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Psychosocial syndemics and quality of life among Australian people living with HIV

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ABSTRACT

Objective: Advances in treatment have transformed HIV into a manageable chronic illness, yet people living with HIV (PLHIV) continue to face psychosocial challenges that reduce quality of life (QoL). These factors often co-occur and interact, creating syndemic effects that worsen outcomes. **Method:** This study examined relationships between HIV-related stigma, mental health difficulties, and social disconnection in predicting QoL. Participants were 213 PLHIV (184 male, 21 female, eight transgender/other/undisclosed) attending Albion, an urban tertiary HIV clinic in Sydney, Australia. They completed questionnaires assessing stigma, mental health, social support, and QoL. **Results:** HIV-related stigma, mental health difficulties, and social disconnection each independently predicted poorer QoL. A syndemic effect was found between stigma and social disconnection, with QoL lowest when both were high. **Conclusions:** Psychosocial comorbidities significantly impact QoL in PLHIV. Findings underscore the value of a syndemic framework to guide clinical research and highlight the need for holistic interventions addressing stigma, social support, and mental health.

Introduction

Psychosocial syndemics and quality of life among Australian people living with HIV

Human immunodeficiency virus infection (HIV), once regarded as an acute and often terminal illness, is now increasingly managed and treated as a chronic illness with significant reductions in morbidity and mortality resulting from early diagnosis, treatment with antiretroviral therapy (ART) and lifelong adherence (Jarrín et al., 2024; Katz & Maughan-Brown, 2017; Nakagawa et al., 2013). Consequently, life expectancy for people living with HIV (PLHIV) in developed countries, including in Australia, now approaches that of the general population (Australian Government, Department of Health, 2022; Katz & Maughan-Brown, 2017), with many more PLHIV now ageing (Teeraananchai et al., 2017). With the success of medical treatments, research and clinical focus has broadened to address the psychosocial needs to improve their quality of life (QoL) so that PLHIV not only live longer but also *live well*. It is well established that PLHIV experience lower QoL than the general population (Brown et al., 2018; Hutton et al., 2013; Nazik et al., 2013) and are particularly vulnerable to psychosocial challenges, including HIV-related stigma (Slater et al., 2013), social disconnection (Bekele et al., 2013) and mental health concerns (Brandt, 2009). Importantly, these factors do not occur in isolation but are often comorbid and interact, with the potential to amplify their negative impact on QoL (Biello et al., 2016; Rasoolinajad et al., 2018). Therefore, understanding the nature of these relationships and their impact on QoL is necessary to support PLHIV effectively.

Quality of life

QoL encompasses an overall sense of well-being, happiness and satisfaction with life (Basavaraj et al., 2010). It goes beyond the presence or absence of disease to consider psychological, social, and environmental factors and their interactions (World Health Organization, 2012). Unsurprisingly, research shows that QoL among PLHIV is generally poorer than the general population (Brown et al., 2018; Hutton et al., 2013; Nazik et al., 2013), likely the result of their vulnerability to psychosocial challenges, including HIV-related stigma, social disconnection and mental health difficulties, which often occur comorbidly (Biello et al., 2016; Rasoolinajad et al., 2018), in addition to physical consequences of living with a chronic disease (Goulet et al., 2007; Guaraldi et al., 2011; Hasse et al., 2011; Rodriguez-Penney et al., 2013) and long-term ART (Chawla et al., 2018; Hasse et al., 2011). Moreover, research suggests that psychosocial factors have a greater impact on QoL for PLHIV than medical factors (Mikołajczak et al., 2022; Power et al., 2019), highlighting that focusing solely on the biomedical aspects of the disease is insufficient to optimise QoL (Karkashadze et al., 2017; Miners et al., 2014; Zeluf-Andersson et al., 2019).

The Joint United Nations Programme on HIV/AIDS (UNAIDS) "95-95-95" HIV care cascade target for HIV management (UNAIDS, 2015), ensuring that 95% of all PLHIV know their status, 95% of those diagnosed receive ART, and 95% of those on ART to achieve an undetectable viral load (UDVL) represents the biomedical continuum of care for HIV (Lazarus et al., 2016). Recent assessments indicate that Australia is progressing towards these targets, with cascade estimates at 93-95-98 (King et al., 2023). Success in achieving biomedical targets has led to calls to incorporate QoL in the continuum of care by adding a "fourth 90", which ensures that individuals with an UDVL also report good health-related quality of life (HRQoL; Lazarus et al., 2016). HRQoL captures specific aspects of QoL and reflects how an individual's health status impacts their well-being and ability to function in different areas of life (Guaraldi et al., 2019; Yin et al., 2016) and has been recognised as an additional outcome in the most recent Global Health Sector Strategy on HIV (WHO, 2022), and in Australia's recent Ninth National HIV Strategy 2023–2030 (Australian Government, Department of Health, 2022).

Optimising QoL is not only important in its own right but is also instrumental to consolidating biomedical outcomes. Psychosocial challenges, such as HIV-related stigma, mental health difficulties, and social disconnection, negatively impact every stage of the cascade, from testing to viral suppression (Brown et al., 2018; Mizuno et al., 2015; Nel & Kagee, 2011). Additionally, psychosocial factors interact with biological factors, affecting the progression of HIV (Blashill et al., 2011; Bulsara et al., 2021). Thus, there is a strong rationale for understanding and addressing psychosocial factors to support PLHIV effectively.

HIV-related stigma

Research shows that PLHIV continue to experience stigma, including in Australia (Mendonca et al., 2023; Mesías-Gazmuri et al., 2023), and that experiencing stigma is a significant predictor of diminished QoL (Rasoolinajad et al., 2018; Slater et al., 2013). Stigma is the experience of social devaluation, which negatively affects social interactions and relationships (Ziersch et al., 2021). For PLHIV, stigma is associated with mental health difficulties, poor sleep, loneliness, hopelessness, and reduced functioning and well-being, particularly in response to negative consequences following disclosure (Clark et al., 2003; Earnshaw & Chaudoir, 2009; Fekete et al., 2018; Lee et al., 2002; Mak et al., 2007; Sowell et al., 1997). HIV-related stigma can also act as a barrier to social support and contribute to social isolation by discouraging the disclosure of HIV status (Arnold et al., 2014; Derlega et al., 2004; Fekete et al., 2018). Furthermore, HIV-related stigma is exacerbated by the stigma associated with affiliation with other marginalised groups, compounding its negative impact on QoL (Andrinopoulos et al., 2015; Slater et al., 2015). In Australia, this includes men who have sex with men (MSM), people who inject drugs, transgender and gender-diverse peoples, and female sex workers (NSW Ministry of Health, 2020). This multi-layered stigma is captured by the theory of intersectionality, which highlights how multiple social identities interact to shape a person's experience and health outcomes (Algarin et al., 2019).

Social disconnection

PLHIV often report lower levels of social support (Garrido-Hernansaiz & Alonso-Tapia, 2017; Marziali et al., 2021; Power et al., 2019), which is associated with diminished QoL (Charkhian et al., 2014; Nazik

et al., 2013; Vo et al., 2016). Low social support results from stigma, which leads to struggles with both disclosure and non-disclosure and causes social isolation (Arnold et al., 2014; Derlega et al., 2004; Feigin et al., 2013; Fekete et al., 2018; Power et al., 2021). Low social support also contributes to loneliness, which is linked to increased stress and mental health difficulties, resulting in lower QoL (Harris et al., 2020). Conversely, research consistently demonstrates a strong association between perceived social connectedness and enhanced QoL among PLHIV (Bekele et al., 2013; Charkhian et al., 2014; Rasoolinajad et al., 2018). The degree of social support is positively associated with the degree of disclosure (Garrido-Hernansaiz & Alonso-Tapia, 2017). Higher levels of social support are inversely related to mental health difficulties (Ashton et al., 2005; Heywood & Lyons, 2016; Rao, Feldman, et al., 2012; Rasoolinajad et al., 2018; Rueda et al., 2016). Moreover, social support has been found to mediate the relationship between stigma and QoL (Mendonca et al., 2023; Rao, Chen, et al., 2012), as well as the relationship between stigma and mental health difficulties (Brener et al., 2020; Rao, Chen, et al., 2012).

Mental health concerns

PLHIV consistently report higher rates of mental health difficulties compared to the general population (Heywood & Lyons, 2016; Lowther et al., 2014), which is associated with lower QoL (Basavaraj et al., 2010; Cai et al., 2020; Charles et al., 2012; Fleming et al., 2004; Vo et al., 2016). This results from concerns around disclosure (Feigin et al., 2013), the experience of multi-layered stigma (Heywood & Lyons, 2016; Logie et al., 2018), and changes to social support satisfaction and expectations following diagnosis (Garrido-Hernansaiz & Alonso-Tapia, 2017). In general, mental health difficulties can reduce the capacity for social interaction, leading to social withdrawal and social disconnection (Department for Digital, Culture, Media & Sport, 2022; Waldron et al., 2021). Furthermore, mental health difficulties have been shown to mediate the relationship between social support and QoL for PLHIV (Degroote et al., 2014). It has also been suggested that mental health difficulties such as depressive symptoms not only result from stigma but may also reinforce it by fostering a negative cognitive bias toward one's HIV status (Yuan et al., 2024), interact with internalisation of stigma, and contribute to believing negative stereotypes (Rao, Feldman, et al., 2012). The interrelatedness of HIV-related stigma, mental health difficulties, and social disconnection, as discussed in previous sections, underscores the need to investigate their combined impact on QoL when they occur comorbidly.

Comorbidity and syndemics

Psychosocial factors significantly impact QoL and, like biological factors, do not occur in isolation but present comorbidly in real-world clinical presentations (Biello et al., 2016; Rasoolinajad et al., 2018). Therefore, understanding the relationships between psychosocial factors and their combined impact on QoL is essential to inform treatment approaches and the allocation of resources (Wawrzyniak et al., 2015). Studies show, in general, that as the number of comorbidities increases in PLHIV, QoL tends to decrease (Rodriguez-Penney et al., 2013). This poses a significant challenge, as PLHIV are now living longer (Teeraananchai et al., 2017), potentially increasing the prevalence of psychosocial comorbidities such as stigma, social disconnection and mental health difficulties.

Syndemic research is an emerging field that examines the compounding effects of biological and psychosocial factors on both biological and psychological health outcomes (Biello et al., 2016; Singer et al., 2017). This approach understands comorbidity through a *syndemic* lens, whereby the burden of comorbidity is not merely additive but multiplicative (Tsai & Burns, 2015). Unlike the biomedical model, where diseases are separate entities, it emphasises the interconnectedness and complex interplay between factors contributing to adverse health outcomes (Tsai & Burns, 2015). See Figure 1 for a graphic depiction of syndemic relationships and the impact on QoL in the context of psychosocial comorbidity.

Since the concept was introduced, there has been increasing evidence supporting syndemic interactions between biological and psychological factors in the context of HIV (Biello et al., 2016; Kwan & Ernst, 2011; Stall et al., 2008). While in the context of psychosocial factors alone, presenting with multiple co-occurring psychosocial issues has been shown to negatively impact engagement in HIV-related medical care, ART adherence, and viral suppression and influence sexual risk-taking behaviour (Biello et al., 2016; Bulsara
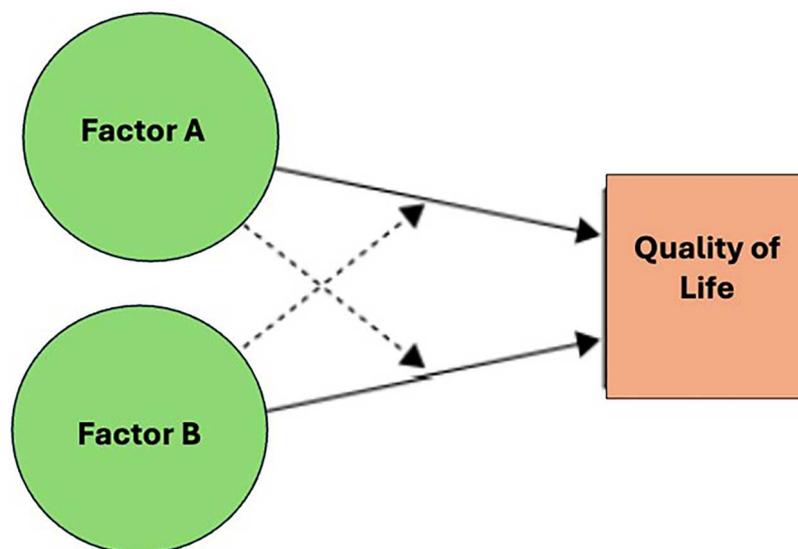
Figure 1. Syndemic model of the synergistic effects of combined psychosocial factors on quality of life.

et al., 2021; Chan et al., 2020; Friedman et al., 2015; Mizuno et al., 2015; Wawrzyniak et al., 2015). However, research investigating psychosocial syndemics and their impact on QoL remains limited, although early indications are that they are associated with lowered QoL (Gomes et al., 2021; Mesías-Gazmuri et al., 2023).

The present study

Research is needed to explore psychosocial syndemics and their impact on QoL, particularly within the Australian context where few studies have been conducted and none, to the author's knowledge, have specifically investigated psychosocial factors and QoL. This is essential given Australia's unique population profile, where the majority reside in urban areas with good access to services (Power et al., 2019), and report favourable education, income, and living standards; factors associated with improved QoL (Tzemis et al., 2013; Yang et al., 2016). Moreover, psychosocial factors, such as stigma, vary according to sociocultural contexts (Herrmann et al., 2013; Link & Phelan, 2001) and thus insights from studies conducted in other contexts may not accurately reflect conditions in Australia. This is important to understand to optimise QoL and promote living well with HIV, as well as optimise biomedical outcomes.

The present study explores the impact of psychosocial syndemics on QoL within an Australian urban context, aiming to identify potential syndemics among HIV-related stigma, mental health difficulties, and social disconnection, which frequently co-occur in this population, and examine their impact on QoL. Specifically, we hypothesise that HIV-related stigma, mental health difficulties and social disconnection will predict QoL. We also hypothesise a syndemic relationship between HIV-related stigma and mental health difficulties, mental health difficulties and social disconnection, and HIV-related stigma and social disconnection, where the overall negative impact on QoL exceeds the additive contributions of each factor when they co-occur, indicating the presence of a syndemic.

Methods

Participants

The present study recruited 213 participants who were attending The Albion Centre (Albion), a multidisciplinary HIV treatment Centre in urban Sydney, Australia. Recruitment occurred through advertisements posted in waiting rooms, direct approaches from staff, and SMS requests (a strategy employed due to COVID-19 constraints at the time). Participation was voluntary, and the sample represented approximately 10% of all Albion attendees. To be eligible, participants had to be over the age of 18, proficient in English, living with HIV and accessing specialist HIV medical care. Ethics approval was obtained from the

University of Technology, Sydney (UTS; HREC ETH21-5827) and South Eastern Sydney Local Health District (SESLHD; HREC 2020/ETH01434).

Procedure

Written informed consent was obtained to be enrolled in the study and access participants' medical records for health, viral load (VL), and illness duration information. Questionnaires were completed in-person with hard copies of questionnaires or via Qualtrics (Qualtrics, 2024), an online survey platform commonly used in research. Participants were asked to provide demographic information before completing measures on HIV stigma, social connectedness, mental health and QoL. Participation took approximately 25 min, and participants were given a $$25 grocery voucher as remuneration for their time. The present study analyses secondary data, which was collected as part of a broader research project (Bowler-Bowerman et al., 2024; Mendonca et al., 2023). Data collection occurred from February 2021 to June 2022.

Measures

The PozQoL is a 13-item measure specifically developed to assess the QoL of PLHIV (Brown et al., 2018). It provides an overall assessment of QoL, in addition to assessing specific domains of well-being (Health Concerns, Psychological, Social, and Functional Well-being). Respondents indicated on a five-point Likert scale (1 = *Not at all* to 5 = *Extremely*) how much a statement applies to them at the time of completing the questionnaire. Scores range from 13 to 65, with higher scores indicating higher QoL. Scores are also calculated for each domain of well-being. The measure has been validated in a diverse sample of Australian adults and has demonstrated excellent internal consistency (Cronbach's α = 0.95), test-retest reliability, and moderate to strong concurrent and convergent validity (Brown et al., 2018; Wang et al., 2022; Wen et al., 2022).

The Scale of Perceived Social Support in HIV (PSS-HIV) is a 12-item measure specifically developed to measure the perception of and satisfaction with social support in PLHIV (Cortes et al., 2014; Engler et al., 2017). It consists of three subscales: Belonging, Esteem, and Self-Development. Respondents rated their agreement with each statement on a five-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*), indicating how they felt at the time of completing the measure. Scores range from 12-60, with higher scores indicating higher perceived social support. The measure has been validated across diverse populations and has demonstrated good internal consistency of the overall scale, subscales, and construct validity (Cortes et al., 2014; Wallace et al., 2019).

The HIV Stigma Scale-Short Form (HSS-SF) measures the experiences and mechanisms of stigma in PLHIV (Reinius et al., 2017). It consists of 12-items and includes four subscales exploring the different facets of HIV-related stigma: Personalised Stigma, Disclosure Concerns, Concerns about Public Attitudes, and Negative Self-Image (Reinius et al., 2017). Respondents rated their agreement with each statement on a four-point Likert scale (1 = *strongly disagree* to 4 = *strongly agree*), indicating how they felt at the time of completing the measure. Scores ranged from 12 to 48, with higher scores indicating higher perceived HIV-related stigma. The measure has shown good reliability across all subscales (α > 0.7) and validity for the overall scale (Reinius et al., 2017), with emerging evidence supporting its cross-cultural applicability (Imran et al., 2020; Luz et al., 2020).

The Diagnostic and Statistical Manual, 5th Ed (DSM-5) Level 1 Cross-Cutting Symptom Measure-Adult (DSM-XC) is a brief, self-rated, transdiagnostic measure of current mental health symptomatology (Mahoney et al., 2020). It was developed to help clinicians identify comorbidities, guide further inquiry, and support treatment decision-making (Meaklim et al., 2018). It consists of 23-items that assess 13 psychiatric domains, assessing the frequency of specific symptoms during the past two weeks. Each item is rated on a 5-point Likert scale ranging from "None (not at all)" (0) to "Severe (nearly every day)" (4). Emerging evidence supports its use with clinical samples (Bravo et al., 2018; Meaklim et al., 2018) and in research (Gibbons et al., 2023; Gonçalves Gonçalves Pacheco et al., 2024). The measure has demonstrated appropriate internal consistency, internal validity, convergent validity with longer measures of the same construct and criterion validity for theoretically relevant constructs (Bravo et al., 2018; Soda et al., 2024). The measure was selected because many screening tools focus on a single diagnostic domain, neglecting the common co-occurrence of mental health concerns (Kessler et al., 2005). Note, item 23 was adapted for an Australian

audience ("Vicodin" was changed to "opioid/codeine-based medications"; "Adderall" changed to "Dexamphetamine").

Statistical analyses

The assumptions of multiple regression analysis were checked and were satisfactory. A bivariate Pearson correlation analysis was conducted to examine the relationships between variables and check for multicollinearity. Collinearity statistics fell within acceptable limits, with tolerance values all greater than 0.1 and all VIF values less than 2 for all study variables. Normality was checked using histogram and scatterplots of residuals.

Subsequently, we explored potential syndemic interactions between the three predictor variables (HIV-related stigma, social disconnection and mental health difficulties) and their impact on QoL using multiple regression analysis. Given the three predictor variables, a 3×3 interaction analysis was the preferred approach. However, due to power limitations resulting from insufficient sample size, this approach was not feasible. Alternatively, we employed a 2×2 interaction analysis and performed four multiple regression analyses to derive four separate models, acknowledging that this approach may have resulted in reduced statistical power. Model 1 included the three predictor variables, with illness duration entered as a covariate and QoL as the outcome variable. Illness duration was included as a covariate to account for potential effects of disease progression (Balderson et al., 2013). Following Model 1, we performed three multiple regression analyses, each consisting of Model 1 with an added unique interaction term. Model 2 included the interaction between HIV-related stigma and mental health difficulties, Model 3 included the interaction between mental health difficulties and social disconnection, and Model 4 included the interaction between HIV-related stigma and social disconnection. These three models (Models 2, 3 and 4) were compared to Model 1 to determine whether comorbidity had an additional effect beyond the individual additive impacts of psychosocial comorbidities (as represented by Model 1), indicating the presence of a syndemic (Tsai & Burns, 2015). Specifically, a syndemic would be indicated by a significant interaction term and/or an increase in explained variance in QoL. Data analysis was conducted using IBM SPSS Statistics Version 29.0.2.0.

Results

Before performing the multiple regression analyses, PSS-HIV scores were reverse coded so that higher scores indicated greater social disconnection. This was done to facilitate ease of interpretation, aligning the direction of the scores with the other variables in the analysis. That is, higher scores indicate higher dysfunction for all predictor variables.

Demographic information

Demographic information is detailed in Table 1. Categorical variables were collapsed and merged if there were low numbers, and it was conceptually sound to do so. For example, for sexual orientation, "transgender" and "other" were merged. The mean age was 49.77 years ($SD = 12.47$; range 27–77). The majority of the sample identified as male ($n = 184$ [84.4]) and identified as gay/queer (Table 1), in line with the HIV-epidemic profile observed in Australia. The mean illness duration was 16.36 years ($SD = 10.35$; range 0.4-40 years). With respect to VL, there were $n = 206$, UDVL and $n = 7$ detectable VL.

Descriptive statistics

Descriptive statistics for questionnaires assessing HIV-related stigma (HSS-SF-HIV), perceived social support (PSS-HIV) and mental health symptomatology (DSM-XC) are detailed in Table 2.

During development of the PozQoL, researchers used an equal distribution to differentiate between various thresholds for QoL (Brown et al., 2018; PozQoL Project, 2020). The results of the present study exhibited a similar distribution pattern (Table 3).

Table 1. Demographic information.

Variable	n (%)
Gender	213
Male	184 (86.4)
Female	21 (9.9)
Transgender/Other/Non-Disclosed	8 (3.8)
Sexual orientation	
Gay/Queer	163 (76.5)
Heterosexual	23 (10.8)
Bisexual/Other/Non-Disclosed	27 (12.7)
Relationship Status	
Single	121 (56.8)
Married/De-Facto/Partnered	72 (33.8)
Casual/Other	20 (9.4)
Income Level	
$$0–37,000	107 (50.3)
$$37,001–$$90,000	75 (35.2)
$$90,000+	31 (14.5)
Highest Education Level	
High School	62 (29.1)
TAFE/College	60 (28.2)
University	91 (42.7)
Housing Status	
Own Home/Rent	155 (72.8)
Department of Housing/ Boarding House/Homeless/Other	58 (27.3)

Table 2. Descriptive statistics.

Measures	Mean	SD	Minimum	Maximum
PSS-HIV[a]	28.21	9.07	12	59
HSS-HIV[b]	30.85	7.71	12	48
DSM-XC[c]	21.27	15.10	0	64

[a]Perceived social support (PSS-HIV.)
[b]HIV-related stigma (HSS-SF-HIV).
[c]Mental health symptomatology (DSM-XC).

Table 3. Thresholds for interpreting the PozQoL[a].

Mean	SD	Minimum	Maximum	QoL[a]			
45.25	11.01	14	65	Low	Moderate	High	Very High
				47 (22.1%)	51 (23.9%)	63 (29.6%)	52 (24.4%)

[a]QoL (PozQoL).

Bivariate Pearson's correlations

A bivariate Pearson Correlation was performed to examine the associations among the variables: illness duration, QoL, HIV-related stigma, social disconnection and mental health symptomatology. See Table 4 for a correlation matrix of study variables.

Multiple linear regression

A series of multiple regression analyses were conducted to explore possible syndemic relationships between HIV-related stigma, social disconnection and mental health symptomatology and their impact on QoL.

Table 4. Pearson correlation matrix (n = 213).

	PoZQoL[a]	Illness duration	PSS-HIV[b]	HSS-SF[c]	DSM-XC[d]
PoZQoL	1	.149*	−.513**	−.678**	−.646**
Illness duration	–	1	.085	−.196	−.034
PSS-HIV	–	–	1	.435**	.372**
HSS-SF	–	–	–	1	.388**
DSM-XC	–	–	–	–	1

[a]QoL (PoZQoL).
[b]Perceived social support (PSS-HIV).
[c]HIV-related stigma (HSS-SF-HIV).
[d]Mental health symptomatology (DSM-XC).
*$p < 0.05$.
**$p < .001$.

Model 1, which included illness duration, HIV-related stigma, social disconnection and mental health symptomatology, was significant (*adj.* $R^2 = .650$, $F[4,207] = 99.109$, $p < .001$), explaining 65% of the variance in QoL. Model 1 was compared with Models 2, 3 and 4 to explore syndemic relationships.

Model 2 explored the possible syndemic between mental health symptomatology and HIV-related stigma by creating an interaction term with the two predictors and adding it to Model 1. Introducing the interaction in Step 2 was not statistically significant ($\Delta R^2 = .000$, *F*-change [1, 206] = .072, $p = .788$), indicating no evidence of a syndemic relationship between mental health symptomatology and HIV-related stigma.

Model 3 explored the possible syndemic between mental health symptomatology and social disconnection by creating an interaction term with the two predictors and adding it to Model 1. Introducing the interaction in Step 2 was not statistically significant ($\Delta R^2 = .000$, *F*-change [1, 206] = .100, $p = .752$), indicating no evidence of a syndemic relationship between mental health symptomatology and social disconnection.

Model 4 explored the possible syndemic between HIV-related stigma and social disconnection by creating an interaction term with the two predictors and adding it to Model 1. Introducing the interaction in Step 2 was statistically significant ($\Delta R^2 = .008$, *F*-change[1, 206] = 4.869, $p = .028$), indicating a syndemic relationship between HIV-related stigma and social disconnection, such that QoL decreases when HIV-related stigma and social disconnection are high. Table 5 shows the respective regression coefficients for each model. See Figure 2 for a visual representation of the syndemic interaction between HIV-related stigma and social disconnection.

Discussion

Understanding the psychosocial factors that impact QoL, and their inter-relationships, is important to ensure PLHIV are psychologically and medically well. In the present study, and consistent with previous

Table 5. Multiple regression results for QoL ($n = 213$).

Analyses	Variables	$^aR^2$	F	B^b	SE^c	β^d	p	CI95% for B LLCI	ULCI
Model 1		0.65	99.109						
	Illness duration			0.071	0.045	0.067	.117	−.018	.160
	Social Disconnection			−0.218**	0.058	−0.180	<.001**	−.332	−.105
	HIV-related stigma			−0.611**	0.069	−0.427	<.001**	−.747	−.474
	Mental health symptomatology			−0.300**	0.033	−0.411	<.001**	−.365	−.234
Model 2	Model 1 + Mental health symptomatology x HIV-related stigma	0.649	78.946						
	Illness duration			0.071	0.045	0.067	.116	−.018	.160
	Social Disconnection			−0.220**	0.058	−0.181	<.001**	−.334	−.105
	HIV-related stigma			−0.609**	0.070	−0.426	<.001**	−.747	−.472
	Mental health symptomatology			−0.298**	0.034	−0.409	<.001**	−.365	−.232
	Mental health symptomatology x HIV-related stigma			−0.001	0.004	−0.011	.788	−.008	.006
Model 3	Model 1 + Mental health symptomatology x Social Disconnection	0.649	78.962						
	Illness duration			0.071	0.045	0.067	.116	−.018	.160
	Social Disconnection			−0.219**	0.058	−0.180	<.001**	−.333	−.105
	HIV-related stigma			−0.609**	0.070	−0.426	<.001**	−.746	−.472
	Mental health symptomatology			−0.301**	0.034	−0.413	<.001**	−.367	−.235
	Mental health symptomatology x Social Disconnection			0.001	0.003	0.013	.752	−.005	.007
Model 4	Model 1 + HIV-related stigma x Social Disconnection	0.657	81.743						
	Illness duration			0.067	0.045	0.063	.132	−.021	.155
	Social Disconnection			−0.184*	0.059	−0.152	.002**	−.301	−.068
	HIV-related stigma			−0.615**	0.069	−0.430	<.001**	−.750	−.479
	Mental health symptomatology			−0.306**	0.033	−0.420	<.001**	−.371	−.241
	HIV-related stigma x Social Disconnection			−0.013**	0.006	−0.092	.028**	−.024	−.001

Model = "enter" method in SPSS statistics.
$^aR^2$ = adjusted R-squared.
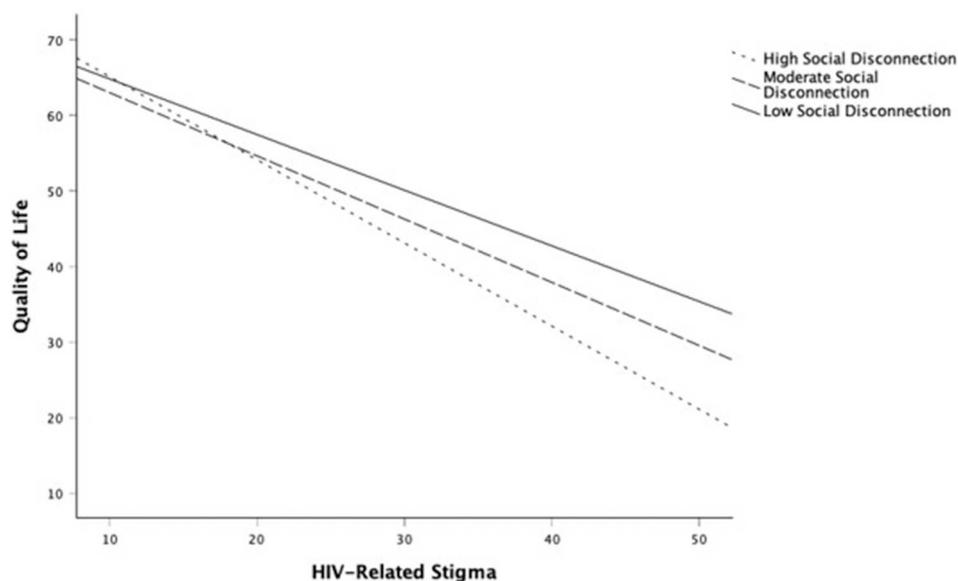^bB = unstandardised regression coefficient.
^cSE = standard error of the coefficient.
$^d\beta$ = standardised coefficient.
*$p < 0.05$.
**$p < 0.001$.

Figure 2. Syndemic interaction between HIV-related stigma and social disconnection impacting QoL.

research on QoL of PLHIV in Australia (Brown et al., 2018; Power et al., 2019), approximately 50% of participants did not report high QoL, underscoring the need for research and intervention. So far, studies have shown that psychosocial factors significantly impact QoL; however, few have examined them through a *syndemic lens*, which accounts for real-world comorbidity.

Independent effects of HIV-related stigma, social disconnection and mental health difficulties

The present study found that HIV-related stigma, social disconnection and mental health difficulties each significantly predicted poorer QoL in PLHIV in this Australian cohort, consistent with previous international research (Cai et al., 2020; Rasoolinajad et al., 2018; Vo et al., 2016). The three variables explained a large proportion of the variability in QoL (65%), highlighting the significant impact of psychosocial factors on QoL. Given that 206 (97%) of the 213 participants reported an UDVL, it indicates, consistent with previous research (Mikołajczak et al., 2022; Power et al., 2019), that addressing medical factors alone is insufficient to optimise QoL.

Greater HIV-related stigma predicted lower QoL, consistent with previous research (Fuster-Ruizdeapodaca et al., 2014; Logie & Gadalla, 2009). In a report on the prevalence of HIV-related stigma in Australia, one-third of respondents surveyed reported experiencing stigma related to their status in the past 12 months (Norman et al., 2022). While it was not directly measured, it is likely that multi-layered stigma also contributed to reduced QoL (Andrinopoulos et al., 2015; Slater et al., 2015).

Greater mental health difficulties also predicted lower QoL, as expected. Research demonstrates that PLHIV consistently report higher rates of mental health difficulties compared to the general population (Heywood & Lyons, 2016; Lowther et al., 2014), as well as higher rates of comorbid mental illness (Gooden et al., 2022), and these are associated with reduced QoL (Basavaraj et al., 2010; Cai et al., 2020; Charles et al., 2012; Fleming et al., 2004; Vo et al., 2016), with which the present results are consistent.

Greater social disconnection predicted lower QoL, consistent with previous research (Charkhian et al., 2014; Fredericksen et al., 2021; Nazik et al., 2013; Vo et al., 2016). Conversely, greater social connectedness predicted improved QoL, again consistent with previous research (Bekele et al., 2013; Charkhian et al., 2014; Rasoolinajad et al., 2018). Social support is theorised to have direct effects on physical and mental health (Bekele et al., 2013) and indirect effects, acting as a buffer against stressful events (Bekele et al., 2013; Berkman et al., 2000; Cohen & Wills, 1985). In the context of HIV, social support has a substantial impact on the experience of HIV-related stigma and disclosure (Brener et al., 2020; Elopre et al., 2016; Garrido-Hernansaiz & Alonso-Tapia, 2017), which will be discussed in the next section.

Syndemic relationships between HIV-related stigma, social disconnection and mental health difficulties

We did not observe a syndemic relationship between HIV-related stigma and mental health difficulties impacting QoL. However, they were positively associated, consistent with previous research (Fekete et al., 2018; Mak et al., 2007; Rasoolinajad et al., 2018). Prejudice or discrimination from others, as well as internalised stigma, have been shown to be risk factors for and contribute to poorer mental health outcomes (Algarin et al., 2021; Clark et al., 2003; Earnshaw & Chaudoir, 2009; Fekete et al., 2018; Lee et al., 2002; Mak et al., 2007; Sowell et al., 1997; Vanable et al., 2006). Furthermore, it has been suggested that mental health difficulties not only result from stigma but also reinforce it by fostering a negative cognitive bias toward one's HIV status, interacting with internalisation of stigma, and leading to believing negative stereotypes (Rao, Feldman, et al., 2012; Yuan et al., 2024). Since HIV-related stigma and mental health difficulties are intrinsically related, it may explain why a syndemic relationship was not observed. Due to their intrinsic relationship, statistical determination may have been limited by reduced statistical power and inflated standard errors. It was beyond the scope of the present study to ascertain whether any current mental health conditions were being treated, which might have mitigated these results. Finally, data collection occurred during COVID-19, and its impact cannot be discounted (Bojanowska et al., 2021; Prati & Mancini, 2021).

We also did not observe a syndemic relationship between mental health difficulties and social disconnection impacting QoL. However, they were positively associated, consistent with previous research (Paolillo et al., 2018; Pollak et al., 2024). This is unsurprising given that social withdrawal is a transdiagnostic feature for mental health difficulties (Meyer, 2003), and mental health difficulties reduce the capacity for social interaction (Department for Digital, Culture, Media & Sport, 2022; Waldron et al., 2021). As previously discussed, the lack of an observed syndemic relationship can be attributed to the variables being intrinsically related, the suitability of the DSM-XC measure, and the impact of the COVID-19 pandemic.

The present study did, however, identify a syndemic relationship between HIV-related stigma and social disconnection impacting QoL, whereby QoL decreased further when both HIV-related stigma and social disconnection were high. This is likely due to the bidirectional relationship between the variables (Takada et al., 2014). The level of social support is a known mediator of the relationship between stigma and QoL (Mendonca et al., 2023; Rao, Chen, et al., 2012; Rasoolinajad et al., 2018), such that as social support increases, the harmful effects of stigma decrease and vice versa (Armoon et al., 2022), a dynamic which can unfold during disclosure decision-making (Kalichman et al., 2003; Takada et al., 2014), whereby greater perceived social support can positively impact the likelihood of disclosing HIV status (Kalichman et al., 2003; Smith et al., 2008). Furthermore, HIV-related stigma and social disconnection can interact following disclosure. Disclosure can facilitate greater social support leading to greater psychological well-being (Brener et al., 2020; Heywood & Lyons, 2016; Stutterheim et al., 2017; Zea et al., 2005). Alternatively, negative reactions following disclosure (Stutterheim et al., 2017) can lead to social network changes and severing of relationships (Takada et al., 2014). Moreover, when individuals feel supported, they are more resilient to emotional distress caused by discriminative experiences, reducing feelings of isolation (Earnshaw et al., 2013; Turan et al., 2017). Internalised stigma is linked to lower support group attendance and fewer connections with others living with HIV (Brener et al., 2013; Brener et al., 2020; Rao, Chen, et al., 2012; Van Tam et al., 2012), contributing to loneliness and reducing QoL (Fekete et al., 2018; Lee et al., 2002; Mak et al., 2007; Wu et al., 2015). Social isolation can potentially exacerbate the experience of internalised stigma, reinforcing feelings of marginalisation and exclusion and curtailing opportunities for positive experiences and validation from others (Sellers et al., 2003; Sellers & Shelton, 2003). Our results suggest a complex and dynamic relationship between HIV-related stigma and social disconnection with mutually negative reinforcing effects on QoL among PLHIV in Australia, consistent with international findings. These findings underscore the importance of intervention strategies that address syndemic interactions, specifically by targeting HIV-related stigma and fostering social connectedness to optimise QoL in PLHIV. They also highlight the importance of recognising and responding to comorbidity as it presents clinically.

Limitations

Due to the cross-sectional design, we cannot make causal inferences (Little & Rubin, 2000), so caution is required. Future research should utilise longitudinal designs to clarify the direction and causality of these relationships.

Due to the profile of the population, findings cannot be generalised to a younger cohort, culturally and linguistically diverse populations or populations living in rural/remote areas. Future research could focus on these populations for further investigation. Moreover, caution is needed in generalising the findings to the broader population of PLHIV in an urban setting, given the sample was self-selected. Individuals experiencing higher stigma and poorer mental health may have been less likely to participate, whereas individuals with stronger social connections may have been more likely to take part. Future research, where feasible, should utilise probability-based sampling to increase representativeness and reduce self-selection bias.

In the present study, the statistical power may have been insufficient to detect syndemic relationships, and we were unable to use a 3×3 design, which could be a valuable approach for future research. Finally, the DSM-XC was selected because it assessed a broad range of symptoms; however, it is designed for screening purposes and is not diagnostic (Mahoney et al., 2020) and therefore may not have been the most appropriate measurement.

Directions for future research

The three variables of interest accounted for 65% of the variability in QoL, indicating that there are other unaccounted-for factors impacting QoL that require research (Rueda et al., 2014). There needs to be further exploration of why syndemic relationships were not observed between mental health difficulties and HIV-related stigma, and mental health difficulties and social disconnection given the associations between variables identified in the literature (Fekete et al., 2018; Mak et al., 2007; Paolillo et al., 2018; Pollak et al., 2024; Rasoolinajad et al., 2018). More broadly, studies are needed to explore syndemic factors and their impact on QoL, especially in Australia, where the literature is limited (Mesías-Gazmuri et al., 2023). Finally, this is the first of few studies (Mendonca et al., 2023) to use mental health as an independent variable, and future studies can apply the same methodology to explore the impact of mental health on QoL as a comorbid factor.

Implications

The present study adds to the growing body of literature demonstrating the significant influence of comorbid psychosocial challenges on QoL (Mikołajczak et al., 2022; Sullivan et al., 2015) and emphasises the need to address these factors in optimising QoL for PLHIV. Addressing these factors is crucial for meeting the QoL targets outlined in the Australian Ninth National HIV Strategy (Australian Government, Department of Health, 2022) and the current NSW: 2021–2025 strategy (NSW Ministry of Health, 2020). Additionally, it aligns with the UNAIDS (2015) "95-95-95" target for HIV prevention and treatments considering existing literature highlighting the detrimental impact of psychosocial challenges on the biomedical continuum of care (Brown et al., 2018; Mizuno et al., 2015; Nel & Kagee, 2011).

The evidence we observed for syndemic relationships, representative of real-world comorbidity (Biello et al., 2016; Rasoolinajad et al., 2018), underscores the need to examine the impact of psychosocial challenges on QoL through a syndemic lens to inform policy, research, and clinical practice (Rasoolinajad et al., 2018). In the context of clinical practice, it highlights the need for a holistic, biosocial and multidisciplinary model of care that addresses comorbidities and the behavioural and social factors contributing to them to promote better long-term health outcomes (Mendonca et al., 2023; Peprah et al., 2020; Stall et al., 2003). This requires addressing syndemic factors with multi-component interventions targeting comorbid factors such HIV-related stigma and social disconnection concurrently (Operario & Nemoto, 2010).

These findings support the implementation of clinical interventions that target HIV-related stigma and social disconnection, emphasising a syndemic approach to address their combined effects. Access

to social support is instrumental in achieving HIV health-related outcomes (Heywood & Lyons, 2016). In the present study, we emphasise its significance for enhancing QoL and buffering against the effects of HIV-related stigma. Based on the research, support from any source, particularly emotional support (Heywood & Lyons, 2016), appears to be crucial, and we can facilitate this at an organisational level and train healthcare professionals to provide emotional support (Rasoolinajad et al., 2018), in addition to creating opportunities for peer support (Berg et al., 2021). Regarding approaches to address HIV-related stigma, they include information-based strategies, skill-building, contact-based interventions, counselling and support, structural approaches, and biomedical components (Stangl et al., 2013). These interventions can be integrated within different sectors (Mendenhall & Singer, 2020) to reduce the impact of stigma on mental health and social support, maximise access and engagement with medical care and optimise QoL. From a syndemic perspective, addressing each psychosocial factor not only mitigates its individual negative impact on QoL but also reduces the compounded detrimental effects that arise from their interactions.

Conclusions

Biomedical advances have significantly improved the mortality and morbidity of PLHIV. However, the present study highlights the significant impact of psychosocial challenges on QoL in PLHIV in Australia and, thus, the variability of QoL in PLHIV as a result. In particular, it showed psychosocial challenges, specifically HIV-related stigma, mental health difficulties and social disconnection have a significant impact on QoL. Importantly, it highlighted that psychosocial challenges, specifically HIV-related stigma and social disconnection, can interact, amplifying harm to QoL. It indicates that responding to these challenges and optimising QoL more broadly necessitates a syndemic approach to policy, research and clinical practice. This is crucial to ensure PLHIV not only live longer but live well. It is also necessary for consolidating biomedical outcomes, which QoL is significantly connected with.

Data availability statement

Data and materials for this study are not available, to comply with ethical standards and participant informed consent.

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