Gender minority stress and depressive symptoms among transfeminine and gender non-conforming individuals in China: mediating and moderating roles of coping

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Note: The findings of this thesis, as they currently stand, should not be utilized to inform any social or policy recommendations and decisions or guide medical and public health programming efforts for this population.

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Abstract

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Objectives:
Transgender and gender non-conforming populations in China experience disproportionately higher burdens of mental health issues such as depression compared to their cisgender counterparts. The gender minority stress and resilience model further elaborates on the original minority stress theory in an effort to understand how various experiences such as gender-based violence, discrimination and rejection impact the mental health outcomes and physical well-being of this population. This study investigates the role of three coping factors: gender minority resilience, social support, and gender-affirming hormone use, and their association between gender minority stress and depression.
Methods:
A cross-sectional study in 2019 recruited and collected data on a total of 277 transfeminine and gender non-conforming individuals from 9 different cities in China. Gender minority stress and resilience scores were collected using the validated Gender Minority Stress and Resilience Measure, with 45 items for gender minority stress (GMS) and 13 items for gender minority resilience (GMR). Depression was measured using the Center for Epidemiologic Studies Depression Scale (CES-D 10) short form with 10 items, previously validated among populations in Hong Kong. Social support was measured using a total of 12 items, including questions on support from family members and friends in forms of emotional and practical support. In regard

to gender affirmation care use, we initially investigated both surgical procedures and gender-affirming hormones. However, given that eligibility criteria for surgical procedure in China intentionally excludes individuals with major depressive disorders, we decided to focus on hormone use as a proxy to gender-affirming care use. We then conducted complete case analyses (N = 258) using structural equation models to examine the mediating role of social support on the effects of gender minority stress on depression, with both exposure and outcome modelled as latent variables. We conducted an exploratory moderation analysis with sum-of-scores of gender minority stress, resilience, and depression scores to test for interaction between gender minority stress and resilience on its relationship with depression. Finally, we explored whether gender-affirming hormone use mediates the relationship between depression and internalized transphobia, a subconstruct of gender minority stress previously found to be associated with gender-affirming hormone use using this study data. Model fit of initial models is reported, but model alterations and re-specification were not explored, thus results are provisional. For all of our models, we adjusted for the following confounders: age (continuous), gender identity (transfeminine & gender non-conforming) and income (3 level nominal categories with 3000 RMB (Chinese currency) per interval). For convenience of interpretation, coefficients included in this abstract are all path coefficients standardized by the variance of both observed and latent variables for structural equation models.

Results:

As noted, given that model fit was not taken into consideration, the findings of this thesis are provisional and require further analysis. For our sample demographics, most of the participants in the study identified as transfeminine (72.1%) and 30.1% were earning less than or equal to 460 USD (3000 RMB) per month. The average CES-D score was 11.8 (out of 30) and over half (62%) would be considered at risk for clinical depression given the CES-D 10 threshold. GMR score was found to be associated with overall depression score (β =-0.411, 95% CI: -0.782 - -0.023). However, we found that GMS has an equally negative impact on one's depression score regardless of one's GMR score (Interaction term β = 0.000, 95% CI: -0.006 – 0.006). In our initial model, social support was found to be negatively associated with both GMS and depression in our structural models. Social support also partially mediated the association between GMS and depression in this model (Indirect effect β = 0.082, 95% CI: 0.018 – 0.154, proportion mediated = 17%). We did not find evidence for any association between hormone use and depression in our starting model (β = -0.238, 95% CI: -0.499 – 0.180) nor did we find a mediating effect of hormone use on the association between internalized transphobia and depression (β = -0.005, 95% CI: -0.011 – 0.003).

Conclusion:

This study highlighted the potential role of social support as a mediator between GMS and depression among transfeminine and gender non-conforming individuals in China. Given the exploratory and cross-sectional nature of the study, we were unable to make inference on the association between hormone use and future mental health outcomes. Further efforts of confirmatory analysis using this data to find a better fitting model is needed to confirm those

results. We also suggest that gender minority resilience measured by the GMSR measures (community connectedness and identity pride) need to be considered under the specific legal and social environment in China when thinking about future studies or interventions in those areas. Future studies might consider various expressions of resilience, in conjunction with environmental factors, to form a comprehensive support system in helping this population with coping. The findings of this thesis, as they currently stand, should not be utilized to inform any social or policy recommendations and decisions or guide medical and public health programming efforts for this population.

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Introduction

Transgender and gender non-conforming populations experience disproportionally higher burdens of violence, discrimination, mental and sexual health outcomes in China. Policies and guidelines for gender affirmation procedures imply de-facto discrimination and being trans is seen as a violation of traditional cultural and sociopolitical values and the binary gender system in China (1). Experiences of bullying as a form of violence was linked to higher burdens of depression or suicidal ideation among gender non-conforming adolescents in China (2). Prevalence of depression among this population was estimated to be between 32% and 54% based on a systematic review in 2021(3). Prevalence of lifetime suicidal ideation and suicidal attempt was 56% and 16%, respectively, as reported by a 2019 national transgender population study (4), as compared to prevalence of lifetime depression of 5.7% and 8% among cisgender men and women in the general population (5). While research is limited, estimates across indicators of violence, discrimination, and mental and sexual health outcomes are higher than the general population, highlighting the need to address negative mental health outcomes as a critical public health problem for this community.

In China, to receive gender affirming care, one must obtain a diagnosis of gender dysphoria by certified psychiatrists. To receive a gender affirmation surgical procedure, individuals are required to first go through mental health treatment for gender dysphoria for over one year and prove that such treatment is insufficient (1). In addition, individuals are required to be over 20 years old and inform their parents for consent before the surgical procedures. Based on a national report of transgender population in China, less than 15% of those who need gender affirmation procedures were able to undergo this procedure (6). Some studies have identified barriers to medical gender affirmation, which includes but not limited to: familial pressure to conform to binary gender system, lack of parental support of transgender identity, lack of hospitals performing procedures (or providing care) and financial costs of this procedure. Access to gender-affirming hormones is also limited, with 79% of the overall trans population reporting difficulty accessing safe and provider-guided hormones. In some studies, researchers have examined the linkages between mental health burdens (e.g., depression and suicidal ideation) and risky behaviors (e.g., obtaining hormones through the underground economy) due to lack of access to gender affirming hormones (1,6). Taken together, these formative findings show the challenges of transgender individuals in accessing high quality gender affirmation care and/or living with a gender they identify with in China. In addition to lack of access to care, previous epidemiologic studies in China also found associations between psychological distress and identity concealment along with socioeconomic status among transfeminine adults and transfeminine sex workers (7).

The minority stress model was an elaboration of the social stress theory for minority groups who bear extra burden of stress due to their minority position (8). Adapted from the minority stress model, the gender minority stress and resilience (GMSR) model identified stressors specific to transgender and gender nonconforming populations and linked those distal and proximal stressors to mental & physical health outcomes. Distal stressors were conceptualized as

direct experiences of external actions including victimization, rejection, discrimination, and non-conformation from others such as family members while proximal stressors are internal processing of the direct experiences including internalized transphobia and negative expectations for the future. Resilience, which could help buffer the effect of these stressors are included in the GMSR model as individual (identity pride) and community levels (community connectedness) (9). While social support and resilience using scales developed for the general population were previously found to have a moderating effect on this association between gender minority stressors and depression in other populations in Hong Kong (10), there are currently no studies, to our team's knowledge, that explore gender minority specific coping factors in transfeminine communities in China.

Currently the bulk of the evidence with transgender populations in China focuses on sexual health outcomes and sexual risk behaviors, most of which concentrates on transgender female sex workers. Other studies conflate this population with the broader lesbian, gay, and bisexual cisgender population – neither of which moves the scientific literature close to characterizing experiences of transgender populations both at the granular and broad levels. Earlier evidence on transgender women in mainland China were also packaged into studies on cisgender men who have sex with men and comparisons were also made with cis-MSM. Assumptions about similarities in terms of behaviors and risks between transgender women and cis-MSM overlooks the unique characteristics of this population.

Geographically, studies were also mostly in metropolitan areas like Shanghai and Hong Kong, where medical resources are more accessible, and may not necessarily capture experiences of transgender people, particularly transgender women, from other parts of China. To address this gap in literature and research limitations, this study aims to focus on transgender women and explore the roles of resilience, health care utilization and social support in the association between gender minority stressors and depressive symptoms among transfeminine individuals from different parts of China.

1. Methods:

Ethical Approvals

All procedures of the original study were approved by the institutional review boards at the University of North Carolina at Chapel Hill (IRB Number: 18-3215) and Southern Medical University- Guangzhou Dermatology Hospital (IRB Number: GDDHLS-20190505(R)). This particular secondary analysis was determined by the University of Washington's Human Subjects Division as non-human subjects research (IRB ID: STUDY00016673). All participants enrolled in the study provided informed consent by checking a box on self-administered online informed consent form indicating their agreement to participate in the study.

Data Collection

Recruitment of participants for this study was conducted in two cities in China: Shenyang and Guangzhou in collaboration with local community-based organizations (CBOs) due to their

established relationship with local community members. Participants who were originally from 8 different provinces in northern, southeastern, southwestern, and central parts of China were recruited both online through social media platforms and offline through outreach events. Data collection was carried out between Jan 2020 and June 2020. Eligibility criteria for this study include: 18 years or older; assigned male at birth; currently identify as woman, gender non-conforming or non-binary. Individuals who were assigned female at birth and/or currently identify as male were considered ineligible. Overall, the study received 324 surveys, out of which 277 were valid responses from eligible participants. Out of the original study participants (N = 277), 60.6% had urban residence (hukou, a migration related term which refers to the permit of residence in China).

Participants were first screened for eligibility and eligible participants completed the surveys on self-administered computer assisted survey platform (Sojump, Shanghai, China). Each eligible participant received a unique participant ID and were required to verify their questionnaire completion with local CBO workers who facilitated the data collection process.

Aims & Hypotheses

Hypothesis 1:

We hypothesized that gender minority resilience will moderate the effect of gender minority stress on depression. Specifically, for those with higher levels of gender minority resilience, gender minority stress would have a lower impact on depression.

Hypothesis 2:

We hypothesized that social support at least partially mediates the effect of gender minority stress on depression. Specifically, those with higher levels of gender minority stress would have lower levels of social support and more prone to depression.

Hypothesis 3:

A previous study using the same dataset found statistically significant associations between internalized transphobia & discrimination and whether participants ever used gender-affirming hormones (11). In this study we hypothesized that ever use of gender-affirming hormones (as a proxy for gender-affirming care utilization) has a mediating role in the effect of internalized transphobia on depression.

Measures

Gender Minority Stress & Resilience

Gender minority stress (GMS) and resilience (GMR) items were translated into Chinese from the GMSR measures described above (9). The original study conducted cognitive interviews with participants to tailor the scale questions. However, the main constructs and meaning of the questions in the GMSR measure remained the same. Measures for gender

minority stress included the following constructs: discrimination (5 items), rejection (6 items), victimization (6 items), non-affirmation (6 items), internalized transphobia (8 items), negative expectation (9 items) for the future and non-disclosure of gender identity (5 items). For discrimination, rejection and victimization items, responses were scored based on "Yes" (1) or "No" (0). For non-affirmation, internalized transphobia, negative expectation and nondisclosure, responses were scored based on 4-point Likert scale: 0 (strongly disagree), 1 (somewhat disagree), 2 (somewhat agree), and 3 (strongly agree). Two measures of gender minority resilience were included: identity pride (8 items) and community connectedness (5 items). All responses to resilience items were also scored using the 4-point Likert scale as described above.

Depressive symptoms

The questionnaire for depressive symptoms adopted the shortened version of Center for Epidemiologic Studies Depression Scale (CES-D 10) for screening depression, developed by Andreson and colleagues (12). Total score for this short form ranges from 0 to 30 with scores equal to or over 12 indicating risks for clinical depression. Three latent constructs were measured in this 10-item questionnaire: depressed affect (four items), somatic symptoms (four items) and positive affect (2 items). Each item is rated on a four-point scale: "Rarely or none of the times (0)", "Some or little of the time (1)", "Occasionally or a moderate amount of time (2)" and "Most or all of the time (3)". Compared to the 20-item full questionnaire (cut off point at 16), the shortened version has a kappa of 0.97 (cut-off point at 10), indicating high levels of agreement between this short version and the full scale. Participants with missing values in the CES-D 10 questions will be excluded as we plan to do a complete case analysis. The original study by Dong dropped the last 2 items of the CES-D 10 for the final measurement model due to low factor loadings of the 2 items compared to other items in the scale as well as theoretical considerations (13). We carried forward this decision and plan to use only the first 8 items in this scale in our structural models. However, full CES-D 10 score with all 10 items will still be presented in table 1 with descriptive summaries.

Social Support

Social support from friends and family was measured with 12 items, including 6 items on emotional availability such as "I have someone in my life who cares about my feelings" and 6 items on practical and direct support such as "I can count on my friends when things go wrong". Response options were all on 4-point Likert scale similar to those described in GMSR section. Social support will be included as a sum-of-scores continuous & observed variable in the structural model for hypothesis 2.

Gender Affirmation Care Utilization

In terms of gender affirming care, participants were asked "Have you ever used hormones for gender affirming purposes (HRT)" and "Have you ever undergone any gender affirming surgical procedures". Options included both history and intentions of use: "Never, and do not

plan to", "Never, unsure about whether or not I will", "Never, but planning to", "I have in the past" and "I am currently". The diagnosis process for gender dysphoria inherently excluded individuals with major depressive disorders from the eligibility for gender affirming surgical procedures. Providers require individuals to prove that their gender dysphoria is not caused by any other major mental health issues such as depression. Such requirements are typically less stringent for hormone access. Therefore, we believe that gender affirming surgical procedures would not be a mediator due to the directionality of causality. However, given the importance of this variable, we will still present descriptive summaries in table 1. We plan to recode hormone use using the following 2 categories: 1 for ever using gender-affirming hormones, never use but plan to and 0 for never use (and unsure or other).

Other Covariates

Three covariates will be included as confounders: age (continuous in years), income (ordered categories, 1: less than 3000, 2: 3000-6000, 3: 6000-10000 and 4: over 10000), and gender identity. The original survey categorized gender identity into transgender women, gender non-conforming or non-binary, women, crossdressers (CD) and *Yao* or transsexual after consulting with local informants. Transsexual translates to an outdated yet still used local term for those who desire to change their sexual characteristics through gender affirmation surgeries. Recognizing that transgender is an umbrella term for individuals with different gender identities, we categorized gender identity based on whether one self-identifies and/or lives with the feminine identity. Therefore, the two major categories are: transfeminine (transgender women, Yao or transsexual and women) and gender non-conforming (gender non-conforming or non-binary and CD) in this analysis.

Initial analysis and model specification

The purpose of this thesis is only to explore concepts and display knowledge and application of epidemiological skills as part of the MPH program at the University of Washington. The results are provisional, and further robust analyses and model specifications are highly needed to make any meaningful recommendations.

We will first inspect bivariate correlations between constructs in gender minority stress and resilience theory with other covariates of interest (social support and depressive symptoms) (two-sided, significance level = 0.05). In terms of scale reliability, Cronbach's alpha will be presented for the scale variables in our model.

We tested our hypotheses using separate structural equation models for hypotheses 2 and 3 proposed above. Given the complexity of a moderation model using latent variables, we tested hypothesis 1 using only observed variables in a path model. In other words, GMR, GMS and depression were all sum of scores of the respective scales in this model. For hypotheses 2 and 3, gender minority stress and depression were modeled as latent variables while social support was scored based on descriptions above. Considering our moderate sample size and model complexity, we included distal stressors proposed by the GMSR theory (i.e., negative

expectation and internalized transphobia) as the same level factors under the overarching GMS latent variable as the proximal stressors.

Given our modest sample size, standard error will be based on non-parametric bootstrapping procedures with 100 iterations to relax assumptions about the sampling distribution. We plan to report four parameters to assess our model fit: 1): Model Chi-square p values, 2): Root Mean Square Error of Approximation (RMSEA), 3): Comparative Fit Index and 4): Standardized Root Mean Square Residual. However, the nature of this analysis is exploratory, and we will only present the initial models and their model fit statistics without further model fit assessment and respecification to seek better fitting, potentially less biased models, given time and capacity constraints. In our hypothesized models, we plan to adjust for the following confounders: age, income, and gender identity. Confounders will be included in both exposure-outcome models and exposure-mediator models. For transparency purposes, we will present both standardized and unstandardized coefficient estimates for all models. We use unstandardized estimates to make statistical inferences (i.e., using confidence intervals and interpretation of the causal relationships between variables in the model) and standardized estimates for comparing the magnitude of effects. In addition, standardized estimates will also be presented in path diagrams.

Community consultation

For best practices of interpretation of results from this study, we consulted two community stakeholders who identify as transgender and work for two different community-based organizations that serve transgender and gender non-conforming individuals in China. Both stakeholders provided context of lived experiences of community members in China, potential explanations for results of this study and one of the stakeholders was involved in the original data collection for the parent study.

Results

When examining the results below, readers should note that the findings presented in this document are still subject to change and are not yet considered final. As such, the findings are inappropriate to use to make any social or policy recommendations on this topic for this population at this time.

Demographic characteristics

Demographic information of study participants is detailed in table 1. The mean age was 29 years with a standard deviation of 8 years. Most (72.1%, N=186) participants identified as transfeminine and most (87.2%, N=225) were never married. Most participants (93.8%, N=242) earn less than 1540 USD (10000 RMB) per month and 44.6% (N=115) of the participants had an education level of high school or less. Participants were relatively evenly spread among different regions with slightly less representation from central provinces since only one city was reported.

A total of 44.2% (N=114) of the participants either have used gender-affirming hormones in the past or were currently using gender-affirming hormones. Very few participants have undergone gender affirmation surgery (9.3%, N = 24) and among those who have not undergone the surgical procedure, 65% were either unsure or did not plan to undergo surgery. Based on the CES-D 10 criteria, 62% of the participants included in this study were at risk for clinical depression. The mean CES-D 10 score (using the full CES-D 10 item scale) was 11.8, with a standard deviation of 6.1, suggesting that a typical individual among this population would potentially be at risk for clinical depression.

Scale reliability of the scales measuring GMR, GMS, social support, and depression

Cronbach's alpha for the CES-D 10 was 0.784. After dropping these two items, the new Cronbach's alpha for the CES-D 10 was 0.826 among participants included in this study. The Cronbach's alpha for social support, gender minority stress and gender minority resilience scales were 0.92, 0.95 and 0.83 respectively, indicating moderate to good internal scale reliability for these scales.

Hypothesis 1: Moderating role of gender minority resilience

We hypothesized based on Meyer's minority stress theory that gender minority resilience will buffer the effect of gender minority stress on depression. Effect estimates for hypothesis 1 are summarized in table 2. In terms of the main effect, every unit increase in the GMS scale is associated with a 0.165-point increase in the CES-D 10 scale (95% CI: 0.012 – 0.311). GMR is also found to be associated with depression, with every unit increase of GMR score, there is a 0.411-point decrease in the CES-D 10 scale (95% CI: -0.782 - -0.023).

In terms of interaction of GMR and GMS, for every 1 unit difference on the gender minority stress scale, those with one point higher on the GMR scale have close to no difference (less than 0.001 decrease) in their CES-D 10 score compared to those with lower GMR scores. Overall, we did not find a statistically significant interaction between gender minority stress and the effect of gender minority stress on depression (95% CI: -0.006 – 0.006). In terms of magnitude of interaction, those reporting higher or lower than average scores on the gender minority resilience tend to experience almost the exact same effects of gender minority stress on depression.

Hypothesis 2: Mediation effects of social support on the association between overall GMS and depression

Adjusted estimates of the initial model for mediation effect of social support on the association between gender minority stress are presented in Table 3. In the current model, social support was shown to mediate the effect of GMS on depression given that the indirect effect is statistically significant ($\beta = 0.082$, 95% CI: 0.018 – 0.154). However, given that the direct effect remains statistically significant after the addition of the mediated path ($\beta = 0.413$, 95% CI: 0.255 –

0.638), social support was found to partially mediate this association. Specifically, for those with one-point higher score in the gender minority stress scale, there were 0.082-point increase in the CES-D 10 scale that was mediated through the social support path when comparing participants with the same age, income category and gender identity. The social support path accounted for 18% of the overall effect of gender minority stress on depression. However, the model fit was relatively poor (fit indices included in Figure 2) based on the rule of thumb cutoff for fit statistics. As shown in Figure 2, the 95% CI for RMSEA was 0.072 – 0.092 and p value for the chi-square value of the model is less than 0.001. Therefore, results for this hypothesis remain inconclusive until they are checked with further model fit assessment and alterations to achieve a good fitting model.

Hypothesis 3: Mediating role of gender-affirming hormones (as a proxy for gender-affirming care use)

Overall, our provisional model shows that those who reported higher tendency of internalized transphobia were more prone to depression (β = 0.113, 95%CI: 0.083 – 0.143). Those who reported higher tendency of internalized transphobia were also more likely to have used hormones in the past or currently at the time of data collection (β = 0.020, 95%CI: 0.007 – 0.031). However, we did not find a statistically significant association between use of gender-affirming hormones and depression (β = -0.238, 95%CI: -0.499 – 0.180). We also failed to find evidence of mediating effect of internalized transphobia on the association between internalized transphobia and depression in the current model (indirect effect β = -0.005, 95%CI: -0.011 – 0.003). As mentioned above, results for this hypothesis are also provisional and require further analyses given the relatively poor model fit (Figure 3).

Discussion

Our main goal of this study was to understand the roles of the three following coping strategies: gender minority resilience, social support, and gender-affirming hormone use in the association between gender minority stress and depression faced by transfeminine and gender non-conforming participants in China. Results from this study are provisional given the poor model fit of hypotheses 2 & 3 and the results of the findings should not be utilized to inform social and policy recommendations and decisions or guide medical and public health programmatic efforts for this population. In this initial analysis, we found that social support partially mediated the effect of gender minority stress on depression while gender-affirming hormone use did not mediate the effect of internalized transphobia on depression. Gender minority resilience was found to be negatively associated with depression while it did not significantly moderate the effects of gender minority stress on depression among this study population. Further efforts to confirm these results using better-fitting models and more robust estimates are needed to reach solid

Although the mean gender minority resilience score in our study population was lower compared to resilience scores measured with same tool among transfeminine and non-binary populations in the US, we found gender minority resilience to be negatively associated with depression (Table 2) (14). This is also consistent with previous studies on general resilience (measured using the Conor-Davidson Resilience Scale) (10) or gender minority resilience specifically among transgender population in another setting (15–17). In our study, gender minority resilience was not found to moderate the association between gender minority stress and depression. However, this finding needs to be interpreted with the following points of concern in mind. First, as mentioned above, resilience might act on alleviating symptoms of depression independently of minority stress encountered given the negative association between gender minority resilience and depressive symptoms. Secondly, we also suggest that identity pride among this population might be expressed in diverse ways that are currently not captured by the gender minority resilience scale. For example, feedback from the community stakeholder suggest that transgender individuals also express taking pride in being accomplished artists and performers or their work as part of the transgender community. Such sense of accomplishment and identity pride were not currently reflected in the gender minority resilience questionnaire.

In addition to diverse expressions of pride, another study with similar results by Breslow et al. suggested that environmental protective factors such external resources might also need to be considered in conjunction with identity pride and community connectedness when we try to understand coping systematically (18). Previous studies in the US have found that intersecting minority stressors such as discrimination and rejection were associated with eviction and housing instability among transgender women (19). Inability to meet those needs such as housing and food can contribute towards higher levels of mental health burden. King et al. further showed that intersectionality of vulnerabilities such as housing instability, lower income or education status and unmet needs for legal gender affirmation among transgender women of color in Detroit were associated with a variety of mental health outcomes, including anxiety and suicidal ideation (20). In our study population, there could be similar intersecting vulnerabilities as shown in table 1, 30.1% of the study participants earned less than 3000 RMB per month, which was lower than the average annual urban household per capita income of 49283 RMB reported by the Chinese National Bureau of Statistics in 2022 (21). The 2015 Transgender Survey found similarly that transgender individuals were more likely to face financial distress and unemployment than the general US population. Previous qualitative evidence from this original study indicated or suggested or included societal level stressors such as reported police terror and discrimination from landlords that transfeminine individuals faced could put them at risk of housing instability. Furthermore, the qualitative evidence also revealed that in the face of immense survival stress, participants described that they prioritize focusing on short-term goals & individual well-being and reducing financial instability (13). The two constructs measured by the gender minority resilience measure (community connectedness and identity pride) might need to be considered alongside environmental factors to help this population cope with high levels of stressors. More specifically, policy changes on issues such as legal gender affirmation

processes and gender-based discrimination that explicitly address structural inequalities faced by this population are also needed to improve mental health outcomes of this population (18).

Evidence for mediation model of social support is provisional, as mentioned above. Using the composite score for social support we found that overall social support from participants' social network was negatively associated with gender minority stress and depression respectively. Social support also partially mediated the association between gender minority stress and depression. Han previously found that social support and internalized transphobia together partially mediated the association between discrimination and mental health well-being among transgender women in southern China. Social support accounted for approximately 13% of the overall effect of discrimination on mental well-being, which is close to our estimate of proportion mediated by social support (22).

Both quantitative and qualitative evidence in other settings have also found social support to buffer the effect of minority stressors on suicidality or depression among transgender population (23–25). In our model, we assumed that the level of social support is affected by one's experiences of minority stressors, in particular since items such as rejection and violence could be perpetrated by one's family members. The importance of familial support as a form of support for mental well-being of transgender individuals has been highlighted in previous studies (26). However, in China and other countries in east Asia, members of the LGBTQ+ community typically lack support from their families due to the conflict between their gender identity or sexual orientation and the deeply rooted Confucian (such as filial piety) heteronormative values (27,28). In a national transgender population survey (N = 7386), 66% of the respondents reported that they did not trust their parents or guardians. For those who reported supported by family, their family members with higher socioeconomic status or who identify as women were more likely to be supportive (6). In absence of support from family members, peer support is vital to this population and evidence has documented the importance of peer support among Chinese transgender women as elder transgender women would provide informational support to their younger peers for e.g., by showing them how to correctly obtain hormones (29). Despite interpersonal levels of social support, Xie et al. also emphasized the need for support on societal and policy levels for transgender individuals in China due to lack of strict clinical guidelines and privacy assurance in gender affirmation care (30). Overall, our results added to the existing body of literature on the importance of targeting social support in order to further reduce mental health burdens due to minority stress among this population. Future studies should look at how social support at various levels by type of support and support among this population in China.

Gender-affirming hormone is a vital part of gender affirmation care that and has been shown to have positive impacts on various aspects of mental health well-being of transgender and non-binary youth as well as adults (31,32). More specifically, use of gender-affirming hormones were found to reduce impacts of gender dysphoria and subsequently improving mental health and quality of life of transgender individuals (33,34). In our current model, we used gender-affirming hormone use as a proxy for gender-affirming care use and we did not find a statistically significant association between use of gender affirming hormones and depression.

Gender-affirming hormone use also did not significantly mediate the association between internalized transphobia and depression. As mentioned above, in our analysis we were unable to assess the influence of barriers of accessing hormones, which might have a more critical influence of how internalized transphobia might impact mental health outcomes for this population in China. One previous study on transgender individuals in China found a significant association between the difficulty in obtaining gender affirming hormones and higher levels of anxiety and depression (35). Chen et al. also pointed out that in order to obtain and start on gender-affirming hormones, transgender individuals in China had to navigate a medical system with minimal awareness of transgender population and high levels of stigma, which could be extra burdensome to this population (4). In addition, a scoping review by Scheim et al. on the conditions of transgender men in lower- and middle-income countries such as India and highlighted lack of hormone access, fear and distrust of health care environments and lack of clinical guidance for hormone use as common themes among transgender men in lower- and middle-income countries (36). Taken together, burdens caused by inaccessibility of gender-affirming hormones might further contribute towards the distress caused by internalized transphobia and safe access of hormones with comprehensive care and counselling services is a critical starting point to alleviate such extra burden.

In China, accessing gender affirmation hormones under clinical setting is difficult as it is neither covered by the national health insurance nor accessible in most parts of China, especially in less developed regions (35). Only several hospitals are offering gender affirmation care services, most of which are concentrated in large cities like Beijing and Shanghai. Transgender women in China also frequently reported purchasing contraceptives as a cheaper substitute for gender-affirming hormones shown by the United Nations Development Programme's report Legal Gender Recognition in China: A Legal and Policy Review (1). In addition, community members report that the restrictive policies and high costs of gender affirmation surgery in China imposed further distress on transgender individuals who are on gender-affirming hormones and are planning to undergo surgeries.

In addition to lack of access to gender affirmation care detailed above, we also did not differentiate between hormone use under clinical guidance and obtaining hormones through the underground economy. Previous evidence from Liu et al. showed that 67.6% of transgender individuals in China who used gender affirming surgery reported ever obtaining hormones through informal access. In addition, only 8.8% of transgender individuals using hormones were using it under guidance. Another survey on LGBTQ+ adolescents in China revealed that more than 83% of transgender adolescents did not seek clinical guidance or counselling support after encountering severe side effects (37). Yang et al. suggested that accessing hormones informally and starting gender-affirming hormones without guidance is of concern since individuals would receive minimal support while facing higher levels of uncertainty (38). Furthermore, transgender individuals (youth in particular) who obtained hormones through underground markets might be further exploited and threatened by the merchants as they face threats of exposing their concealed identity and power imbalances in such trading process. In order to reduce risks and

harms of using hormones through informal access, expansions of gender-affirmation health care services are needed to allow for equitable and safe access to gender affirming care in cities other than only the capital city of each province.

Limitations

Analytic limitations

There are several limitations to the study which could influence the results. First of all, this is an initial analysis without sufficient refining of model fit and mis specified models might not be the most accurate representation of the data. Estimates from our models 2 and 3 are provisional and should be interpreted with caution as mentioned above. The sample size is moderate, given the difficulty of reaching such a marginalized population. For hypothesis 2, the current model fit was relatively poor, potentially due to our moderate sample size and large number of variables in the model. Missing not at random is another limitation to our study, especially for the social support questions. As previously mentioned, this study is a complete case analysis which only included 258 individuals with complete data on the CES-D form. There were originally 324 completed surveys at the end of study recruitment. Individuals who were excluded might have a harder time answering questions related to their relationships with their family (asked in the social support measure), mental health conditions and violence experiences (asked in the gender minority stress measure) that are difficult for them. Such missingness could have a considerable impact on our study estimates as those who did not complete the survey could have different levels of depression, social support, and stress experiences than those who were able to complete the survey. There might also be self-report biases associated with complete data as questions that could be considered intrusive and hard to answer, especially given the sensitivity of as well as stigma around mental health. We also only presented mediators in separate pathways and used observed variables instead of latent variables in our hypothesis 1 model as well as for social support given our moderate sample size and model fit considerations. Since latent variables attempt at partitioning out measurement errors, only using sum of scores or observed variables for those constructs might produce biased estimates. This sample of transgender and gender non-conforming individuals was recruited from CBOs providing HIV testing services and might not be representative of the wider transfeminine and gender non-conforming individuals in China. Our interpretations and incorporation of community feedback is also not without limitations. Our community stakeholder acknowledged that this is a large and diverse population group and those who were consulted on this study are not necessarily entirely representative of the community at large. Additionally, this is a cross-sectional survey and the correlations established will lack temporality, especially for variables such as gender-affirming hormone use. As noted earlier, mediation models assume temporality between exposure and mediators as well as between mediators and outcomes. Future longitudinal studies are needed, especially in this area of gender-affirming hormone use to understand their long-term effects on mental health outcomes.

Measurement limitations

The social support and gender minority resilience scales were not edited or validated in detail through cognitive interviews given the capacity and limited resources of the original study team. Future studies should also aim to first validate measurement tools in this population in China before conducting further confirmatory analyses. In particular, culturally appropriate and context specific adaptations of the GMSR measures is needed to measure and understand the diverse range of experiences of minority stress and diverse expressions of resilience or pride among this community in China. Items that focus on legal and social environmental factors are also important in order to understand comprehensively the lived experiences of individuals in this community. In the survey questions, there was no distinction made between gender-affirming hormones obtained through clinics and gender-affirming hormones from the underground economy. Those who obtain gender-affirming hormones from the underground economy might have different characteristics from those who obtain gender-affirming hormones through clinics. For example, those who obtain hormones through underground merchants might be economically disadvantaged, given the cost of prescription, laboratory tests and counseling. In addition, those who are in less developed areas in western parts of China reported higher barriers of access to gender-affirming hormones than those in eastern parts (35).

Conclusion

In this study we highlighted the mental health burden faced by transfeminine and gender non-conforming individuals in China. Although gender minority resilience was not observed to moderate the effect of minority stress on depression, it was found to be negatively associated with depression independently. No association was observed between ever use of hormones and depression among this population. However, we highlighted that barriers to accessing hormones or surgery could impose more burden on this population and future studies need to focus on evidence that captures the unmet demands of and difficulty of access to gender affirmation care in China, especially in less developed regions. In our provisional model, social support partially mediated the effect of gender minority stress on depression. The importance of social support highlights needs for 1): future research in identifying the effects of familial, community and peer support respectively; 2): expanding and supporting efforts of family therapy, development of community safe spaces and outreach in order to provide a comprehensive social network that transfeminine and gender non-conforming individuals can trust and rely on while coping with stress. Given several analytical and measurement limitations of this study, future work with robust modeling are highly needed to confirm or disconfirm the findings of this study. At the time of writing, the findings are inappropriate to be utilized for making any significant social or policy recommendations or public health programming efforts for this population in China.

Tables and figures

Demographic Characteristics	Total n (%) unless specified (N =258)	Not At risk for clinical depression (N = 120)	At risk for clinical depression (N = 138)
Age (Mean, sd)	29.0 (7.7)	30.1 (7.9)	28.3 (7.5)
Gender Identity			
Transfeminine	186 (72.1%)	67 (68.4%)	119 (74.4%)
Gender non-conforming	72 (27.9%)	31 (31.6%)	41 (25.6%)
Sexual Orientation			
Heterosexual	206 (80.9%)	82 (83.7%)	124 (77.5%)
Gay	14 (5.4%)	7 (7.1%)	7 (4.4%)
Bisexual	23 (8.9%)	4 (4.1%)	19 (11.9%)
Other	15 (5.9%)	5 (5.0%)	10 (6.3%)
Hukou*			
Rural	103 (39.9%)	34 (34.7%)	69 (43.1%)
Urban	155 (60.1%)	64 (65.3%)	91 (56.9%)
Monthly income**			
Less than 3000	73 (28.3%)	23 (23.5%)	50 (31.3%)
3001-6000	116 (45.0%)	41 (41.8%)	75 (46.9%)
6001-10000	53 (20.5%)	23 (23.5%)	30 (18.8%)
More than 10000	16 (6.2%)	11 (11.2%)	5 (3.1%)
Education			
High school or below	115 (44.6%)	40 (40.8%)	75 (46.9%)
Some college	66 (25.6%)	24 (24.5%)	42 (26.3%)
College and above	77 (29.8%)	34 (34.7%)	43 (26.9%)
Marital Status			
Never married	225 (87.2%)	86 (87.8%)	139 (86.9%)
Engaged or married	10 (3.9%)	4 (4.1%)	6 (3.8%)
Separated or divorced	22 (8.5%)	7 (7.1%)	15 (9.4%)
Region***			
Northern	92 (35.7%)	33 (33.7%)	59 (36.9%)
Southeast	52 (20.2%)	23 (23.5%)	29 (18.1%)
Central	35 (13.6%)	9 (9.2%)	26 (16.3%)
Southwest	75 (29.1%)	32 (32.7%)	43 (26.9%)
Unknown	4 (1.6%)	1 (1.0%)	3 (1.9%)

Depression Score (CES-D10) (Mean, sd)	11.8 (6.0)	6.9 (3.1)	16.3 (4.3)
Depression Score (CES-D 10 after dropping the last 2 items (Mean, sd)	10.6 (5.4)	6.6 (3.0)	14.1 (4.6)
Gender affirming hormone use			
In the past	62 (24.0%)	24 (24.5%)	38 (23.8%)
Currently using	52 (20.2%)	20 (20.4%)	32 (20.0%)
Never, don't plan to	72 (27.9%)	27 (27.6%)	45 (28.1%)
Never, unsure	46 (17.8%)	16 (16.3%)	30 (18.8%)
Never, plan to	26 (10.1%)	11 (11.2%)	15 (9.4%)
Gender affirmation surgery			
Have undergone surgery	24 (9.3%)	12 (12.2%)	12 (7.5%)
Never, don't plan to	72 (27.9%)	21 (21.4%)	51 (31.9%)
Never, unsure	96 (37.2%)	36 (36.7%)	60 (37.5%)
Never, plan to	66 (25.6%)	29 (29.6%)	37 (23.1%)
Gender minority stress (Mean, sd)			
Discrimination (6 items, 12 total)	2.6 (2.1)	1.7 (1.7)	3.2 (1.7)
Rejection (5 items, 10 total)	2.5 (1.6)	2.1 (1.4)	2.8 (1.7)
Victimization (6 items, 12 total)	2.0 (1.9)	3.0 (2.1)	2.6 (2.1)
Non-affirmation (6 items, 24 total)	12.0 (3.7)	10.9(3.8)	12.7 (3.5)
Internalized transphobia (8 items, 32 total)	12.9 (5.4)	9.9(5.0)	14.7 (4.8)
Negative expectations (9 items, 36 total)	15.5 (5.6)	13.4 (5.5)	16.8 (5.3)
Non-disclosure (5 items, 20 total)	9.2 (3.4)	8.4 (3.7)	9.6 (3.1)
Gender Minority Resilience (Mean, sd)			
Identity pride (8 items, 32 total)	13.1 (4.1)	14.2 (4.0)	12.5 (4.1)
Community connectedness (5 items, 20 total)	9.9 (2.3)	10.4 (2.6)	9.6 (2.1)
Social support (Mean, sd) 12 items, 48 total	33.0 (6.7)	35.6 (6.4)	31.1 (6.4)

Table 1: Item level descriptive statistics
**Hukou: Refers to the residence status of a Chinese citizen given where they were born; this residence status could be tied to the type of insurance one holds in the universal health care system in China.*
***Income of 3000 yuan is equivalent of approximately 460 USD; 10000 yuan is equivalent of 1540 USD*
****Region: Northern (Shenyang, Jinan, Qingdao); Southwest (Kunming, Guiyang, Nanning); Southeast (Guangzhou, Nanjing); Central (Wuhan)*

	Standardized estimates	Unstandardized estimates	Standard error	Confidence intervals
Main effect of GMS on depression (c)	0.497	0.165	0.073	0.012 – 0.311
Direct effect of GMR on depression (b)	-0.346	-0.411	0.202	-0.782 - -0.023
Direct moderation effect (gender minority resilience x gender minority stress) on depression (a)	0.009	0.000	0.003	-0.006 – 0.006

Table 2: Moderating role of gender minority resilience on the effect of gender minority stress on depression; adjusted for age, income categories and gender identity.

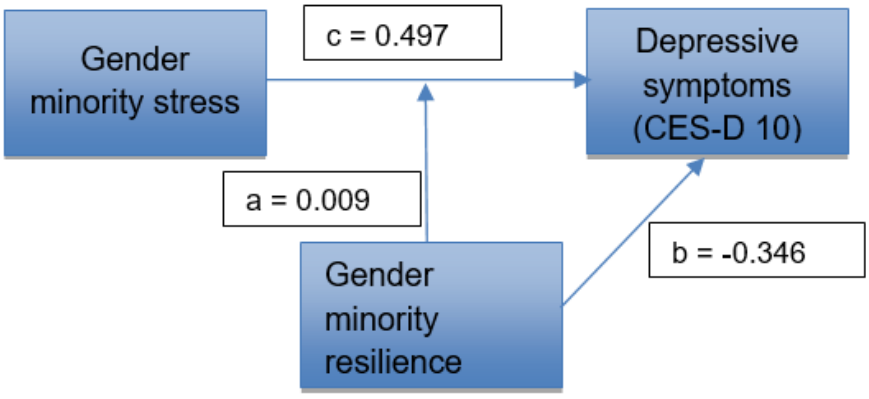

Figure 1: Path diagram for moderation effect of gender minority resilience on the association between gender minority stress and depression

	Standardized estimates	Unstandardized estimates	Standard error	Confidence interval for unstandardized estimate
GMS -> Social support (a1)	-0.209	-1.394	0.604	-2.567 - -0.282
Social support -> CES-D (b1)	-0.304	-0.054	0.012	-0.077 - -0.029
Indirect effect (a1 * b1)	0.070	0.082	0.036	0.018 – 0.154
Direct effect GMS -> CES-D(c)	0.321	0.413	0.096	0.255 - 0.638
Total effect	0.348	0.488	0.108	0.316 – 0.726
Proportion mediated (indirect effect/total effect)	16.9%			

Table 3: Mediation effect of social support on the association between gender minority stress and depression (adjusted for income, gender identity and age)

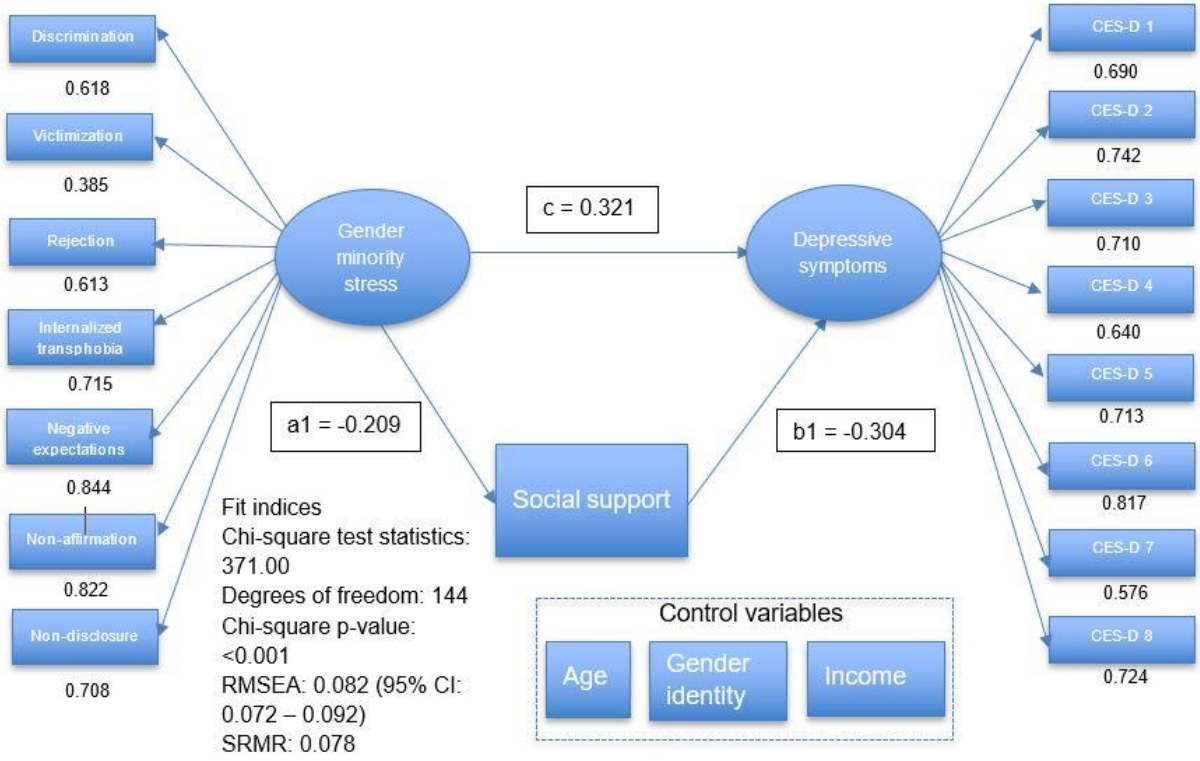

Figure 3: Path diagram for hypothesis 2 testing mediation effect of social support on the association between overall gender minority stress and depression

	Standardized estimates	Unstandardized estimates	Standard error	Confidence interval for unstandardized estimates
IT -> gender-affirming hormone use (a1)	0.221	0.020	0.006	0.007 – 0.031
gender-affirming hormone use -> Depression (b1)	-0.100	-0.238	0.150	-0.499 – 0.180
Indirect effect (a1 * b1)	-0.022	-0.005	0.003	-0.011 – 0.003
Direct effect (c)	0.095	0.113	0.018	0.083 – 0.143
Total effect	0.091	0.108	0.017	0.078 – 0.136
Proportion mediated (Indirect effect / Total effect)	4.63%			

Table 4: Mediation effect of gender-affirming hormone use on the association between internalized transphobia and depression (adjusted for income, gender identity and age)

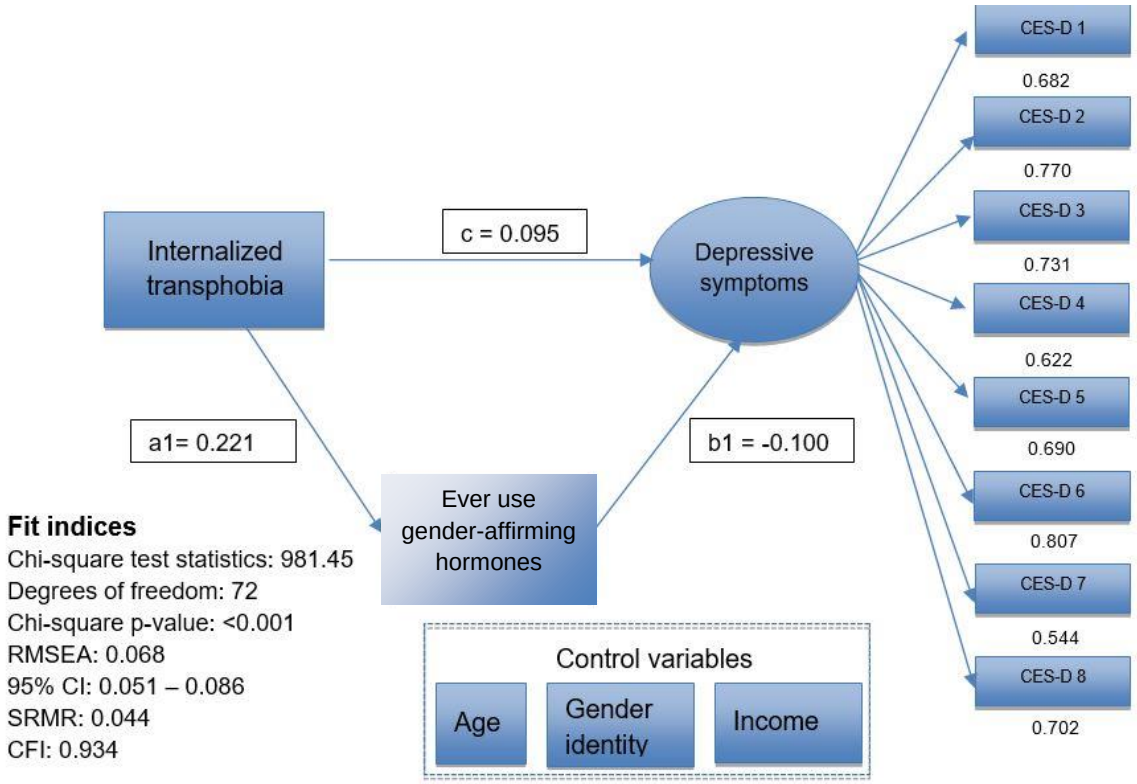

Figure 4: Path diagram for model 3 testing mediation effect of gender-affirming hormone use use on the association between internalized transphobia and depression

Appendix table:

	Rejection (1)	Discrimination (2)	Victimization (3)	Non-disclosure (4)	Non-affirmation (5)	Negative expectations (6)	Internalized transphobia (7)	Community connectedness (8)	Identity pride (9)	Social support total (10)	Depressive symptoms (11)
1		**0.64**	**0.38**	**0.31**	**0.49**	**0.46**	**0.43**	0.08	0.04	**-0.25**	**0.38**
2	**0.64**		**0.22**	**0.36**	**0.52**	**0.49**	**0.39**	**0.16**	**0.12**	**-0.14**	**0.23**
3	**0.38**	**0.22**		**0.21**	**0.30**	**0.33**	**0.26**	-0.05	0.03	-0.12	**0.25**
4	**0.30**	**0.36**	**0.21**		**0.62**	**0.65**	**0.51**	**0.33**	0.11	-0.12	**0.22**
5	**0.49**	**0.52**	**0.30**	**0.62**		**0.70**	**0.57**	**0.33**	**0.17**	-0.08	**0.25**
6	**0.46**	**0.49**	**0.33**	**0.65**	**0.70**		**0.61**	**0.27**	0.05	**-0.17**	**0.31**

7	**0.43**	**0.39**	**0.26**	**0.51**	**0.57**	**0.61**		0.08	-0.01	**-0.25**	**0.51**
8	0.08	0.16	-0.05	**0.33**	**0.33**	**0.27**	0.08		**0.17**	0.05	-0.12
9	0.04	0.12	0.03	0.11	**0.17**	0.05	-0.01	**0.17**		**0.43**	**-0.24**
10	**-0.24**	**-0.14**	-0.12	-0.12	-0.08	**-0.17**	**-0.25**	0.05	0.43		**-0.41**
11	**0.38**	**0.23**	**0.25**	**0.22**	**0.25**	**0.31**	**0.51**	-0.12	**-0.24**	**-0.41**	

Appendix Table 1: Bivariate correlation matrix of gender minority stress and resilience constructs, social support, and CES-D 10 scores; correlations that are statistically significant at $\alpha = 0.05$ (p value under but not including 0.05) are bolded

Summary of community stakeholder feedback

1. Access to health care the comprehensively ensures best quality care is needed as many community members were obtaining hormones from underground markets without proper counseling and medical advice meanwhile could be poorly supported by others in their social networks
2. Many of those who are currently using gender-affirming hormones might be waiting for gender affirmation surgeries, but given the restrictive and inhumane policies on accessing surgery and changing gender on national ID in China, they had to report their sex assigned at birth as their gender on national identification cards, which causes much distress when they are looking for jobs, going to the hospitals or anytime they need to use the national ID.
3. Identity pride might be expressed in different forms for different individuals. For e.g., some might express pride in their occupation as dancers or singers, these were missed by the current resilience scale but were important parts of their identities.
4. Most of the community interactions are positive, however, type of interaction is important context. Supportive groups chats allow members to make friends and extend their social network, with a better sense of belonging.
5. Some forms of community interactions might bring further distress instead of positive support in certain circumstances: for e.g., participants get together in chat groups to purchase hormones and discuss side effects, which could be anxiety-inducing instead of facilitating. This is connected with the previous point about lack of access to safe spaces and fear (and distrust) of public hospitals and hostile clinical environments. These should all be considered when we discuss safer community space for transfeminine and gender non-conforming individuals

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