Income, mental health and sleep quality in sexual minorities in the United Kingdom

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Abstract

This study examines the relationships between income level, the mental health variables of depression, anxiety and life satisfaction, and sleep quality in a sample of 295 lesbian, gay and bisexual (LGB) people in the United Kingdom. The study also examines the potential moderating role of minority stressors (i.e., discrimination and acceptance concerns) and protective factors (i.e., identity resilience and social support) in the relationships between low income, poor mental health and poor sleep quality. There was an indirect relationship between low income and poor sleep quality through depression, anxiety and life satisfaction. There were some moderation effects of both the minority stressors and protective factors in the relationships between income, mental health and sleep quality. Overall, the results suggest that reducing exposure to minority stressors, enhancing feelings of identity resilience and facilitating access to social support may collectively contribute to better mental health outcomes and sleep quality in LGB people – especially those with low income.

Keywords
income; depression; anxiety; life satisfaction; identity resilience; social support; LGBT

Public significance statement
This research suggests that reducing minority stress among lesbian, gay and bisexual (LGB) people, enabling them to derive feelings of self-esteem, self-efficacy, continuity and positive distinctiveness, and encouraging them to access social support networks may collectively contribute to better mental health outcomes and sleep quality – especially those with low income.

Introduction

There is evidence that lesbian, gay and bisexual (LGB) people generally experience poorer sleep quality than heterosexual people (Campbell et al., 2024). Moreover, there is a higher prevalence of poor mental health, such as anxiety and depression, in LGB people when compared to heterosexual people (Semlyen et al., 2016). These inequalities can be attributed to many factors, with exposure to minority stressors being a key cause (Frost & Meyer, 2016; Meyer, 2003). LGB people of course vary in terms of level of income, which has been found to be associated with exposure to minority stressors (Swank et al., 2012), poor mental health (King & Richardson, 2016), and decreased sleep quality (Duncan et al., 2017; Groeger & Hepsomali, 2023).

There is limited evidence concerning the ways in which income, minority stressors, protective factors and mental health outcomes operate as part of a social psychological system that might collectively explain sleep quality in LGB people. Specifically, studies have not

examined the potential protective and risk factors associated with sleep disturbance, such as identity resilience and social support; and discrimination and acceptance concerns, respectively. This study addresses these questions testing two moderated mediation models predicting sleep quality in a sample of LGB people in the United Kingdom (UK). This study is the first to examine the relationships between income level, the mental health variables of depression, anxiety and life satisfaction, and sleep quality using a robust measure of sleep quality. Drawing upon tenets of minority stress theory (Meyer, 2003) and identity process theory (Jaspal & Breakwell, 2014), the study also examines the potential moderating role of minority stressors (i.e., discrimination and acceptance concerns) and protective factors (i.e., identity resilience and social support) in the relationships between income, mental health and sleep quality.

Mental health and sleep quality in LGB people

This study focuses on the relations between three specific dimensions of mental health (i.e., anxiety, depression and life satisfaction) and sleep quality. Understanding the social psychological underpinnings of sleep quality is important partly because higher sleep quality is associated with greater productivity in life, lower risk of cognitive decline, and better physical health outcomes as one ages (Clement-Carbonell et al., 2021; Hepsomali & Groeger, 2022; Irwin, 2015; Kucharczyk et al., 2016; Muzni et al., 2022).

Research shows that LGB people are much more likely to experience generalized anxiety than heterosexual people (Semlyen et al., 2016) but has generally found that LGB people report similar levels of life satisfaction to heterosexual people (Hu et al., 2016). There are of course multiple antecedents to depression, anxiety and life satisfaction. Studies of LGB people have found all three dimensions to be affected at least in part by stressors associated with one's sexual minority status (Hoy-Ellis, 2023; Hung & Chan, 2022) and, in the general population, with income level (Layte, 2012). There is also evidence that depression, anxiety and life satisfaction are all independently associated with sleep quality (João et al., 2018). In short, the higher the depression and anxiety and the lower the life satisfaction, the lower one's sleep quality. It is hypothesized that the mental health variables of anxiety, depression and life satisfaction will mediate the relationship between income and sleep quality, with those reporting poor mental health being more susceptible to poor sleep quality. It is clear from multiple studies that LGB people experience poorer sleep quality than heterosexual people (Galinsky et al., 2018; Martin-Storey et al., 2018). This has been attributed to exposure to various types of minority stressor, such as living in areas where there is low support for LGB equality, dysfunctional parental relationships, bullying, and antagonistic interpersonal relationships (Butler et al., 2020).

Income as a predictor of psychological adversity

Many empirical studies have found income to be a significant predictor of mental health issues in general population samples in the UK, with lower income being a significant risk factor for anxiety, depression and decreased life satisfaction (Beutel et al., 2010), as well as decreased sleep quality (Moore et al., 2002). It is noteworthy that these effects have also been observed in LGB people (Duncan et al., 2017; King & Richardson, 2016).

Much research rightly advocates for social mobility and greater economic equality as practical recommendations for improving mental health and sleep quality in those with lower income levels (Farbmacher et al., 2022; Premo et al., 2023; Tarullo et al., 2023). This is important but unlikely to be achieved in the short- to medium-term, especially in post-pandemic societies facing economic decline, austerity and growing economic inequalities. Evidence concerning the possible role played by stressors and protective factors that accentuate or attenuate the adverse effects of low income on mental health and sleep quality is thus

required while longer-term strategies are developed for addressing societal inequalities. As outlined below, there is evidence that additional stressors, such as those associated with one's minority status, can imperil both mental health and sleep quality (Chan & Fung, 2021). In a similar vein, protective factors should enhance mental health and sleep quality in the face of decreased income.

Minority stressors

Minority stress theory (Meyer, 2003) postulates that members of stigmatized minority groups are exposed to a series of stressors associated with their minority status. The theory distinguishes between distal stressors, which are stress processes external to the individual (e.g., discrimination that one faces from other people) and proximal stressors, which are internal to the individual and often by-products of distal stressors (e.g., sexual identity acceptance concerns that can arise in the individual). Exposure to stressors can result in poor mental health outcomes, including anxiety, depression and lower life satisfaction (Jaspal et al., 2023). This study focuses on the possible moderating role of the distal and proximal stressors of discrimination and acceptance concerns, respectively, on the relationships between income, mental health and sleep quality.

Exposure to discrimination due to one's sexual orientation can be harmful for mental health. Discrimination has been found to be associated with both internalizing (e.g., low mood and anxiety) and externalizing (e.g., substance misuse) psychological disorders for sexual minorities (Lee et al., 2016). In data from a sample of 1032 LGB young people, Almeida et al. (2009) found that perceived discrimination was associated with higher depressive symptomatology. Reported experiences of discrimination can also adversely impact sleep quality in LGB people (Butler et al., 2020; Chan & Fung, 2021). It is hypothesized that discrimination (as a distal stressor, i.e., an external event that brings about cumulative psychological stress) will moderate the relationships between low income, poor mental health (anxiety, depression, lower life satisfaction) and poor sleep quality.

The proximal stressor of sexual identity acceptance concerns, which refers to the anxious expectation that one will be rejected by others due to one's sexual orientation, is also associated with poor mental health (Feinstein, 2020). LGB people who anticipate rejection from others tend to perceive it even in innocuous or ambiguous situations. This is essentially what differentiates acceptance concerns from actual discrimination – it is an internal cognitive state that produces anxiety resulting from past and anticipated future experiences. Stigma sensitivity (a proxy for acceptance concerns) has been found to be positively associated with depression, social anxiety, generalized anxiety and post-traumatic stress symptoms (Cohen et al., 2016; Slimowicz, Siev & Brochu, 2020). Similarly, Feinstein et al. (2012) found that rejection sensitivity mediated the relationship between discrimination and depression and social anxiety. Exposure to minority stressors is likely to undermine sleep quality (Butler et al., 2020). In this study, it is hypothesized that stigma sensitivity (as a proximal stressor, i.e., an internal state or experience that brings about cumulative psychological stress) will moderate the relationships between low income, poor mental health (anxiety, depression, lower life satisfaction) and poor sleep quality.

Protective factors

Identity process theory (Breakwell, 2021; Jaspal, Lopes & Breakwell, 2023) postulates that individuals strive to construct an identity that is characterized by feelings of self-esteem, self-efficacy, continuity and positive distinctiveness. Recent research has focused on the concept of identity resilience (see Breakwell, 2023). Identity resilience is said to be high when the individual perceives their identity configuration to be characterized by a high overall combined rating of their self-efficacy, self-esteem, continuity and positive distinctiveness. It reflects one's

own subjective belief in one's capacity to interpret and overcome challenges as they occur, one's self-worth and value, certainty of who one is and will remain despite changes in context and circumstance, and one's self-construal as unique and positively distinctive.

This identity characteristic is based on many individual and social phenomena and experiences, such as group memberships, education, exposure to cultures, religion (e.g., Jaspal, Assi & Maatouk, 2022; Jetten et al., 2015; Smeekes & Verkuyten, 2015), as well as personality traits, intellectual capacity, or physical abilities (e.g., Bardi et al., 2014; Breakwell, 2021). It can fluctuate over the life course. Higher identity resilience has been found to be associated with less distress when faced with a stressor (Breakwell & Jaspal, 2021) and with the adoption of more adaptive, effective and sustainable coping strategies in response to the stressor (Jaspal, Assi & Maatouk, 2022).

The derivation of social support is an especially effective coping strategy, which is well-established in the psychological literature (Chao, 2011). Indeed, the protective function of social support against poor mental health has been described in several psychological theories, including social identity theory and the social cure perspective (Frisch et al., 2014; Wakefield et al., 2019). After all, social support can enable the individual to exchange confidences with sympathetic others, derive alternative ways of viewing their predicament, and overcome challenges.

On this basis, the psychological variable of identity resilience and the social variable of social support are, as protective factors, predicted to moderate the relationships between income and mental health (anxiety, depression, and low life satisfaction) and then between mental health and sleep quality.

Hypotheses

1. Income should impact indirectly on the variance in sleep quality through the mediators of depression, anxiety and life satisfaction, with lower income being associated with higher depression, anxiety and lower life satisfaction, which in turn will be related to poorer sleep quality.
2. Identity resilience and social support should moderate the relationships between income, depression, anxiety, life satisfaction and sleep quality. As identity resilience and social support increase, the relationships between income and depression and anxiety should weaken, while the relationship between income and life satisfaction should strengthen, and this should in turn be associated with increased sleep quality in LGB people.
3. Acceptance concerns and discrimination should moderate the mediated relationships between income, depression, anxiety, life satisfaction and sleep quality. As discrimination and sexual identity acceptance concerns increase, the relationships between income and increased depression and anxiety and decreased life satisfaction should strengthen, and these should in turn be associated with poorer sleep quality in LGB people.

Method

Ethics approval

This study was approved by Nottingham Trent University's College of Business, Law and Social Sciences Research Ethics Committee (ref: 2021/13). All participants provided electronic consent before completing the study.

Design and procedure

A cross-sectional survey study focusing on sexual identity, mental health and sleep quality was conducted in January 2023. Participants first provided socio-demographic data, including their

age, gender, sexual orientation, ethnicity, level of education, income, and relationship status. They then completed measures of discrimination, acceptance concerns, identity resilience, social support, depression, anxiety, life satisfaction and sleep quality. Participants were fully debriefed, thanked and paid 6 GBP (8 USD) for their time.

Participants

There were two eligibility criteria: (1) being aged 18 or over and (2) self-identifying as LGB. A sample of 295 participants was recruited on Prolific, an online participant recruitment platform. Mean age was 30.7 years (*SD*=11.13, range 18-74). Table 1 provides a full overview of participants' socio-demographic characteristics.

Insert Table 1 here

Statistical analyses

Data analyses were performed using SPSS (version 22) and Jamovi Advanced Moderated Mediation Generalized Linear Models (GLM) (Gallucci, 2020).

A moderation mediation analysis approach was chosen to examine the associations between income and sleep issues in LGB people through depression, life satisfaction, and anxiety as mediators because in prevention research this approach has been used successfully to understand the mechanisms whereby particular effects occur. However, in order to determine the generalizability of these mechanisms or to explain a small significance effect, it is useful to investigate whether the relationships are observable in different subgroups of participants (e.g., high discrimination vs. low discrimination). Depression, anxiety and life satisfaction were chosen as mediators following past work (Bonsu et al., 2019; Poundja et al., 2006) that tested the mediation effects of those variables on physical conditions (e.g., pain, sleep). Moreover, depression and anxiety are affective transient mood states, not traits, that were measured with a clinical measure of depressive and anxious symptomatology. Similarly, life satisfaction is the perception of one's quality of life at the present moment and, as such, can vary. Therefore, it was included as a mediator following previous research (Senol-Durak & Durak, 2011). However, mediation does not demonstrate causality – it shows only that an independent variable is associated with a dependent variable through a particular mechanism and thus assumptions about causation should be avoided. Following valid critiques of mediation analysis in behavioral research (e.g., Fiedler et al., 2011; Tate, 2015), it is acknowledged that mediation is not the only analytical approach that could be applied but, in view of the hypotheses and the status of the variables (as non-traits), this approach was deemed to be the most appropriate. In this article, a possible mediation framework is suggested for understanding the relationships between the variables.

Since most variables were non-normally distributed, Kruskal-Wallis tests with the MonteCarlo Method bootstrapped at 10,000 samples were performed to assess the effects of income levels on identity resilience, social support, discrimination, acceptance concerns, depression, anxiety, life satisfaction and sleep quality. Then, Spearman Rho's correlations were performed to assess relationships between the variables.

None of the critical assumptions for Generalized Linear Models (GLM) were violated, e.g., statistical dependence of the n observations, the dependent variable does not need to be normally distributed and maximum likelihood estimation (MLE) is a parameter estimation (Breslow, 1996). Therefore, two moderated mediation models were performed in Jamovi GLM, assessing the relationships between income and sleep quality through the mediators of depression, anxiety and life satisfaction and the moderators of stressors (discrimination and acceptance concerns) (Model 1) and of protective factors (identity resilience and social support) (Model 2). GLM was used for the statistical analysis because it allows us to examine the effects of both non-continuous and continuous variables. A significant mediation is

observable when the relationship between the independent and dependent variables only exists in the presence of the mediator (e.g., whether income is associated with sleep disturbances only when depression is present). A significant moderation exists when the moderator influences the magnitude and direction of the relationship between the independent and dependent variables (e.g., whether discrimination influences the relationship between income and poor sleep).

Measures

Income

Income was measured on a 6-point ordinal scale (1=less than £12,500, 2=£12,500-18,000, 3=£18,001-40,000, 4=£40,001-60,000, 5=£60,001=100,000, 6=more than £100,000).

Sexual identity acceptance concerns

The Acceptance Concerns Subscale of the Lesbian Gay and Bisexual Scale (Mohr & Kendra, 2011) was used to measure concerns that others will not accept one's sexual identity. The subscale consists of 3 items, such as "I often wonder whether others judge me for my sexual orientation," and is scored on a 5-point Likert scale (1=strongly disagree to 5=strongly agree). A sum score of the 3 items was calculated, with possible scores ranging from 3 to 15. A higher score indicates greater acceptance concerns, α=0.73.

Discrimination

The Everyday Discrimination Scale (Williams et al., 1997) was used to measure discrimination. The scale consists of 9 items that capture the frequency of discrimination, such as "being treated with less courtesy than others" and is scored on a 6-point Likert scale (0=never to 5=almost every day). A sum score of all 9 items was calculated, with possible scores ranging from 0 to 45. A higher score indicates more frequent discrimination, α=0.92

Identity Resilience

The Identity Resilience Index (Breakwell, Fino & Jaspal, 2022) was used to measure identity resilience. The Index consists of 16 items across 4 factors; self-esteem, self-efficacy, continuity, and positive distinctiveness, scored on a 5-point Likert scale (1=strongly disagree to 5=strongly agree). The scale includes items, such as "On the whole, I am satisfied with myself." A sum score of all 16 items was calculated, with possible scores ranging from 16 to 80. A higher score indicates greater identity resilience, α=0.82.

Social support

The Interpersonal Support Evaluation List-12 (ISEL-12) (Cohen et al., 1985) was used to measure perceived social support. The ISEL-12 consists of 12 items, such as "I feel that there is no one I can share my most private worries and fears with" scored on a 4-point Likert scale (1=definitely false to 4=definitely true). A sum score of all 12 items was calculated, with possible scores ranging from 12 to 48. A higher score indicates greater perceived social support, α=0.89.

Depression and Anxiety

The Hospital Anxiety Depression Scale (HADS) (Zigmond & Snaith, 1983) was used to measure symptoms of depression and of anxiety. The scale consists of 14 items (7 that measure generalized anxiety and 7 that measure depression). The scale includes items, such as "I feel tense and wound up" (generalized anxiety) and "I have lost interest in my appearance" (depression), and is scored on a 4-point Likert scale (0=rarely or none of the time [less than one day] to 3=all of the time [5 to 7 days]). A sum score of all 7 items measuring depression and another of all 7 items measuring anxiety were calculated, with higher scores indicating

higher depression and anxiety, respectively. Zigmond and Snaith (1983) recommend cut-off scores of between 8-10 for clinical anxiety and clinical depression, α= 0.89.

Life satisfaction

The Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, S., 1985) was used to measure life satisfaction. The scale has 5 items, such as "I am satisfied with my life," and is scored on a 7-point Likert scale (1=strongly disagree to 7=strongly agree). A sum of all 5 items was calculated with possible scores ranging from 5 to 35. A higher score indicated higher life satisfaction, α= 0.90.

Sleep quality

The Pittsburgh Sleep Quality Index (PSQI, Buysse et al., 1989) was used to evaluate overall sleep quality. Each of the questionnaire's 19 self-reported items belongs to 1 of 7 subcategories: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. Respondents are asked to indicate how frequently they have experienced certain sleep difficulties over the past month and to rate their overall sleep quality. Scores for each question range from 0 (not during the past month) to 3 (three or more times as week), with higher scores indicating poorer sleep quality. A total score was computed by adding the scores of each item. Possible scores range from 0 to 21, with scores greater than 5 indicative of poor sleep quality (Buysse et al., 1989) The scale includes items, such as "During the past month how often you cannot sleep within 30 minutes?", α= 0.85.

Results

Normality checks

Kolmogorov-Smirnov (K-S) tests were conducted to test the normality of distributions. Results showed that depression [$D(295)=.086$= $p<.001$]; anxiety [$D(295)=.068$ $p=.002$]; life satisfaction [$D(295)=.079$, $p<.001$]; social support [$D(295)=.068$, $p=.002$]; discrimination [$D(295)=.19$, $p<.001$]; acceptance concerns [$D(295)=.093$, $p<.001$] and sleep quality [$D(295)=.17$, $p<.001$] were all non-normally distributed. Therefore, non-parametric tests were used. Skewness and Kurtosis values of asymmetry for all variables were in an acceptable range for GLM to be conducted (George & Mallery, 2010) (see Table 2).

Insert Table 2 here

Descriptive statistics

Table 2 provides an overview of the descriptive statistics. In the sample, 109 people (37%) met the criteria for clinical depression (M=12, SD=2.74) and 173 (58.69%) met the criteria for clinical anxiety (M=12.46, SD=2.84), indicating a high prevalence of depression and especially anxiety in the participant sample. Respondents also had poor sleep quality (M=8.21, SD= 2.58).

Effects of income on the key variables

Kruskal-Wallis tests with the MonteCarlo Method bootstrapped at 10,000 samples were conducted to examine the effects of income (1=low income to 6=high income) on depression, anxiety, life satisfaction, social support, identity resilience, discrimination, acceptance concerns and sleep quality. Overall, results suggested that lower income groups reported higher depression, higher anxiety and poorer sleep quality than higher income groups. In contrast, higher income groups reported higher identity resilience, higher life satisfaction and higher social support than lower income groups. There were no statistically significant differences between income groups for discrimination and acceptance concerns (see Table 2).

Correlations

Spearman Rho's correlations showed that depression and anxiety were negatively correlated with sleep quality (i.e., lower levels of depression were associated with better sleep). In contrast, life satisfaction, identity resilience and social support were all positively correlated with sleep quality (i.e., greater life satisfaction, identity resilience and social support were associated with better sleep). Discrimination and acceptance concerns were also negatively correlated with sleep quality but less strongly than the mental health variables (see Table 3). Although age was negatively associated with depression and anxiety with younger people reporting higher depression and anxiety than older people, age did not relate to sleep quality and, when inserted in the models as a covariate, age did not interact with depression, anxiety and life satisfaction to predict sleep quality. Therefore, it was not included in the final models.

Moderation mediation model with identity resilience and social support as moderators of the relationships between income, depression, anxiety, life satisfaction and sleep quality

Insert Figure 1 here

A moderation mediation model (see Figure 1) was conducted to test the moderator effects of the protective factors of identity resilience and social support on the relationships between income and the dependent variable of sleep quality through the mediators of depression, anxiety and life satisfaction.

The results indicated that income did not impact directly on the variance in sleep quality (*β*=-.03, *SE*=.08, *95%CI* -0.72, 0.18, *p*=.62), but there were statistically significant mediation pathways, supporting Hypothesis 1. Indeed, income impacted statistically significantly on the variance in depression (*β*=-.25, *SE*=1.14, *95%CI* 1.24, 5.69, *p*=.002) and then depression impacted statistically significantly on the variance in sleep quality (*β*=.25, *SE*=.03, *95%CI* 0.08, 0.35, *p*<.001). Similarly, income impacted directly on the variance in anxiety (*β*=-.29, *SE*=1.37, *95%CI* 0.31, 5.68, *p*=.002) and on that in life satisfaction (*β*=.08, *SE*=.20, *95%CI* -2.44, 2.82, *p*=.049). Both anxiety and life satisfaction impacted on the variance in sleep quality (*β*=.35, *SE*=.03, *95%CI* 0.13, 0.25, *p*<.001; *β*=-.25, *SE*=.02, *95%CI* -0.13, -0.05, *p*<.001, respectively).

There were some moderator effects of identity resilience and social support for the relationships between income, depression, anxiety, life satisfaction and then sleep quality, partially supporting Hypothesis 2. First, identity resilience moderated the relationships between income and anxiety (*β*=-.11, *SE*=.11, *95%CI* -0.41, 0.02, *p*=.035) and depression (*β*=-.13, *SE*=1.85, *95%CI* 0.32, 7.56, *p*=.033), but not between income and life satisfaction (*β*=.05, *SE*=.18, *95%CI* -0.44, 0.24, *p*=.57). There was also a statistically significant moderator effect of identity resilience on the direct pathway between income and sleep quality (*β*=-.16, *SE*=.04, *95%CI* -0.17, -0.02, *p*=.019). Moreover, there was also a statistically significant moderation effect of identity resilience for the mediation pathway between income -> depression -> sleep quality (*β*=.25, *SE*=.04, *95%CI* -4.87, 0.015, *p*=.006). There were no statistically significant moderator effects of identity resilience for the mediation pathways between income -> anxiety -> sleep quality (*β*=-.06, *SE*=.04, *95%CI* -0.01, 0.005, *p*=.40) and income -> life satisfaction-> sleep quality (*β*=.05, *SE*=.002, *95%CI* -0.004, 0.005, *p*=.75).

Results showed that social support moderated the relationships between income and depression (*β*=-.15, *SE*=.14, *95%CI* 0.03, 0.57, *p*=.027) and between income and anxiety (*β*=-.21, *SE*=.12, *95%CI* 0.07, 0.53, *p*=.009), but not between income and life satisfaction (*β*=.02, *SE*=.17, *95%CI* -0.28,0.38, *p*=.76).

Social support also moderated the direct relationship between income and sleep quality (*β*=-.19, *SE*=.06, *95%CI* 0.03, 0.27, *p*=.016). Finally, social support moderated the mediating

pathways between income -> anxiety -> sleep quality (*β*=-.21, *SE*=.005, *95%CI* -0.018, 0.003, *p*=.010) and between income -> depression -> sleep quality (*β*=-.15, *SE*=.006, *95%CI* -0.018, 0.007, *p*=.036) but not the mediating pathway between income -> life satisfaction-> sleep quality (*β*=.07, *SE*=.004, *95%CI* -0.005, 0.009, *p*=.56).

Moderation mediation model with acceptance concerns and discrimination as moderators of the relationships between income, depression, anxiety, life satisfaction and sleep quality

Insert Figure 2 here

A second moderation mediation model was conducted in order to assess the moderator effects of acceptance concerns and discrimination on the relationships between income and sleep quality through the mediators of depression, anxiety and life satisfaction (see Figure 2).

Results partially supported Hypothesis 3 because there were only a few moderator effects of acceptance concerns and discrimination on the relationships between income, depression, anxiety, life satisfaction and then sleep quality. First, acceptance concerns moderated the relationships between income and anxiety (*β*=.16, *SE*=.40, *95%CI* 0.21, 1.76, *p*=.013), depression (*β*=.14, *SE*=.38, *95%CI* 0.06, 1.53, *p*=.035), and life satisfaction (*β*=-.23, *SE*=.86, *95%CI* -4.39, -1.01, *p*=.002).

However, acceptance concerns did not moderate the relationship between income and sleep quality (*β*=.07, *SE*=.13, *95%CI* -0.13, 0.37, *p*=.34) nor the mediating relationships between income -> depression-> sleep quality (*β*=.09, *SE*=.01, *95%CI* -0.01, 0.04, *p*=.32); income -> anxiety -> sleep quality (*β*=.09, *SE*=.01, *95%CI* -0.03, 0.02, *p*=.54) or income-> life satisfaction-> sleep quality (*β*=-.04, *SE*=.00, *95%CI* -0.01, 0.02, *p*=.83).

Concerning the moderator effects of discrimination, results showed that discrimination did not moderate the relationships between income and depression, (*β*=-.07, *SE*=1.96, *95%CI* -1.71, 5.96, *p*=.28), income and anxiety (*β*=-.07, *SE*=1.89, *95%CI* -5.33, 2.09, *p*=.39) or income and life satisfaction (*β*=.03, *SE*=3.28, *95%CI* -4.75, 8.13, *p*=.61). However, discrimination did moderate the direct relationship between income and sleep quality (*β*=.14, *SE*=.78, *95%CI* -0.09, 2.99, *p*=.045). Moreover, discrimination moderated the mediating relationships between income -> depression-> sleep quality (*β*=.28, *SE*=.08, *95%CI* -0.31, 9.11, *p*=.002) and between income -> anxiety -> sleep quality (*β*=.27, *SE*=.07, *95%CI* -0.01, 0.26, *p*=.004) but not between income-> life satisfaction-> sleep quality (*β*=-.10, *SE*=.04, *95%CI* -0.14, 0.03, *p*=.18).

Discussion

Participants generally reported high levels of depression and especially anxiety as well as poor sleep quality, which is consistent with the findings of previous research (see Gmelin et al., 2022). Minority stress theory attributes this increased mental health burden in LGB people to exposure to distal and proximal stressors associated with their sexual minority identity status (Frost & Meyer, 2016; Meyer, 2003). The results of this study showed no direct relationship between income and sleep quality but did show an indirect relationship through the mental health variables of depression, anxiety and life satisfaction. This suggests that, in general, low income is associated with poor mental health outcomes (i.e., higher anxiety and depression and lower life satisfaction), which in turn is associated with poor sleep quality. There were some moderation effects of the stressors (i.e., discrimination and acceptance concerns) and the protective factors (i.e., identity resilience and social support) on the relations between income, mental health outcomes and sleep quality.

Income, mental health and sleep quality

Poor mental health outcomes (i.e., depression, anxiety and decreased life satisfaction) appear to be associated with poor sleep quality in our sample of LGB people. This is consistent with previous research conducted in other populations. In a sample of 1044 college students in the US, Kenney et al. (2013) found that anxiety, depression and stress were all independently associated with poor sleep. A systematic review of social media usage in youth found a positive relationship between sleep quality and mental health outcomes (Alonzo et al., 2021). Our study of LGB people suggests that, while income and sleep quality are not directly related, they are indirectly associated through the mediators of anxiety, depression and life satisfaction. Low income is known to be associated with poor mental health outcomes in people, perhaps due to limited opportunities in life, worries about the present and future, and feelings of helplessness and hopelessness (see Cheung & Lucas, 2015; Lopes et al., 2019). It is therefore predictable that low income should be related to low sleep quality through the mediators of poor mental health. This proved to be the case. Crucially, the results provide insight into the impact of stressors and protective factors on these relations.

Minority stressors

Minority stress theory distinguishes between distal and proximal stressors in terms of their differential impact upon mental health (Jaspal et al., 2023). The present study found that there were moderation effects of each minority stressor on some relationships between income, the mental health variables, and sleep quality.

The distal stressor of discrimination moderated the relationship between income and sleep quality only, suggesting that the presence of discrimination may accentuate the link between low income and poor sleep quality. This supports the argument of cumulative stress in minority stress theory research (Diamond & Alley, 2022), whereby individuals who face financial hardship (i.e., a socio-economic stressor) and who also experience a minority stressor (i.e., discrimination due to their sexual orientation) in turn experience poor sleep quality. Discrimination also moderated the mediated relationships between (1) income, anxiety and sleep quality, and (2) income, depression and sleep quality. In a similar vein, this suggested that the presence of discrimination may accentuate the links between low income, anxiety and depression and thus poor sleep quality. It is noteworthy that discrimination did not moderate the mediated relationship between income, life satisfaction and sleep quality. A possible explanation is that the stressor of economic hardship may limit opportunities for involvement in sexuality-affirmative contexts (Bassi, 2006; Cronin & King, 2014), potentially exposing individuals to greater discrimination, thereby affecting mental health and thus sleep quality.

The proximal stressor of acceptance concerns moderated the relationships between income and depression, anxiety and life satisfaction, respectively, but none of the mediated relationships between income, the mental health variables and sleep quality nor the relationship between income and sleep quality. Moreover, the results indicated that, in contrast to the distal stressor of discrimination, the presence of the proximal stressor of acceptance concerns, may accentuate the relationships between *high* income and poor mental health. In other words, as identity concerns increase, the higher the depression and anxiety and the lower the life satisfaction in high income groups compared to low income groups. This was inconsistent with our original hypothesis that low income and poor mental health would be associated through both types of stressor. As LGB people with higher financial capital generally have access to sexuality-affirmative contexts that can provide sexual identity acceptance (see Gallow & Matthews, 2023), it is possible that there are other factors (e.g., family expectations, internalized homonegativity) that may be generating proximal stressors (i.e., acceptance concerns) and thus poor mental health outcomes in this group in particular. Clearly, more research is required to understand this relationship more fully.

Protective factors

Identity resilience is a psychological variable found to be protective against adversity, including identity threat and psychological distress (Breakwell & Jaspal, 2022; Jaspal et al., 2023). Social support – a social variable – has similarly been found to buffer the negative psychological effects of adverse events and situations (McConnell et al., 2015; McDonald, 2018). As predicted, both protective factors moderated the relationship between income and sleep quality, as well as those between income and depression and anxiety, respectively. However, the relationship between income and life satisfaction was not moderated by either protective factor. Overall, the results suggest that, when income is low but identity resilience and social support are high, both depression and anxiety decrease. In a similar vein, when income is low but identity resilience and social support are high, sleep quality appears to improve.

In addition, identity resilience moderated the mediated relationships between income, depression and sleep quality, and social support moderated the mediated relationships between (1) income, anxiety and sleep quality and (2) income, depression and sleep quality. These results indicate that, when income is low, both identity resilience and social support may be stimulating less depression and thus better sleep quality. In other words, they both appear to perform a protective function against depression and poor sleep quality in the face of low income. It is noteworthy, however, that only social support appeared to be protective against anxiety and thus poor sleep quality in the face of low income. Overall, these results suggest that both identity resilience and social support may help people overcome challenges associated with financial hardship, potentially resulting in better mental health and sleep quality.

Qualitative differences between anxiety, depression and life satisfaction

The results demonstrate differential effects of the stressors and protective factors upon specific dimensions of mental health, namely anxiety, depression and life satisfaction. Anxiety results from anticipation of internal or external threats (e.g., discrimination) and depression by intense feelings of sadness, hopelessness, a sense of personal defeat and feeling trapped in an unavoidable nefarious situation. It is therefore unsurprising that the cumulative stressors of financial hardship and discrimination should be associated with both forms of poor mental health. People may feel threatened and agitated as well as hopeless about the future when faced with these stressors.

Yet, it must be noted that only social support was protective against both depression and anxiety, while identity resilience was protective against depression only. This may suggest that social support, in particular, alleviates the perception of threat (from others) by providing a supportive environment within which people can gain exposure to positive messages about the self-concept and thus feel less anxious. This will need to be studied further. In contrast, the results suggest that life satisfaction, as a "cognitive and global evaluation of the quality of one's life as a whole" (Pavot & Diener, 2008, p. 137), may be less susceptible to change in the face of stressors, such as financial hardship and discrimination. Indeed, the mediated relationship between income, life satisfaction and sleep quality was not moderated by any of the stressors or protective factors, suggesting that participants were indeed providing a global evaluation of their life quality that was not domain-specific (cf. Stubbe et al., 2005). Given the multiplicity of identity (Breakwell, 2015), individuals may retain the ability to derive life satisfaction on the basis of other facets of their identity – beyond their socio-economic status and sexual orientation.

Limitations

First, as this is a cross-sectional survey study, it is not possible to infer causality on the basis of the findings. Furthermore, given the design of the study, the mediation modeling technique

does not guarantee that mediation is occurring. Future research using an experimental or longitudinal design will help clarify causation. Second, although the study attempts to examine socio-economic inequalities (i.e., differences in level of income) in LGB people, there are other characteristics that should be examined in the future. As previous research shows the acute effects of stressors on identity processes in LGB people from minority ethnic backgrounds (e.g., Jaspal et al., 2021), it would be useful to include people from minority ethnic groups. The potential cumulative effects of exposure to homonegativity, racism and other stressors faced by minority ethnic people should be examined. Third, the study provides preliminary evidence regarding the differential impact of stressors upon particular mental health outcomes (i.e., depression, anxiety and life satisfaction) and sleep quality. These results need to be replicated. The current study supports findings from earlier self-reported sleep studies in sexual minorities and, crucially, does so using a standard, well validated sleep measure. Studies that objectively measure LGB sleep are essential if we are to understand why LGB sleep is so poor with the attendant implications for health and wellbeing. Finally, this study focuses on LGB people but the vast majority of participants self-identified as bisexual, precluding robust analyses of intergroup differences. Future research should examine the intersection of sexual orientation and minority stressors. Furthermore, this study does not include trans people given that sexual orientation and gender are distinct characteristics. In view of the significant minority stressors faced by trans people due to their gender identity (Mezza et al., 2024), it is important that future research also test the proposed moderation mediation framework in this population.

Implications and conclusions

This study contributes evidence that low income is associated with poor mental health and, through poor mental health, with poor sleep quality. This clearly reinforces the need to address socio-economic inequalities in society which must occur on multiple levels – societal awareness, government intervention, access to education, the generation of jobs, job security and others. However, the true novelty of this study lies in the identification of minority stressors and protective factors as moderators of the relations between income, mental health and sleep quality.

Overall, the results suggest that building feelings of identity resilience and facilitating access to social support may constitute effective short- to medium-term strategies for enhancing mental health outcomes and sleep quality in LGB people with lower income levels. This could be achieved through psychotherapeutic intervention, community initiatives (e.g., in LGBT community centers), and societal campaigns. Encouraging people to think of identity characteristics, experiences and life events that bolster feelings of self-esteem, self-efficacy, continuity and positive distinctiveness could allow their identities to become more resilient to adversity (e.g., low income and discrimination) and enable them to elect more effective coping strategies (e.g., support-seeking). There is a reciprocal relationship between identity resilience and social support. On the one hand, greater identity resilience may enable people to seek social support, despite the risk of rejection that the pursuit of social support itself entails (e.g., Jaspal & Breakwell, 2022). On the other hand, social support can enable people to build a more positive self-concept (Wright & Perry, 2006). Yet, social support must actually be available to LGB people. This is not universally the case. In some contexts, LGB people are unable or feel unwilling to seek social support. The support structures may be difficult to access and, in some contexts, they may not even exist. Austerity measures in many countries have led to the closure of LGBT community centers, charities and venues – all potential sources of social support. However, social media and geospatial networking applications now abound and could perform a supportive function for some LGB people (see Jaspal, 2017).

In view of the importance of mental health and sleep quality for many dimensions of health and wellbeing, it is crucial that discrimination continue to be challenged and that identity resilience and access to social support be facilitated in LGB communities.

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Table 1: Sample socio-demographic statistics

Demographic variable		**Frequency (*N*)**	**Percentage (%)**
Biological sex	Male	141	47.8%
	Female	153	51.9%
	Other	1	0.3%
Sexual orientation	Lesbian	38	12.9%
	Gay	54	18.3%
	Bisexual	203	68.5%
	Other	1	0.3%
Ethnicity	Any Other White/White British/ White Irish	272	92.2%
	British South Asian (Indian/Pakistani)	3	1%
	Any other Asian	3	1%
	African	3	1%
	Mixed (White/Black African; White/Asian and White Black Caribbean)	9	3%
	Caribbean	1	0.3%
	Any other mixed background	1	0.3%
	Middle Eastern	1	0.3%
	Other Ethnic background	2	0.6%
Relationship status	Single	115	39%
	Monogamous	158	53.6%
	Open	21	7.1%
	Other	1	0.3%
Income	Less than £12,500	46	15.6%
	£12,500-£18,000	35	11.9%
	£18,001- £40,000	95	32.2%
	£40,001-£60,000	56	19%
	£60,001-£100,000	28	9.5%
	More than £100,000	9	3.1%
Employment status	Employed full-time	136	46.1%
	Employed part-time	42	14.2%
	Unemployed	19	6.4%

Student	70	23.7%
Retired	2	0.7%
Unable to work through illness/disability	15	5.1%
House/family duties	7	2.4%

Table 2. Descriptive statistics for the continuous variables

Variables	***M***	***SD***	***Minimum***	***Maximum***	***Skewness***	***Kurtosis***
Identity resilience	50.28	8.34	23	74	-.10	.22
Social support	28.92	6.30	10	40	-.48	-.24
Discrimination	14.87	6.54	9	45	1.43	2.54
Sexual identity acceptance concerns	8.44	3.00	3	15	-.08	-.58
Life satisfaction	19.00	7.40	5	35	-.13	-.97
Depression	7.40	4.35	0	21	.44	-.16
Anxiety	9.22	4.70	0	20	.02	-.65
Sleep quality	8.21	2.58	3	16	.82	.42

Table 3. Differences between income groups for the key variables

	1. Identity Resilience		2. Social Support		3. Discrimination		4. Sexual Identity acceptance concerns		5. Life satisfaction		6. Depression		7. Anxiety		8. Sleep quality		Kruskal_Wallis H	P value	95% CI
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*			
Income	46.46	10.40	26.70	6.32	15.41	7.18	7.72	3.34	16.20	6.93	7.54	5.15	9.87	4.80	8.65	2.85	24.38	<.001	00,.00
1. Less than £12,500 (*n*=46, 15.6%)	49.98	9.06	27.91	6.63	16.18	7.32	8.23	2.85	17.82	6.74	8.09	4.42	11.67	4.92	9.22	3.03	21.94	<.001	.00,.00
2.£12,500-£18,000 (*n*=35, 11.9%)	49.25	8.31	28.15	6.48	15.17	6.60	8.65	2.93	17.56	7.45	8.24	4.29	9.85	4.25	8.60	2.71	2.99	.77	.69,.72
3.£18,001- £40,000 (*n*=95, 32%)	53.04	7.25	30.88	5.63	14.32	6.21	8.88	3.12	21.34	6.64	6.59	3.81	8.77	4.41	7.65	2.10	3.60	.61	.59,.61
4. £40,001-£60,000 (*n*=56, 19%)	56.29	8.41	32.46	5.97	13.50	4.43	8.57	2.47	24.50	7.03	5.00	4.51	6.39	4.27	7.14	2.62	30.38	<.001	00,.00
5. £60,001-£100,000 (*n*=28, 9.5%)	49.22	5.54	29.44	4.03	13.44	5.88	9.22	3.23	20.33	8.05	7.00	3.20	9.00	5.66	8.18	2.47	14.99	.010	.008,.013
6. > £100,000 (*n*=9, 3.1%)	46.46	10.40	26.70	6.32	15.41	7.18	7.72	3.34	16.20	6.93	7.54	5.15	9.87	4.80	8.65	2.85	15.10	.009	.007,.011

Table 4. Correlations between the main variables

Variables	1	2	3	4	5	6	7	8	9
1. Identity resilience									
2. Social support	.44**								
3. Discrimination	-.12*	-.06							
4. Sexual identity acceptance concerns	-.13*	-.09	.36***						
5. Life satisfaction	.53***	.52***	-.11	-.12*					
6. Depression	-.55**	-.45***	.18**	.16**	-.54***				
7. Anxiety	-.51***	-.29***	.27**	.26***	-.45***	.57***			
8. Sleep quality	-.36***	-.23***	.19**	.11*	-.37***	.52***	.47***		
9. Age	.22***	-.007	-.20**	-.08	.06	-.15*	-.21**	-.09	

* $p<.05$
** $p<.01$
***$p<.001$

Figure 1. Moderation Mediation model with identity resilience and social support as moderators of the relationships between income and sleep quality through the mediators of depression, anxiety and life satisfaction

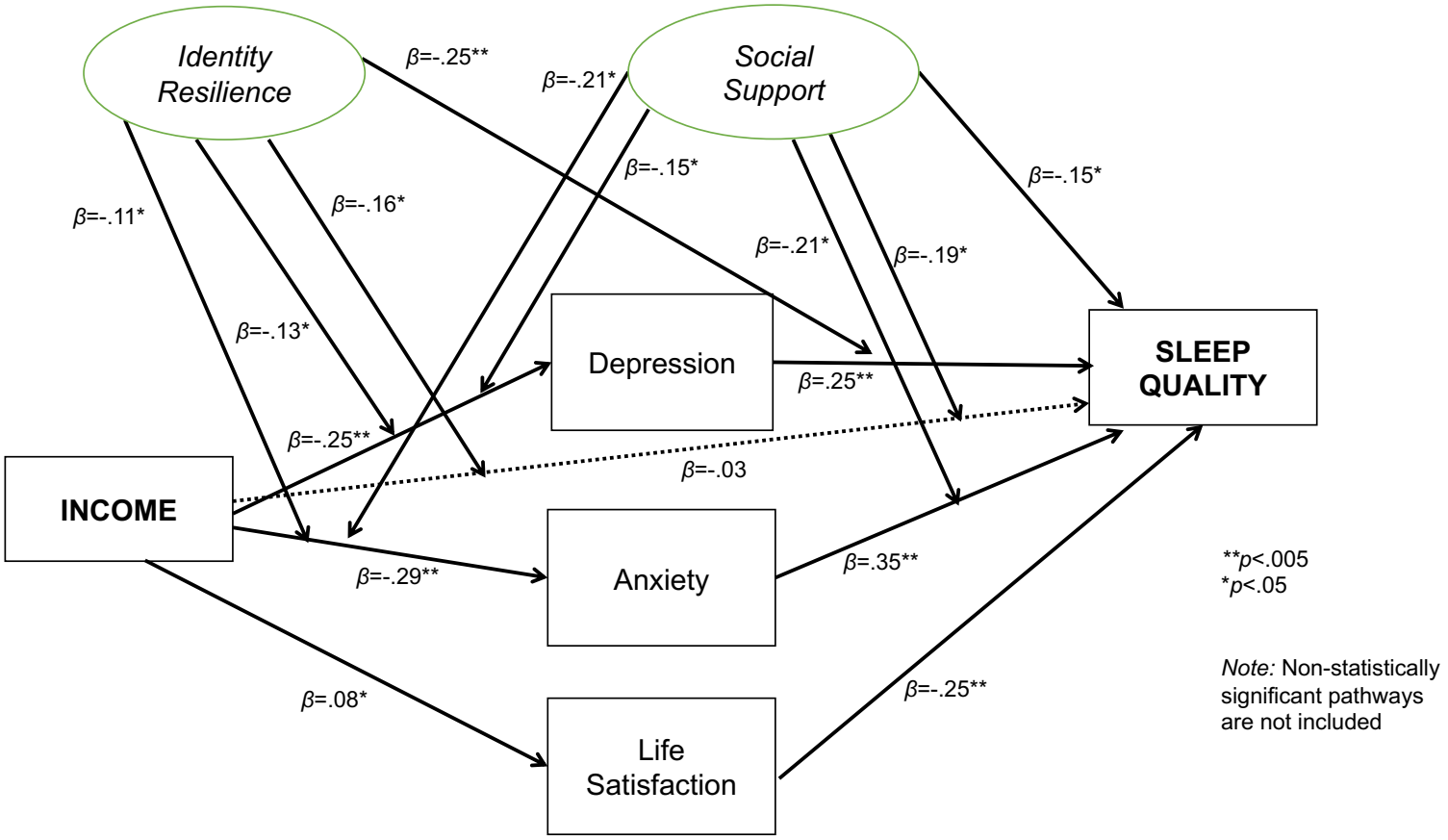

Figure 2. Moderation Mediation Model with sexual identity acceptance concerns and discrimination as moderators of the relationships between income and sleep quality through the mediators of depression, anxiety and life satisfaction