at public places	0.013	1.574	1.101	2.249	<0.001	2.366	1.625	3.447	<0.001	1.908	1.477	2.465
Childhood adversity												
Insulted or bullied at school	0.010	1.550	1.111	2.163	0.001	1.856	1.304	2.641	<0.001	1.754	1.379	2.231
Mental health												
Ever suffered from MDD	<0.001	2.823	2.033	3.920	<0.001	6.387	4.411	9.247	<0.001	4.233	3.325	5.391
CESD-9												
None (ref)												
Tendency to depression	<0.001	2.142	1.454	3.158	<0.001	3.601	2.384	5.439	<0.001	2.754	2.081	3.645
Risk for MDD	<0.001	4.024	2.674	6.055	<0.001	6.677	4.459	9.998	<0.001	5.294	3.990	7.023
RSES												
Low self-esteem	0.095	2.655	0.845	8.338	0.010	3.220	1.323	7.838	0.001	3.154	1.569	6.339
Normal self-esteem (ref)												
High self-esteem	0.007	0.513	0.315	0.837	<0.001	0.221	0.109	0.449	<0.001	0.362	0.244	0.539
Self-harm	<0.001	7.588	4.513	12.757	<0.001	8.114	4.985	13.207	<0.001	8.042	5.641	11.464
Seeking mental health service	<0.001	3.552	2.292	5.505	<0.001	2.850	2.001	4.058	<0.001	3.219	2.451	4.226

Table S3 Estimates of odds ratio from univariate logistic regression analysis for suicide attempt

	FTM				MTF				Total population			
	P	OR	95% CI		P	OR	95% CI		P	OR	95% CI	
			Lower	Upper			Lower	Upper			Lower	Upper
Demographic details												
Age	0.759	0.994	0.955	1.034	0.479	0.989	0.960	1.019	0.285	0.987	0.963	1.011
Education												
Less than high school	0.120	3.043	0.749	12.361	0.096	2.483	0.852	7.235	0.009	3.029	1.327	6.914
High school and equal	0.066	2.825	0.932	8.561	0.056	2.613	0.977	6.991	0.004	2.909	1.400	6.044
Bachelor and equal	0.528	1.412	0.484	4.119	0.196	1.890	0.719	4.967	0.134	1.726	0.845	3.523
Higher than master (ref)												
Residence												
City	0.776	0.902	0.441	1.842	0.381	0.816	0.519	1.285	0.206	0.784	0.537	1.143
Town and county (ref)												
Current employment												
Paid employment (ref)												
Not working	0.415	1.414	0.615	3.252	0.010	1.937	1.174	3.195	0.002	1.956	1.287	2.974
Student	0.390	0.788	0.458	1.356	0.448	0.850	0.558	1.295	0.261	0.827	0.595	1.151
Annual income												
< ¥10,000	0.306	1.598	0.652	3.921	0.351	1.433	0.673	3.048	0.134	1.551	0.873	2.755
¥10,000~24,999	0.711	0.780	0.209	2.911	0.397	1.463	0.606	3.530	0.397	1.357	0.670	2.746
¥25,000~49,999	0.304	0.504	0.136	1.863	0.311	1.556	0.662	3.655	0.583	1.210	0.613	2.389
¥50,000 ~ 99,999	0.438	1.516	0.530	4.331	0.378	1.493	0.613	3.637	0.230	1.512	0.770	2.971
≥¥100,000 (ref)												
Marital status												
Never married (ref)												
Married	0.860	0.830	0.105	6.593	0.435	1.344	0.640	2.823	0.244	1.502	0.757	2.981
Separated/divorced	0.241	1.953	0.637	5.987	0.017	4.032	1.279	12.714	0.025	2.375	1.112	5.071
Relationship												
Current	0.253	0.684	0.357	1.312	0.028	1.635	1.054	2.535	0.796	1.048	0.734	1.497
Ever	0.945	1.021	0.564	1.849	0.731	1.085	0.682	1.727	0.822	0.960	0.671	1.373
None (ref)												
Sexuality conflicts												
Disliking biological sexuality	0.221	1.550	0.769	3.127	<0.001	3.138	1.679	5.862	<0.001	2.374	1.492	3.778
Seeking hormone therapy	0.025	2.106	1.100	4.030	0.041	2.048	1.028	4.077	<0.001	2.452	1.541	3.900
Seeking gender reassignment surgery	0.039	1.755	1.028	2.997	0.001	2.558	1.467	4.460	<0.001	2.443	1.682	3.547

Intense conflicts with parents	0.405	1.391	0.640	3.025	0.021	3.061	1.187	7.892	0.009	2.215	1.223	4.013
Suffering discrimination or violence at public places	0.002	2.290	1.368	3.835	<0.001	2.804	1.898	4.140	<0.001	2.549	1.876	3.465
Childhood adversity												
Insulted or bullied at school	0.003	2.688	1.407	5.134	0.377	1.221	0.784	1.902	0.002	1.745	1.219	2.499
Mental health												
Ever suffered from MDD	<0.001	5.200	2.604	10.385	<0.001	8.522	4.085	17.780	<0.001	7.265	4.415	11.956
CESD-9												
None (ref)												
Tendency to depression	0.337	1.393	0.708	2.740	0.230	1.413	0.804	2.484	0.071	1.485	0.966	2.282
Risk for MDD	0.001	2.792	1.534	5.081	<0.001	3.119	1.910	5.092	<0.001	3.309	2.279	4.804
RSES												
Low self-esteem	0.112	2.567	0.802	8.213	0.046	2.046	1.013	4.133	0.004	2.381	1.310	4.330
Normal self-esteem (ref)												
High self-esteem	0.089	0.405	0.143	1.147	0.023	0.189	0.045	0.792	0.002	0.261	0.113	0.602
Self-harm	<0.001	12.206	6.967	21.383	<0.001	15.329	9.841	23.879	<0.001	14.413	10.208	20.350
Suicidal ideation	0.993	4.39E+08	—	—	0.993	8.37E+08	—	—	0.990	6.47E+08	—	—
Seeking mental health service	0.001	2.585	1.509	4.427	<0.001	2.623	1.796	3.831	<0.001	2.859	2.107	3.878