Sexual minority mental health: investigating the association between sexual identity, depressive symptoms and suicide attempts in a community sample of adolescents

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Abstract

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Background: Previous studies have highlighted the elevated risk of depression and suicidality among sexual minority youth (SMY). However, few studies have investigated effect modifiers of the association between sexual identity and depressive symptomology. **Methods:** We used data from a community sample of adolescents (n = 465) to describe differences between heterosexual and SMY in depression symptom counts assessed over the adolescent period and lifetime history of suicide attempts by late adolescence. We used negative binomial regression to adjust for relevant confounders of the association between sexual identity and depressive symptoms. We used logistic regression to investigate the association between sexual identity and lifetime odds of suicide attempt, while adjusting for relevant confounders. We conducted a stratified analysis to investigate the role bullying plays in depressive symptoms among heterosexual and SMY. We also examined whether maternal connection, social support, or emotion dysregulation modified the association between sexual identity and depressive symptomology. **Results:** We found that SMY experienced higher levels of depressive symptomology (Symptom Count Ratio: 1.36; 95% CI: 1.15, 1.61; $p < 0.001$) and higher odds of lifetime suicide attempt (OR: 6.65; 95% CI: 2.72, 16.27, $p<0.0001$). We also found that SMY were more likely to report being bullied; and among both heterosexual and SMY, those who experienced more bullying reported higher depressive symptoms. We found that maternal connection was an effect modifier of the association between sexual identity and depressive symptomology. **Conclusion:** SMY reported more depressive symptoms and were more likely than heterosexual youth to have experienced a suicide attempt. The association between SMY and depressive symptoms was weaker among youth who reported stronger connection with their mothers. Interventions to strengthen parent-child relationships could contribute towards reducing mental health disparities for SMY.

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1. Introduction

Suicide and depression are significant health concerns among adolescents in the United States. Suicide is the second leading cause of death among 11 to 21-year-olds (CDC, 2017), and statistics from 2016 suggest that around 3.1 million adolescents, or 12.8% of the population between the ages of 12 and 17, experienced at least one major depressive episode in the year prior (NIMH, 2016). Research among adolescents that belong to sexual minority groups has demonstrated elevated rates of adverse mental health outcomes compared to heterosexual adolescents (Marshal et al., 2011).

1.1. Background

Sexual minority youth (SMY) are those that experience same sex-attraction or identify as Lesbian, Gay, Bisexual, or Transgender (LGBT). Higher rates of depression have been identified in many studies among sexual minority youth. A meta-review of studies conducted among SMY described average elevated depression levels that were .33 standard deviations higher than among heterosexual youth (Marshal et al., 2011). The same meta-review also found that SMY reported an average three times higher odds of suicidality compared to heterosexual youth (Marshal et al., 2011). Further, the disparities increased as the severity of suicidality increased: odds were 1.96 higher for ideation, 2.20 higher for intent or plans for suicide, 3.18 for suicide attempts, and 4.17 for suicide attempts that required medical attention (Marshal et al., 2011). Additionally, there is evidence that elevated prevalence of mood disorders and suicidality begin as early as 9-10 years of age among sexual minority youth (Blashill & Calzo, 2019). Studies that focus on specific subgroups such as gay or trans adolescents have identified similar patterns. A meta-analysis of studies conducted with people identifying as LGB found 2.47 higher lifetime

odds of suicide attempts (King et al., 2008). A population-based study of transgender adolescents found 2.99 times greater odds of suicidal ideation compared to the general population (Perez-Brumer, Day, Russell, & Hatzenbuehler, 2017).

Although depression and suicide attempts may be serious health concerns on their own and signs of significant distress, they also have implications for a variety of other issues in this population. Suicidal ideation and attempts are strong predictors of death by suicide in adolescents (Miranda, Ortin, Scott, & Shaffer, 2014).

1.2 Theoretical framework

Meyer's Minority Stress Model (2003) has been an important conceptual tool that has informed much of the research on mental health disparities among sexual minority populations. The model recognizes that it is not sexual identity that leads to negative mental health outcomes, but rather "circumstances in the environment" (Meyer, 2003; Figure 1). As such it is helpful in recognizing the role that social norms, attitudes, and policies have in determining the health status of minority populations, including sexual minorities. These environmental conditions can cause stress which, in turn, can lead to adverse mental health outcomes, shifting the onus of responsibility from minority populations or individuals with these backgrounds to unfavorable or hostile surroundings.

Meyer describes stressors in his model as either "distal" or "proximal." These refer to (1) specific events or experiences versus (2) the way that people think about and react to these experiences and their own identity. Distal stressors might include instances of discrimination and violence associated with LGBT identity. Recent research supports the importance of distal stressors in influencing mental health. Studies have highlighted that sexual minority youth have

greater odds of being exposed to various forms of violence including child abuse and intimate partner violence, which can explain some of the elevated mental health outcomes including depression (McLaughlin, Hatzenbuehler, Xuan, & Conron, 2012). Several studies have found that both bullying and peer victimization during middle school and high school are higher among SMY compared to heterosexual adolescents (Schuster et al., 2015). Other researchers have highlighted how LGBT youth may be at increased risk of victimization from parents and classmates due to their sexual identity and that the risk of suicidal attempts increases with earlier openness about sexual identity, parental efforts to discourage gender-atypical behavior, and lifetime verbal abuse related to sexual identity (D'Augelli et al., 2006). Additionally, some studies have found an association between hate crimes against LGBT individuals in a neighborhood and odds of suicidality among adolescents residing there—suggesting that even perceptions of discrimination are sufficient to influence stress (Duncan & Hatzenbuehler, 2014).

1.3. Effect modifiers

Using Meyer's conceptualization of Minority Stress, there are a number of factors, including parental connection, social support, and emotion regulation, that could serve as important effect modifiers or buffers in the relationship between sexual identity and mental health outcomes.

1.3.1. Parental Connection

Parent-child relationships are important for the psychological health of all children, but they have received special attention in research among SMY. Parents might be first to react and respond to gender atypical behavior or youth's disclosure of their sexual identity (Mills-Koonce, Rehder, & McCurdy, 2018). Two aspects of parenting most commonly studied include parental

acceptance and parental control. The first usually includes constructs related to warmth, affection, and support, while control usually refers to parent's attempts to impose beliefs and "undermine individuality and autonomy" in children (Mills-Koonce et al., 2018, p. 641). While these aspects of parenting are applicable to all adolescents, they might have additional significance among SMY. Indeed, there is some evidence that certain of these parenting aspects are associated with mental health among SMY. One study among LGBT adolescents found that increased parental control was associated with increased psychopathology, but parental acceptance was not (Bebes, Samarova, Shilo, & Diamond, 2015). Further, parental efforts to control and dissuade children's gender atypical behavior was associated with increased odds of suicide attempts (D'Augelli et al., 2006). A study of LGB adolescents found that low parental support mediated in part the association between sexual identity and higher odds of depressive symptomology (Needham & Austin, 2010). Another study seeking to further understand the mechanisms through which parental connection impacts mental health found that SMY with autonomy-supportive parents reported decreased feelings of shame and internalized homophobia which was associated with better psychological health (Legate, Weinstein, Ryan, DeHaan, & Ryan, 2018). One of the few research studies to investigate effect modification by parental support found that among lesbian and gay participants, higher parental acceptance was protective against distress related to an individuals' sexual orientation. However, parental acceptance did not buffer against overt discrimination which still remained related to depressive symptomology (Feinstein, Wadsworth, Davila, & Goldfried, 2014).

1.3.2. Social Support

Support from peers and family has long been hypothesized to play an important role in the mental health of LGBT individuals. Hatzenbuehler (2009) hypothesizes that self-stigma and minority stress could impact youth's ability and desire to form close relationships with others. Recent studies have suggested that social support could influence outcomes such as depression, anxiety, and suicidality in SMY. One study among LGBT adults that sought to evaluate the importance of loneliness and peer relationships through a mediation analysis concluded that these were important factors for both mental and physical health (Mereish & Poteat, 2015). Another study that looked at depression symptoms also concluded that a lack of social support was an important factor that could explain the difference in depression scores between gay and bisexual adult men living in rural areas compared to those living in urban areas who had lower levels of depression (Cain et al., 2017). A study that sampled transgender adults found that social support from family and peers moderated the relationship between stigma and depression (Bockting, Miner, Swinburne Romine, Hamilton, & Coleman, 2013). When studying the predictors of suicidality in SMY in England, investigators found that being unable to talk about one's emotions with others was associated with increased risk of suicidality (McDermott, Hughes, & Rawlings, 2018). The importance of social support identified in a variety of research studies highlights that this is an important factor in this population that could warrant further attention.

1.3.3. Emotion Dysregulation

The ability to regulate one's emotions has been hypothesized as an important factor influencing the mental health of SMY. Emotion regulation is related to the "proximal stress processes" highlighted by Meyer's Minority Stress Model and could play a role in the way

adolescents respond to instances of discrimination and process complicated emotions (Hatzenbuehler, 2009). Studies investigating this construct have measured it as both emotional awareness (Hatzenbuehler, McLaughlin, & Nolen-Hoeksema, 2008), and as specific experiences and behaviors related to regulating difficult emotions (Bradley et al., 2011). Emotion regulation is a general process that has been shown to be independently related to depressive symptomology and a history of suicide among adults (Bradley et al., 2011). There is some evidence that SMY experience higher rumination which is associated with emotion dysregulation, depression and anxiety (Hatzenbuehler et al., 2008). However, while another study also found that sexual minority youth had poorer self-regulation skills, emotion regulation itself was not associated with depression in that sample (Martin-Storey & Crosnoe, 2012). Thus, it remains unclear whether there are specific ways this process is related to minority stress and if it can help to buffer stressors that can lead to depression or suicide attempts among SMY.

1.4 Study objectives

The current study is an attempt to leverage longitudinal data collected through the Developmental Pathways Project to meet the following aims and test the accompanying hypotheses:

1. To describe differences between sexual minority and heterosexual youth in suicide attempts and depression, across the adolescent period.
    a. Hypothesis 1a: Sexual minority youth will experience elevated levels of suicidality and depression compared to heterosexual youth.

b. Hypothesis 1b: Associations between sexual minority status and mental health will remain significant in multivariate models with adjustment for sociodemographic variables.

2. To compare the prevalence of bullying and the role of bullying in mental health status among sexual minority and heterosexual adolescents.
    a. Hypothesis 2a: Sexual minority youth will experience elevated levels of bullying compared to heterosexual youth.
    b. Hypothesis 2b: Bullying will play a more prominent role in mental health for sexual minority youth than for heterosexual youth.
3. To examine whether social support, emotion dysregulation, and parental connection modify the association between sexual minority status and depression.
    a. Hypothesis 3a: The association between SMY and depression will be weaker among youth with strong connection to parents, strong social support, and low emotion dysregulation.

2. Methods

2.1. Sample

Data for this study came from the Developmental Pathways Project (DPP), a population-based prospective cohort study, undertaken to understand the predictors and development of co-occurring depression and conduct disorders in adolescents. The study has been approved by the University of Washington Human Subjects Division.

The study sample was recruited from 6th grade classrooms in four Seattle public middle schools. The sample was selected using a two-stage sampling process (Vander Stoep et al.,

2005). First, between 2001 and 2004 universal classroom screening of 2,187 6th graders for depression and conduct problems was carried out by administering the Mood and Feelings Questionnaire (MFQ) (Angold & Costello, 1987) and Youth Self Report (YSR) (Achenbach & Edelbrock, 1987) Externalizing scale. To enhance the likelihood of observing psychopathology and related outcomes over the course of middle school, children whose screening scores were high on depression and/or conduct dimensions were over-sampled for participation in the longitudinal study. A 0.5 standard deviation above the mean cutoff score on both scales was used to categorize students as scoring high on neither depression nor conduct problems (NE); high on depression, only (DP); high on conduct problems (CP), only; or high on both depression and conduct problems (CM). A target number of children was randomly selected from the four cells at a ratio of approximately 2 NE: 1 DP: 1 CP: 1 CM. In the general school population, the ratio is close to 6 NE: 1 DP: 1 CP: 1 CM. Of those randomly selected, 64.2% agreed to participate. The cohort study sample included 521 6th grade students.

As part of the original cohort study, adolescents and one parent were interviewed at baseline (age 11-12 years) and at 6, 12, 18, 24, 36, and 72-month follow-up, and again at age 21-22 years. We will use data from all waves of the original study. Between 80% and 91% of the original cohort was retained at each follow-up assessment, including 91% at 72-month follow-up. For this study, we only included 465 participants in the DPP cohort who completed the sexual identity item during their 72-month or 21-22 year assessment administered in late adolescence and early adulthood.

2.2. Measures

2.2.1. Independent Variable

The main exposure of interest was sexual identity as measured by a question that asked youth "what do you consider to be your sexual orientation?" with response options "Straight/Heterosexual," "Gay/Lesbian/Homosexual," or "Bisexual." In their review of research studies on sexual minority populations, Marshal et al. (2011) described that sexual orientation in adolescents is usually operationalized in the following ways: (1) through asking youth to self-identify, (2) when youth endorse same-sex attraction, (3) when youth provide a history of same-sex sexual behaviors, or (4) through a combination of two or more from 1-3. These investigators found that operationalization of sexual identity did not affect the association between sexual orientation and mental health in the studies they reviewed (Marshal et al., 2011).

In the Developmental Pathways Project youth were asked about their sexual orientation during the 72-month follow-up interview, when they were 17-18 years of age, and then again at age 21-22. We created a binary variable with categories of "sexual minority", reflecting whether the participant endorsed "gay/lesbian/homosexual" or "bisexual" at either time point, or "heterosexual" if they endorsed this category at both time points. There were 36 individuals who identified as sexual minority during the 72-month follow-up interview, and 15 new participants from the follow-up at age 21-22 that did not identify as such in the previous interview.

2.2.2. Dependent Variables

The main outcomes of interest in this study are (1) depressive symptoms and (2) suicide attempts. Both were measured using the *Computer-based Diagnostic Interview Schedule for Children Version IV* (C-DISC) (Costello, Edelbrock, & Costello, 1985). The C-DISC is a fully structured diagnostic interview designed to be administered by a lay interviewer. It has been used in clinical settings to aid in diagnosis and in research studies to easily collect comprehensive

information on participants' mental health across a lifetime and over a given period of time (i.e., past twelve months or past 4 weeks) (Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). The C-DISC IV was the most recently revised version at the time that data collection began and was designed to identify a variety of mental disorders described in the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (American Psychiatric Organization, 2000).

The C-DISC IV mood disorders module includes items on DSM-IV symptoms of major depression. Although these items are used to determine clinical diagnosis, a count of symptoms is also generated by the C-DISC. Symptoms were considered present when youth reported experiencing them "most of the day" or "almost every day" in a two-week period in the past year. There were nine criteria for depression, with two to four items per criteria, for possible total symptom count of 22 (Shaffer et al., 2000).

We used symptom count based on youth report since previous research has found that for internalizing symptoms such as depression, adolescents serve as the best respondents of their own psychopathology (Achenbach, McConaughy, & Howell, 1987). We created a composite score of depressive symptoms measured at baseline, and 12, 24, 36 and 72-month follow-up in which past twelve-month symptom count from each of the interviews the youth completed was averaged.

Suicide attempt was measured using an item from the CDISC administered during the 72-month follow-up of data collection in which youth were asked about ever having attempted suicide before in their life (with response options "yes" or "no").

2.2.3. Other Relevant Factors

Bullying. We measured exposure to bullying using four items from the Olweis Bullying Scale which asked about specific instances of bullying and discrimination at school (Solberg & Olweus, 2003). Briefly, these items included four questions relating to being (1) teased, (2) excluded, (3) stolen from, and (4) hit/kicked/pushed, with response options on a five-point Likert scale ("never," "once or twice," "occasionally", "often," or "frequently"). We dichotomized students into two groups: those who reported "never" or "once or twice" to all four of the items were classified as "low bullying," while those that responded "occasionally," "often" or "frequently" on one or more items were classified as the "high bullying" group. We used bullying information which was collected during the 72-month follow up interview in the study.

Demographics. Demographic information including child's sex, race/ethnicity, middle school of attendance, and household income was obtained from parents during the first visit. Sex, race/ethnicity, and household income were used as covariates in multivariable models.

2.2.4. Effect modifiers

Parental connection. Youth's connection with parents was measured using the Parent Connection Subscale from the Parent Behavior Index (PBI) that was administered at the 24-month follow-up. The Parent Connection Subscale assesses aspects of parent's expressions of affection, such as "my mother/father is a person who cheers me up when I am sad" or "who enjoys doing things with me", with responses of "a lot like her/him", somewhat like her/him" and "not like her/him" (Schaefer, 1965). Youth completed the PBI twice, reporting on their connection with both their mothers and fathers. For our current study we only examined the scores relating to connection with mothers, partly because children often did not have data on both parents. Previous research has found that certain aspects of maternal parenting have a

greater influence on SMY mental health than paternal parenting (Bebes et al., 2015). We dichotomized all youth into two groups: those with a score at or below the mean score of 15.19 were categorized as "low" connection and those with a value greater than the mean score we categorized as having a "high" connection.

Social support. Social support was measured using the Multidimensional Scale of Perceived Social Support (PSS) (Zimet, Dahlem, Zimet, Gordon, & Farley, 1988) administered at baseline. The PSS includes multiple items on emotional, instrumental, and informational support provided from different people: family, friends, and other significant adult. Each question was rated on a 4-point Likert scale with values ranging from "very true" to "not true." A total score was calculated from this measure to capture support provided from all sources, and it was dichotomized into high and low for youth who were at or above the mean (score of 50.57) and below the mean, respectively.

Emotion dysregulation. Emotion dysregulation was measured using the Affective Dysregulation subscale on the Dysregulation Inventory (DI) (Mezzich, Tarter, Giancola, & Kirisci, 2001) that was administered at the 24-month follow-up. This scale has been shown to have strong psychometric properties. The Affective Dysregulation subscale includes items on arrousability, emotional control, and irritability. For each item (e.g., "my mood goes up and down without a reason") youth responded on a Likert-scale ranging from "never true", "occasionally true", "mostly true", and "always true." The scores were dichotomized into "high" emotion dysregulation and "low" emotion dysregulation for youth who were above and below the mean (of 24.59), respectively.

2.3. Statistical Analyses

There were three parts to our analytic plan to address the three aims of this study. For Aim 1a, we calculated mean depression symptom count and proportion of youth who reported a lifetime suicide attempt, comparing heterosexual and sexual minority youth. A Wilcoxon-ranked sum test was used to compare the distribution of depression symptom counts between the groups. This non-parametric test was used because of the non-normal distribution of the depression symptom count data. A chi-square test statistic was used to compare proportions of youth in each group who had attempted suicide. For the multivariate analyses (Aim 1b), we fit separate models for each of our outcomes of interest. Due to the non-normal distribution of depression symptom count, we used negative binomial regression to model the association between depression symptom count and sexual identity. We used logistic regression to model history of suicide attempt with sexual identity as the predictor. We included race/ethnicity, income, and sex as covariates in these models.

For Aim 2a, to understand if bullying was associated with sexual identity, we used a Chi-square test to compare the proportions who reported high bullying between SMY and heterosexual youth. For Aim 2b we conducted a stratified analysis using Wilcoxon-ranked sum tests to determine whether the association between bullying and depression differed between SMY and heterosexual youth.

For Aim 3, to test for effect modification, we fit three separate models, each with one interaction term in the negative binomial (depression symptom count) analysis described above. Negative binomial regression was used to examine if (1) social support, (2) emotion regulation, and (3) maternal connection modified the association between sexual identity and depression symptom count. To examine whether social support modified the association between sexual

identity and depression symptom count, we used a negative binomial regression model with depression symptom count as the outcome and sexual identity as the exposure, and we included an interaction term between sexual identity and social support. We evaluated the coefficient on the interaction term to determine if social support was an effect modifier. These same procedures were followed for testing whether emotion dysregulation and maternal connection modify the effects of SMY status on our depression outcome.

All statistical analyses were run using *R* version 3.6.0 (R Core Team, 2019). We used $p < .05$ to indicate statistical significance.

2.3.1. Sensitivity Analyses

To account for missing data we carried out multiple imputation by chained equations using the MICE package in R (van Buuren & Groothuis-Oudshoorn, 2011). This method of imputation assumes that values are missing at random, and observed values are used to fill in plausible or likely estimates in order to create a "complete" dataset (Azur, Stuart, Frangakis, & Leaf, 2012). We performed the multiple imputations 20 times and imputed missing values based on all the variables that would be subsequently used in the analyses: sexual identity, race/ethnicity, income at baseline, sex, history of suicide attempts, average depression over all of study visits, bullying at the 72-month follow up, parental connection at 24-month follow up, perceived social support at baseline, and emotion dysregulation at 72-month follow up. There were no missing values in race/ethnicity or in the average depression score over the lifetime as this variable was a composite score composed of all the available observations. We then re-ran all of the models using the "complete" dataset.

3. Results

3.1. Participants

Characteristics of the study sample are included in Table 1. There were 465 youth who answered the question on sexual minority identity during the two final study interviews. In total 51 (9.7%) participants identified as sexual minority youth, and 461 (88%) participants identified as heterosexual. There was generally equal distribution between the two groups in terms of income and schools of attendance. However, there were some differences between participants in distribution of sex and race/ethnicity: sexual minority individuals were more likely to be female (74.5% vs 44.9%) and Non-Hispanic white (60.8% vs 46.1%).

3.2. Aim 1: Describe disparities in mental health outcomes

Among SMY, the mean depression score was 8.25, while among heterosexual youth it was 6.12 (Table 2). Approximately 6.7% of youth reported at least one lifetime suicide attempt by age 17-18 years, including 23.5% of sexual minority youth and 4.6% of heterosexual youth.

In our unadjusted models, sexual identity was significantly associated with depression symptom count. Sexual minority youth had an average depression symptom count that was 1.34 times higher than the average depression symptom count of heterosexual youth (95% CI 1.14-1.59; $p = 0.001$). Results were similar after adjusting for race, income, and gender (Symptom Count Ratio: 1.36, 95% CI 1.15 – 1.61; $p < 0.0001$) (Table 3).

Sexual identity was also significantly associated with lifetime odds of suicide attempt. In our unadjusted models, SMY had 6.40 times higher odds of reporting attempting suicide in their lifetime compared to heterosexual youth (95% CI: 2.89, 14.15; $p < 0.001$). Findings were similar

in our model adjusting for race, income, and sex (OR: 6.64, 95% CI: 2.72 – 16.27; $p < 0.001$) shown in Table 4.

3.3. Aim 2: Investigate bullying prevalence and its role in depressive symptoms

Bullying was reported by 12.2% of youth in our sample. Among SMY, 22% reported experiencing bullying compared to 11% of heterosexual youth. SMY had 2.28 times higher odds of having experienced bullying compared to heterosexual youth (95% CI: 0.97, 5.35; $p = 0.05$), but results were not statistically significant.

When we stratified the sample into heterosexual and SMY groups to evaluate the association between mental health status and bullying in each group, we found the mean depression score was markedly higher for youth who had experienced bullying in both the heterosexual and SMY groups. However, due to small numbers in the SMY group, the difference in depression scores between bullied and non-bullied adolescents only reached statistical significance in the heterosexual group (Table 6).

3.4 Aim 3: Examine potential effect modifiers

There was evidence that maternal connection modified the association between sexual identity and depressive symptoms (Symptom Count Ratio for sexual identity x maternal connection interaction term = **0.60** (95% CI: 0.50 – 0.99; $p < 0.001$)) (Table 8). When youth reported having high maternal connection, the symptom count ratio comparing SMY to heterosexual youth with high maternal support was low: 1.19 (95% CI 0.83 – 1.40). However, when youth had low maternal connection, SMY experienced significantly higher mean depression symptom counts compared to heterosexual youth (Symptom Count Ratio: 1.59; 95%

CI: 1.26 – 2.01). We did not find evidence that the association between sexual identity and mean depression symptom counts differed significantly according to levels of social support or emotion dysregulation.

3.5. Sensitivity Analyses

We re-ran all of the models using imputed data and obtained similar results. There was very little change in the symptom count ratios estimated from the negative binomial regressions or odds ratios estimated from the logistic regression analyses. There was no change in direction or statistical significance of the interaction terms. As in our complete case analysis, only the maternal connection interaction was statistically significant.

4. Discussion

Consistent with findings from previous studies, our study found evidence that sexual minority youth had poorer mental health than heterosexual youth, as reflected in symptoms of depression assessed from early to late adolescence and lifetime suicide attempts assessed in late adolescence. The associations between sexual identity and depression and suicide attempts remained statistically significant even after adjusting for family income, race/ethnicity, and sex.

In trying to understand patterns of peer victimization, we found that bullying was more prevalent among SMY. Additionally, bullying was significantly associated with depression symptom count among all youth in our sample. When we stratified by sexual identity, the relationship between bullying and depressive symptoms was similar in both groups: depression scores were higher for youth who were bullied. However, due to the small number of SMY, the association was not statistically significant among SMY.

We hypothesized that association between sexual minority identity and depressive symptoms would be weaker among youth with strong maternal connection, high social support, and low emotion dysregulation. Our study found that the strength of the youth's connection with their mother was a statistically significant modifier. SMY with a weaker connection with their mothers had a significantly higher mean count of depression symptoms compared to heterosexual youth with similarly weak maternal connection, while SMY reporting a stronger maternal connection had a mean count of depression symptoms that was more equivalent to the depression symptoms count in heterosexual youth with stronger maternal connection. We did not find that social support or emotion dysregulation modified the association between sexual identity and depression symptoms.

Our findings are consistent with previous research which has highlighted the extent of mental health disparities evident when comparing sexual minority youth to their heterosexual counterparts. Elevated rates of depression have been found in many cross-sectional studies which assessed recent depressive symptoms (Marshal et al., 2011). There have also been several studies which have assessed recent suicide attempts and found higher odds of suicide attempts among SMY (Marshal et al., 2011). A previous study that ascertained lifetime history of depression and suicide attempt among adolescents reported similar findings although in a different population. Barney (2003) reported that American Indian and Alaska Native adolescent males with same-sex attraction were almost twice as likely to have a history of depression as those without same-sex attraction and almost twice as likely to report previous suicide attempt. Additionally, the proportion with reported suicide attempts among older adolescent SMY in our study (23.5%) was very similar to the 19.1% lifetime prevalence of suicidality that a recent study found among much younger SMY who were 9 to 10 years of age (Blashill & Calzo, 2019).

Our findings on bullying prevalence are similar to other studies. Schuster, Bogart, and Elliott's (2015) studied bullying among adolescents in three different school districts and found that sexual minority youth had twice the odds of experiencing bullying in the past year compared to heterosexual youth. National data from the Youth Risk Behavior Surveillance System similarly found that 18.8% of heterosexual youth reported being bullied at school compared to 34.2% of lesbian, gay, and bisexual students (Kann et al., 2015). That the same overall relationship was found between bullying and depressive symptoms in SMY and heterosexual youth in our study suggests that bullying activates similar stress processes that the influence coping capacity and mental health regardless of sexual identity (Hatzenbuehler, 2009). This finding suggests that interventions to prevent bullying could have beneficial mental health effects among both SMY and heterosexual youth (Hatzenbuehler & Keyes, 2013). Nevertheless, prior research has also found that anti-bullying policies which specifically address the needs of SMY have a particular positive benefit for SMY.

We hypothesized that maternal connection, social support, and emotion dysregulation could be important effect modifiers of the association between sexual identity and depressive symptoms. Our study found that the strength of the adolescent's connection with their mother did modify the association, but social support and emotion dysregulation did not. Previous studies have found that parental connection is an important factor which could influence the development of depression symptomology (Bebes et al., 2015). Further, studies about the effects of parenting in SMY have also found that it was an effect modifier of the relationship between exposure to stress and depressive symptomology (Feinstein et al., 2014). Parental connection could impact important proximal stress processing mechanisms among SMY such as increased

feelings of autonomy, self-esteem, and decreased feelings of shame as reported by Legate et al. (2018).

Although we did not find that social support modified the association between sexual identity and depressive symptoms, other studies have found it is an important factor influencing the mental health and well-being of SMY. For instance, in their review of 34 articles on the subject of SMY mental health, Postuvan et al. (2019) found that inadequate social support among youth's close social network was associated with the development of suicidality. However, we used a general measure of social support that reflected support from multiple sources. In prior studies, different types of social support have been shown to be more important among certain subgroups of SMY. For instance, parent, classmate, and close friend support were associated with lower depression among lesbian youth, while in gay and bisexual males only parent support was associated with lower depression (Watson, Grossman, & Russell, 2019). Furthermore, there is some evidence that the type of social support that individuals receive could influence the mental health trajectories of SMY. SMY receiving support from family showed lower levels of depression compared to those who received support from non-family members (McConnell, Birkett, & Mustanski, 2015, 2016). Our measure of social support included family, peers, and significant others. Finally, it is possible that there was not enough variability in levels of perceived support in our sample to detect a difference in effects, as both heterosexual youth and SMY reported relatively high levels of social support.

Our study did not find evidence that emotion dysregulation modified the association between sexual identity and depression. Prior research has shown that emotion regulation plays a role in depression among adults (Bradley et al., 2011) and has been shown to be associated with depression among adolescents (Mehta & Joshi, 2017; Silk, Steinberg, & Morris, 2003; Young,

Sandman, & Craske, 2019). There have been few studies on the role that emotion regulation plays in the mental health of SMY, and the findings have been conflicting. While Hatzenbuehler et al. (2008) found that rumination, one aspect of emotion dysregulation, was associated with depression, Martin-Storey and Crosnoe (2012) did not find that emotion regulation was associated with depression in SMY. Given that there are many different skills and strategies for managing emotional distress, it would be interesting to study ways in which SMY and heterosexual youth differ in the skills they employ to effectively deal with instances of bullying or discrimination.

4.1 Strengths and limitations

One strength of our study is that our sample was heterogeneous with regard to race/ethnicity, sex, and socioeconomic status. In addition we were able to use multiple waves of longitudinal data to assess mental health outcomes over a developmental period that spanned from early to late adolescence. We additionally had information on components of the minority stress process model, including exposure to bullying, maternal connection, social support, and emotion regulation which allowed us to examine their role in the association between sexual minority status and depression.

Our study also had a number of limitations. Firstly, it is possible that adolescents would be hesitant to disclose their sexual minority identity, and this might have resulted in misclassification of sexual identity status. This would result in under-ascertainment of sexual minority adolescents and could lead us to underestimate the true difference between depression symptoms in SMY and heterosexual youth. However, ascertaining sexual orientation at two time points, including one in young adulthood, as was done in this study, may have reduced misclassification. A previous study found that assessing sexual orientation at earlier ages among

individuals could lead to a large number of adolescents being incorrectly classified as heterosexual (Marshal et al., 2013). Previous research to understand the development of gay sexual orientation found that a significant portion of individuals did not disclose or open up about their identity until relatively late (after 12th grade and before the age of 28) (Friedman, Marshal, Stall, Cheong, & Wright, 2008).

The low number of sexual minority youth in the sample limited our ability to detect statistically significant interactions. Given the limitations in sample size of SMY and low number of suicide attempt outcomes, we did not have adequate power to examine effect modification of the relationship between sexual identity and suicide attempts. It is also possible that youth might have underreported suicide attempts. Another factor that limited our power to detect significant interactions is that information on the moderators of interest was not available for the full study sample.

There are also potential problems with our approach to measuring depressive symptoms. While most past studies of mental health in SMY have looked only at recent depression symptoms, our study measured depression using an overall symptom count which averaged symptoms from several different time points across the adolescent period. Our approach could result in an underestimation of relevant depression experiences, as youth who experienced a single serious depressive episode at one of the assessment points but had low depressive scores at other time points could have relatively low average scores across the full adolescent period. Additionally, we used measures from different time points for other study variables. For instance, the bullying measure was taken from the 72-month follow-up, while maternal connection and emotion dysregulation measures came from the 24-month follow-up, and social support was from the baseline assessment. In general, the timing of these measurements could

affect our findings, as there might be critical windows where bullying, maternal connection, social support, and emotional dysregulation could have greater or lesser effects on mental health. Finally, our study was conducted among students in the Seattle Public School System, and findings might not be generalizable to adolescents living in other regions. This could be important, as past studies have found that both state-level policies (Hatzenbuehler et al., 2012) and specific events such as hate-crimes in the community (Duncan & Hatzenbuehler, 2014) can influence mental health among sexual minority populations.

4.2 Implications

Adverse mental health outcomes among sexual minority youth have been well-demonstrated in the literature. Meyer's minority stress model highlights some important areas for intervention that could be useful for improving mental health outcomes among sexual minority adolescents. Our study suggests that programs that strengthen connections between parents and adolescents could have a positive effect on the mental health of sexual minority youth. Other researchers and clinicians have reached similar conclusions in suggesting the need for interventions that target the parent-youth relationship to improve mental health outcomes among SMY (Earnshaw et al., 2017; Reitman et al., 2013). Some preliminary work is underway through the Family Acceptance Project, a San Francisco-based community research, intervention, education and policy initiative that is designed to strengthen and help families support their lesbian, gay, bisexual, and trans-sexual children (Ryan, 2010).

5. Conclusion

Among the most serious health disparities that sexual minority youth experience are high rates of suicidal behavior and depression. Meyer's minority stress model is helpful in understanding that the causes of these disparities are rooted in the environments in which SMY

find themselves. Outcomes like suicide and depression result from socially-determined risks such as discrimination, social exclusion, and stigma. Although population-based studies have been helpful in highlighting the extent to which SMY experience greater risk of adverse mental health outcomes, there has been less focus on developing effective interventions. Public health interventions which show evidence of strengthening relationships between parents and adolescents could help to reduce mental health disparities experienced by sexual minority youth.

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7. Tables and Figures

Table 1. Descriptive statistics for sexual minority and heterosexual youth.

	Sexual Minority Youth (n=51)	**Heterosexual Youth (n=414)**
Race/Ethnicity		
Non-Hispanic White	31 (60.8%)	191 (46.1%)
African-American	9 (17.6%)	107 (25.8%)
Asian/ Pacific Islander	5 (9.8%)	71 (17.1%)
Latino	5 (9.8%)	29 (7.0%)
Native American	1 (2.0%)	16 (3.9%)
Family income		
Low (<$35,000)	14 (27.5%)	133 (32.1%)
Medium ($35,000-$74,999)	20 (39.2%)	141 (34.1%)
High (>=$75,000)	16 (31.4%)	130 (31.4%)
Missing	1 (2.0%)	10 (2.4%)
Sex		
Male	13 (25.5%)	228 (55.1%)
Female	38 (74.5%)	186 (44.9%)
Missing	0 (0%)	0 (0%)
Age at enrollment		
Mean (SD)	12.1 (0.479)	12.0 (0.399)
Median [Min, Max]	11.9 [11.0, 13.1]	11.9 [11.1, 13.6]
School at baseline		
1	8 (15.7%)	96 (23.2%)
2	22 (43.1%)	197 (47.6%)
3	6 (11.8%)	36 (8.7%)
4	15 (29.4%)	85 (20.5%)
Missing	0 (0%)	0 (0%)

Table 2. Depression, suicide attempts, and bullying in sexual minority and heterosexual youth.

	All	SMY	Heterosexual	Test statistic	p-value
N	522	51	414		
Depression symptom count mean (sd)	6.0 (3.84)	8.25 (4.07)	6.12 (3.7)	Wilcoxon rank sum test: 7326.5	0.0003
Youth who attempted suicide (%)	31 (6.7%)	12 (23.5%)	19 (4.6%)	Chi-square statistic: 23.222	< 0.0001

Table 3. Symptom count ratios from negative binomial models investigating the association between sexual identity and depression symptom counts (unadjusted and adjusted models shown below).

Depression	Model 1	Model 2
	(unadjusted)	(adjusted)
Factor	N= 408	N= 397
Sexual Identity		
Heterosexual	Ref	Ref
SMY	**1.34 (1.14 – 1.59)*** **	**1.36 (1.15 -1.61)*** **
Race/Ethnicity		
White		Ref
African-American		**1.19 (1.03 – 1.39)***
Asian/Pacific Islander		1.08 (0.92 – 1.27)
Latino		1.13 (0.91 – 1.39)
Native American		1.05 (0.78 - 1.41)
Income		
Low		Ref
Medium		**0.85 (0.75 – 0.97)***
High		**0.79 (0.68 – 0.97)****
Sex		
Male		Ref
Female		**1.14 (1.02 – 1.27)***
p-values		
***p<0.0001		
** p<0.001		
* p<0.01		
† p<0.05		

Table 4. Odds ratios from logistic models examining the association between sexual identity and odds of lifetime suicide attempts (adjusted and unadjusted models shown below).

Suicide	Model 3	Model 4
	(unadjusted)	(adjusted)
Factor	N = 408	N = 397
Sexual Identity Heterosexual SMY	 Ref **6.40 (2.89 – 14.15)*** **	 Ref **6.64 (2.72 - 16.27)*** **
Race/Ethnicity White African American Asian/ Pacific Islander Latino Native American		 Ref 1.03 (0.34 - 3.11) 1.97 (0.70 - 5.60) 0.35 (0.04 - 3.06) 2.41 (0.43 - 13.61)
Income Low Medium High		 Ref 0.53 (0.21 - 1.37) 0.58 (0.20 - 1.69)
Sex Male Female		 Ref 1.12 (0.49 – 2.53)
***p<0.0001 ** p<0.001 * p<0.01 † p<0.05		

Table 5. Prevalence of bullying in our sample of SMY and heterosexual (HY) groups.

	All	SMY	HY	X2 test statistic:	p-value
Bullying N (%)	47 (12.2%)	8 (22.2%)	39 (11.1%)	3.747	0.053

Table 6. Differences in depression symptom counts in students who were bullied and for sexual minority and heterosexual youth separately.

	All		SMY		HY	
	Never bullied N=374	Bullied N = 39	Never bullied N= 39	Bullied N= 8	Never bullied N= 311	Bullied N= 28
Depression symptom count (mean)	5.82	8.29	7.97	9.40	5.57	8.14
SD	3.55	3.93	4.15	4.08	3.36	4.06
Wilcoxon-Ranked Test Statistic	4737.5		122		2798.5	
p-value	**0.0003**		0.34		**0.0017**	

Table 7. Models examining effect modification of the association between sexual identity and depression.

Depression counts	Model 5	Model 6	Model 7	Model 8
Factor	N= 323	N= 357	N = 390	N = 343
Sexual Identity				
Heterosexual	Ref	Ref	Ref	Ref
SMY	**1.30 (1.11 – 1.54)****	**1.59 (1.26 – 2.00)*****	**1.31 (1.04 - 1.67)***	**1.43 (1.09 - 1.89)***
Race				
White	Ref	Ref	Ref	Ref
African-American	1.12 (0.96 – 1.31)	**1.23 (1.06 – 1.44)****	**1.21 (1.04 – 1.39)***	1.14 (0.98 – 1.32)
Asian/Pacific Islander	0.94 (0.80 – 1.12)	1.05 (0.88 – 1.24)	1.03 (0.88 – 1.21)	1.01 (0.86 – 1.19)
Latino	1.10 (0.88 – 1.36)	1.11 (0.89 – 1.39)	1.14 (0.93 – 1.40)	1.10 (0.89 – 1.36)
Native American	0.69 (0.47 – 1.01)	0.81 (0.74 – 1.42)	1.03 (0.77 – 1.38)	0.77 (0.55 – 1.07)
Income				
Low	Ref	Ref	Ref	Ref
Medium	0.91 (0.79 - 1.04)	0.90 (0.78 – 1.04)	**0.86 (0.76 - 0.98)***	0.89 (0.78 – 1.02)
High	**0.84 (0.72 – 0.98)***	0.88 (0.74 – 1.02)	**0.79 (0.68 – 0.92)****	**0.84 (0.72 – 0.98)***
Sex				
Male	Ref	Ref	Ref	Ref
Female	1.11 (0.98 – 1.25)	**1.12 (0.96 – 1.25)**	**1.19 (1.07 -1.33)****	1.08 (0.97 - 1.20)
Protective/Risk factors				
High maternal connection	0.91 (0.81 – 1.02)	0.90 (0.79 - 1.02)	-	-
High social support	**0.81 (0.71 – 0.91)*****	-	**0.77 (0.64 - 0.85)*****	-
High emotional dysregulation	**1.47 (1.31 – 1.65)*****	-	-	**1.51 (1.32 - 1.73)*****
Interaction with sex. identity				
High maternal connection	-	**0.60 (0.50 - 0.99)***	-	-
High social support	-	-	1.01 (0.73 -1.39)	-
High emotional dysregulation	-	-	-	0.92 (0.66 - 1.28)
***p<0.0001 ** p<0.001 * p<0.01 † p<0.05				

Table 8. Depression symptom count ratios with effect modifier of maternal support.

	HY	SMY
	Symptom Ratio	Symptom Ratio
Low maternal connection	1.00 (Reference)	1.59 (1.26 – 2.01)
High maternal connection	1.00 (Reference)	1.19 (0.83 – 1.40)

8. Appendix:

Figure 1. Minority stress processes in sexual minority populations. Source Meyer (2003).