

## Depressive symptomatology and their correlates among caregivers of children and adolescents living with HIV in KwaZulu-Natal, South Africa

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### ABSTRACT

**Background:** Few studies have examined factors linked to depressive symptomatology among caregivers of children and adolescents living with HIV (CALHIV). This study estimated prevalence of depressive symptoms and identified associated factors among caregivers of CALHIV in KwaZulu-Natal, South Africa.

**Methods:** We used baseline data from a cluster-randomised controlled trial of the impact of a cash transfer program and an economic empowerment intervention on health and well-being caregivers of CALHIV. Depressive symptoms were assessed using 10-item Centre for Epidemiologic Studies Depression Scale (CES-D-10), with score of  $\geq 12$  indicating presence depressive symptomatology. Correlates of depressive symptoms were identified using multilevel generalised linear models.

**Results:** The prevalence of depressive symptoms was 57% (95% CI: 51% – 63%). Factors associated with increased odds of depressive symptomatology were residing in peri-urban (OR = 4.80,  $p = 0.038$ ), having any form of disability (OR = 8.12,  $p = 0.001$ ), having existing medical condition (OR = 3.27,  $p = 0.009$ ), experiencing physical abuse in the past 12 months (OR = 3.53,  $p = 0.020$ ), and low social support (OR = 3.94,  $p = 0.005$ ).

**Conclusion:** The prevalence of depressive symptoms was high among Caregivers of CALHIV. These findings highlight the need for targeted, context-specific interventions that include mental health screening for caregivers to support their mental health and well-being.

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## Background

Depression (also known as depressive disorder), as defined by the World Health Organization (WHO), is a common mental disorder that involves depressive mood or loss of pleasure or interest in activities for a long period (World Health Organization (WHO), 2024). Depression has a significant impact on daily functioning, including sleeping, eating, and working. WHO estimates indicate that 5% of adults present with clinically detectable depressive symptoms (World Health Organization (WHO), 2024). A systematic review of self-reported depressive symptomatology found that between 2001 and 2020, 34% (95% CI 30% – 38%) reported depressive symptoms globally, with major depressive disorders and dysthymia estimated at 8% (Shorey et al., 2022). These findings highlight the widespread prevalence of depressive symptomatology, underscoring the need to examine specific at-risk populations, such as caregivers, who are particularly vulnerable to mental health challenges.

Caregiving, regardless of the health condition involved, has been recognised as one of the risk factors for depressive symptoms and diminished mental health (Chakraborty et al., 2023). For example, 30–33% of caregivers of children and adolescents who survived a stroke developed depressive symptoms during a

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follow-up period of 18 months (Berg et al., 2005). Similarly, 57.6% (95% CI 53.3–7.2) of caregivers of children and adolescents with mental health illnesses reported depressive symptomatology (Minichil et al., 2019). Among CALHIV in Ghana, mild to severe depressive symptoms were present in 28% of caregivers (Ofori-Atta et al., 2019). Moreover, a South African study reported increased anxiety and depressive symptomatology among caregivers of children with HIV (Kuo et al., 2014). A global review of the literature on the prevalence of depressive symptomatology among people living with HIV found that 35% (95% CI 31% to 38%) of people living with HIV had some depressive symptomatology (Yang et al., 2024).

Depressive symptomatology among caregivers is predicted by several factors, which can be broadly categorised into lack of social support, burden of disease, length of illness, and abuse or violence (Karabekiroğlu et al., 2018). A longitudinal and qualitative study of caregiver depression and quality of life (QoL) among parents of adolescents living with HIV in Cape Town (South Africa) found that family resources, family support, and physical health strongly increased depressive symptomatology and poor health-related quality of life (HRQoL) among caregivers (Sevenoaks et al., 2022). Depressive symptomatology among caregivers could significantly impact their QoL and, consequently, the quality of care provided to the children or adolescents (Kim, 2022). A longitudinal qualitative study of caregiver depression and QoL in adolescents living with HIV found that caregiver depression was associated with poor physical health, diminished HRQoL, and an increase in externalising and internalising problems among adolescents living with HIV in Cape Town, South Africa (Sevenoaks et al., 2022). Caregiver depression was found to significantly affect adolescent behaviour and emotional development as well as their mental health in South Africa (Du Toit et al., 2023).

There is a critical need to address the mental health of caregivers of CALHIV, particularly in high HIV burden settings such as KwaZulu-Natal, South Africa. Despite the well-documented psychological stress associated with caregiving for chronic illness, such as HIV, there remains a notable paucity of targeted mental health interventions for this population. Caregivers play a significant role in ensuring adherence to treatment, psychosocial support, and overall well-being of CALHIV, yet their mental health needs are often overlooked. While the prevalence and correlates of depression have been explored in general populations or among caregivers in broader contexts, limited research has focused specifically on caregivers of CALHIV in resource-limited, high HIV prevalence districts such as rural KwaZulu-Natal. By identifying the factors associated with depressive symptoms in this vulnerable group, the current study aims to generate evidence that can inform the development of contextually relevant, targeted mental health screening and support strategies. This study, therefore, examined prevalence and correlates of depressive symptomatology among caregivers of CALHIV in KwaZulu-Natal, South Africa.

## Methods

### Design

We used baseline cross-sectional data collected from the Caregiver Well-Being Plus trial. This pilot cluster randomized trial aimed to evaluate the impact of a cash transfer plus an economic empowerment intervention on the health and well-being of caregivers of CALHIV aged between 5 and 19 years in KwaZulu-Natal, South Africa.

### Setting

The trial was conducted in the eThekweni metropolitan health district of KwaZulu-Natal, South Africa. The eThekweni municipality has 35 facilities, including primary healthcare clinics, community healthcare centers, and outpatient hospital-based facilities. HIV prevalence among children in the study area is approximately 1.4% (Hall, 2024), whereas HIV prevalence among adolescents is 4.1% (Mabaso et al., 2021).

### Participant's eligibility criteria

Eligible participants for the original trial were female caregivers aged 18 years and above, primary caregivers of CALHIV who were eligible for South Africa's COVID-19 grant but were not currently receiving it, had access to a mobile phone, and provided informed consent.

## Participant recruitment

Participants for the trial were recruited from public-sector HIV clinics within the eThekweni municipality. Potential participants were referred to field workers by clinic staff who conducted face-to-face preliminary screening using a checklist to ensure that participants met the inclusion criteria. A total of 273 caregivers met the criteria for the baseline assessment and were included in the final analysis.

## Data collection

Baseline data were collected by trained field staff using a five-part questionnaire that included modules on sociodemographic factors, physical and mental health, well-being, and sexual and physical abuse.

## Variables used

**Outcome variable. Depressive symptomatology:** Depressive symptomatology was measured using the Centre of Epidemiological Studies Depression Scale 10-item version (CES-D-10). The CES-D-10 is a 10-item scale that assesses depressive symptoms over the past week (Moyo et al., 2024). Sample items include: “I was bothered by things that don’t usually bother me”, “I had trouble keeping my mind on what I was doing”. The levels of severity for each of the items ranged from *rarely or none of the time, some or little of the time, occasionally or moderate amount of time*, and *can’t get going*. The details of the computations and measurements are explained elsewhere (Pincus, 2014; Williams et al., 2020). The items in the CES-D-10, when summed, had a total unweighted score of 30. Typically, individuals who score  $\geq 10$  on the CES-D-10 scale are considered to have depressive symptoms (Andresen et al., 1994). However, a validation of the CES-D-10 tool among Zulu, Afrikaans, and Xhosa populations of South Africa found that a CES-D-10 cutoff point of  $\geq 12$  provided good sensitivity and specificity compared to a cutoff point of  $\geq 10$  and therefore provided good performance characteristics. Further details of the validation of the CES-D-10 among Zulu, Afrikaans and Xhosa populations have been described in detail elsewhere (Baron et al., 2017). Consequently, we used a cutoff point of  $\geq 12$  to assess the presence of significant depressive symptomatology.

## Variables examined as potential correlates of depressive symptomatology

**Age group:** Age referred to the caregiver’s current age at the time of completion of the baseline questionnaire. We created a variable age group (years) categorised as follows: 18–25, 26–35, 36–45, 46–50, and 51.

**Race:** This variable describes the ethnicity of the caregiver, categorised into South Africa’s racial categories as follows: Black and Asian/Indian.

**Education:** This variable describes the highest educational attainment of the caregiver, categorised as no formal education, certificate, college diploma, and degree.

**Employment:** This variable describes whether the participant was employed at the time of the data collection. The categories are unemployed, employed, self-employed, and piecework.

**Dwelling type:** This variable describes the composition of a caregiver’s house. The categories are formal (brick and cement), informal (tin and wood), and traditional (mud).

**Residence:** Residence described the classification of the location where the caregiver resided at baseline. The categories are rural, peri-urban, urban, and mixed.

**Marital status:** We asked the caregivers to indicate their marital status. The categories of marital status described by caregivers were legally married, traditionally married, dating, and casual.

**Any health condition:** This variable describes whether the caregiver has any medical condition. The following medical conditions were considered: Tuberculosis, Hypertension, Diabetes, and Asthma.

**HIV status:** Participants were asked if they had been tested for HIV and were aware of their HIV status. Participants who were HIV-positive were coded 1, and those who were HIV-negative were coded 0.

**Any disability:** We further asked the participants to assess their disability status and whether they had any form of functional disability.

**Caregiver visual analogue scale:** The caregiver visual analogue scale (VAS) for assessing the quality of life was assessed by asking clients to rate their health on a scale ranging from 0 to 10, with 0 representing the worst imaginable health state and 10 for the best imaginable health state (Feng et al. (n.d.)).

### *Intimate partner violence (IPV) experience in the past 12 months*

**Physical IPV:** We asked caregivers if they had been abused multiple times by their partners using standard questions to assess intimate partner violence. Caregivers who indicated that they were abused multiple times were coded as 1, while those who indicated that they were not abused multiple times were coded as 0.

**Sexual IPV:** Caregivers were asked if they experienced any form of sexual violence, that is, forced sex, coercion, and rape within the past 12 months from a current or previous husband or partner. Participants who indicated that they had ever experienced sexual abuse were coded 1, and those who had never experienced sexual abuse were coded 0.

**Economic IPV:** We also assessed whether caregivers were prevented by their current or previous husband or partner from pursuing IPV. Any economic activities through standard questions assessing economic abuse, such as partners taking their earnings, preventing them from working, and participating in other economic activities. Those who responded yes were coded 1, and those who indicated no were coded as 0.

**Social grant recipient:** This variable indicated whether the caregiver was receiving any form of social grant from the government (e.g.,) at the time of data collection.

**Multidimensional perceived social support scale.** We measured caregivers' social support systems using 12 items Multidimensional Perceived Social Support Scale (MPSSS), which included items such as, "There is a special person who is around when I am in need" and "my friends really try to help me, I can count on my friends when things go wrong" (Zimet et al., 1988). These items were scored on a 7-point Likert scale, where 1 = very strongly disagree and 7 = very strongly agree. We computed and categorised the social support variables by deriving the mean of the total score (the total score divided by 12). The total mean score was categorised as low social support (mean score 1–2.9), moderate support (mean score 3.0–5.0) and high social support (mean score 5.1–7.0).

### *Sources of bias and how they were addressed*

The potential sources of bias were.

**Small sample sizes:** Since this study utilized baseline from randomized controlled study, a big sample size could not be negotiated due to resource constraints. However, the sample size was enough to estimate the prevalence of depression and identify its correlates (Von Gunten & Bartholow, 2021).

**Social desirability bias and information bias:** This kind of bias could affect our findings if those involved in data collection influenced the way participants provided information, and if participants did not provide accurate information. However, field workers underwent training on how to collect information including on depressive symptoms from participants to minimize bias.

**Selection bias:** This kind of bias relates to the way participants were selected among those eligible had there were systematic differences between those who were selected and those who were not. We minimized this kind of bias by making sure that all participants who met the inclusion criteria were included.

### *Statistical analyses*

All analyses were conducted using STATA version 17.0. Quantitative variables were first summarised using means and standard deviations for scores, while categorical variables were summarised using frequencies and percentages. The CES-D-10 score was computed by summing the responses from all CESD-10 questions. The cutoff point at which participants were considered to have signs of detectable clinical depressive symptomatology was  $\geq 12$ . We conducted chi-square analyses to examine evidence of significant differences in the prevalence of depressive symptoms according to participant characteristics.

### *Examination of correlates of depressive symptomatology among caregivers*

We employed multilevel mixed-effects generalised linear models with a binomial distribution and logit link function to examine the association between depressive symptomatology and its correlates, accounting for clustering by arm to which caregivers were allocated. Results from the multivariable model are presented on the odds ratio scale, with 1 as the reference value. Variable selection for the final model was informed by both a review of the literature on established predictors of depression and bivariate chi-square analyses of variables associated with CES-D-10 scores  $\geq 12$ . Age and marital status were included based on their

strong theoretical and empirical links to depressive symptoms, despite not being significantly associated with CES-D-10  $\geq 12$  in the bivariate analysis. Covariates considered in the multivariable model included age group, education level, employment status, marital status, dwelling type, residence (urban, peri-urban, rural), presence of any medical condition, presence of any disability, and caregiver self-rated health (VAS).

## Results

Among the 273 caregivers who completed the baseline survey, the median age was 36 years (IQR = 30–43), with the majority (68%) aged between 26 and 45 years (Table 1). Approximately 70% of participants had no formal educational qualifications. Most caregivers (71%) lived in formal housing structures made of bricks and cement. In terms of health status, 17.2% of caregivers reported having some form of disability, and 17.6% reported having a medical condition such as tuberculosis, diabetes, hypertension, or asthma. A large proportion (86%) of the caregivers were HIV positive. Experiences of intimate partner violence were also reported: 15.4% reported physical abuse and 3.3% reported sexual abuse in the past 12 months.

Social support was assessed using the Multidimensional Scale of Perceived Social Support (MPSS). Low, moderate, and high levels of social support were reported by 11%, 41.8%, and 47.2% of caregivers, respectively. Table 1 further presents the distribution of CES-D-10 scores. About 24% of caregivers reported being occasionally or moderately bothered by things that did not usually upset them, and 20% reported being bothered all the time. Difficulties focusing were reported by 28% occasionally and 16% frequently. Additionally, 21% of caregivers reported feeling depressed all the time, and 22% occasionally. Only 8.2% said they were rarely hopeful, while 47% felt hopeful all the time. Persistent fear was reported by 17.2%, and 33% reported rarely feeling fearful. Loneliness was reported all the time by 16%, and rarely by 32%.

Table 2 presents depressive symptomatology stratified by participant characteristics. Overall, 57% of caregivers screened positive for depressive symptomatology (95% CI: 51% – 63%). Higher prevalence was observed among caregivers aged 36–45 years (60.1%) and 51–60 years (71.5%). Depressive symptoms were more prevalent among caregivers from peri-urban (61.5%) and urban (65.8%) settings than rural (25%). Similarly, depressive symptoms were more common among caregivers who had experienced physical abuse (73%) or sexual abuse (88%) in the past 12 months. Social support was inversely related to depressive symptoms: 80% among those with low support, 58.8% with moderate support, and 50.4% with high support.

We used a multilevel mixed-effects multivariable regression model to identify factors associated with depressive symptomatology (Table 3). Caregivers living in urban areas were over four times more likely to report depressive symptoms (OR = 4.81, 95% CI: 1.23–11.05), while those in peri-urban areas had over three times the odds (OR = 3.33, 95% CI: 1.58–7.40) compared to caregivers residing in rural areas. Traditionally married caregivers had significantly higher odds (OR = 6.20, 95% CI: 4.12–13.87) compared to those legally married. Disability was strongly associated with depressive symptoms (OR = 8.07, 95% CI: 4.30–10.31) compared to their counterparts without any disability. The presence of any medical condition (OR = 3.25, 95% CI: 1.33–8.31) was also associated with elevated risk of depression among caregivers. Caregivers who reported physical abuse in the past 12 months had significantly increased odds of depressive symptomatology (OR = 3.44, 95% CI: 1.19–9.35) compared to their counterparts who did not report abuse

**Table 1.** Caregivers scoring of CESD-10 depressive scale.

S/N		Rarely or none of the time	Some or little of the time	Occasionally/Moderate amount of time	All the time
1	Bothered	83 (30.40)	71 (26.01)	65 (23.81)	54 (19.78)
2	Focused	78 (28.57)	76 (27.84)	75 (27.47)	44 (16.12)
3	Depressed	100 (36.63)	57 (20.88)	60 (21.98)	56 (20.58)
4	Effort	33 (12.09)	51 (18.68)	92 (33.70)	97 (35.53)
5	Hopeful	23 (8.24)	42 (15.28)	81 (29.67)	127 (46.52)
6	Fearful	92 (33.70)	74 (27.11)	60 (21.98)	47 (17.22)
7	Sleep	81 (29.67)	59 (21.61)	69 (25.27)	64 (23.44)
8	Happy	45 (16.54)	82 (30.15)	98 (36.03)	47 (17.28)
9	Lonely	87 (31.99)	77 (28.31)	58 (21.32)	50 (18.38)
10	Get Going	86 (31.50)	76 (27.84)	70 (25.64)	41 (15.02)

**Table 2.** Comparison of depressive symptomatology by caregivers characteristics.

Characteristic	Column (%) N = 273	CESD-10 $\geq$ 12 (row %)	CESD-10 < 12 (row %)	Chi-Square Test
Overall		156 (57.14)	117 (42.86)	—
Age group				0.444
18–25	34 (12.45)	18 (52.94)	16 (47.86)	
26–35	95 (34.88)	49 (51.58)	46 (48.42)	
36–45	92 (33.78)	56 (60.87)	36 (39.13)	
46–50	31 (11.36)	18 (50.06)	13 (41.94)	
51–60	21 (7.69)	15 (71.46)	6 (28.57)	
Qualification				0.940
None	190 (69.6)	108 (56.84)	82 (43.16)	
Certificate	70 (25.64)	41 (58.57)	29 (41.43)	
Diploma and above	14 (4.77)	7 (53.85)	6 (46.15)	
Employment status				0.706
Employed, piece jobs,	23 (8.42)	14 (60.87)	9 (39.13)	
Unemployed	250 (91.58)	142 (56.80)	108 (43.20)	
Dwelling type				0.972
Formal (Brick, Cement)	194 (71.06)	110 (56.70)	84 (43.30)	
Informal (Tin, Wood)	79 (28.94)	46 (57.5)	34 (42.5)	
Residence				0.050
Rural	60 (21.98)	34 (61.54)	26 (38.46)	
Peri-urban	137 (50.18)	72 (52.55)	65 (47.47)	
Urban	76 (27.84)	50 (65.79)	26 (34.21)	
Marital status				0.149
Legally married	11 (6.51)	5 (45.45)	6 (54.55)	
Traditionally Married	26 (15.38)	19 (73.08)	7 (26.92)	
Long-term dating	116 (68.64)	58 (50.00)	58 (50.00)	
Short-term dating	16 (9.47)	10 (62.50)	6 (37.50)	
Any disability				0.001
Yes	47 (17.22)	37 (78.72)	10 (21.28)	
No	226 (82.78)	119 (52.65)	107 (47.35)	
Any medical condition				0.017
Yes	225 (82.42)	51 (68.92)	23 (31.08)	
No	48 (17.58)	105 (52.76)	94 (47.24)	
CAREQOL-VAS				0.002
0–5	93 (34.06)	65 (69.89)	28 (30.11)	
6–10	180 (65.94)	91 (50.56)	89 (49.44)	
Abused many times				0.018
Yes	42 (15.38)	31 (73.81)	11 (26.19)	
No	231 (84.62)	125 (54.11)	106 (45.89)	
Sexually abused				0.05
Yes	9 (3.30)	8 (88.89)	1 (11.11)	
No	264 (96.70)	148 (58.06)	116 (43.94)	
HIV status				0.801
Positive	235 (86.08)	135 (57.45)	100 (42.55)	
Negative	38 (13.92)	21 (55.26)	17 (44.74)	
Social support scale				0.012
Low social support	30 (10.99)	24 (80.00)	6 (20.00)	
Moderate social support	114 (41.76)	67 (58.77)	47 (41.23)	
High social support	129 (47.25)	65 (50.39)	64 (49.61)	

in the past 12 months. Lastly, low social support was strongly associated with depressive symptoms (OR = 3.90, 95% CI: 1.49–6.17) compared to high social support.

## Discussion

This study assessed depressive symptomatology and its correlates among caregivers of CALHIV in the KwaZulu-Natal, South Africa. The results suggest that approximately one in two caregivers experienced depressive symptoms. This finding is high compared to related studies that found that 28% of caregivers of children living with HIV in Ghana (Paruk & Ramdhial, 2018) and comparable to 43% of caregivers of adolescents living with HIV in Nigeria (National Association of Resident Doctors of Nigeria, 2015). Increased odds of depressive symptoms were associated with residing in peri-urban or urban areas compared to rural areas, being traditionally rather than legally married, having a disability, having a medical condition, experiencing physical abuse within the past 12 months, and reporting low as opposed to high social support. In previous studies, depression among CALHIV has been attributed to caregivers' fear of the perceived outcome of HIV infection, psychosocial issues such as limited social support (Casale et al.,

**Table 3.** Odds ratios from the mixed-effects generalised model of correlates of depressive symptomatology among caregivers.

Predictor	Odds Ratio	95% Confidence Interval		P-Value
		Lower	Upper	
Age group				
18–25	1			
26–35	0.83	0.25	2.69	0.762
36–45	1.54	0.46	5.19	0.494
46–50	0.61	0.10	3.84	0.598
51–60	1.62	1.05	4.13	0.071
Residence				
Rural	1			
Peri-urban	3.33	1.58	7.40	0.040
Urban	4.81	1.23	11.05	0.037
Marital status				
Legally married	1			
Traditionally married	6.20	4.12	13.87	0.032
Long-term dating	2.22	0.44	11.04	0.329
Short-term dating	1.43	0.19	11.00	0.727
Any disability				
No	1			
Yes	8.07	4.30	10.31	0.001
Any health problem				
No	1			
Yes	3.05	1.27	7.12	0.006
CAREQOL-VAS				
0–5	1			
6–10	0.49	0.21	1.15	0.102
HIV status				
Positive	1			
Negative	0.33	0.24	1.23	0.100
Physical abuse				
Yes	3.54	1.21	8.35	0.020
No	1			
Social support scale				
Low social support	3.94	1.51	6.27	0.005
Moderate social support	1.40	0.84	2.33	0.191
High social support	1			

2014), isolation and role overload (Lentoor, 2017), failure to adhere to treatment, longevity of the infection, and time spent taking care of the child among working caregivers (Kalomo et al., 2017). COVID-19 has also been found to increase the odds of clinical diagnosis of depressive symptomatology (Shetty et al., 2023).

The presence of any disability among caregivers strongly predicts depressive symptoms. This finding is consistent with our previous work on health-related quality of life of people living with HIV, which found poor quality of life among disabled people living with HIV (Moyo et al., 2024), and several other studies in different settings and conditions (Karki et al., 2023; Peng et al., 2022; Roebuck et al., 2023; Rong et al., 2021). Similarly, the odds of depressive symptomatology among caregivers with any medical condition such as tuberculosis, diabetes, and hypertension was high compared to their counterparts without any medical condition, a finding that is consistent with other studies that investigated the impact of these conditions on depressive symptomatology (Akhaury & Chaware, 2022; Goodwin, 2006; Rubio-Guerra et al., 2013; Ruiz-Grosso et al., 2020). Physical abuse and sexual abuse increased the odds of depressive symptomatology among caregivers, an association that has also been demonstrated by other authors (Chaplin et al., 2021; Radell et al., 2021). This shows that the prevention of physical and sexual abuse among caregivers who already have the burden of caring for CALHIV could potentially lower the odds of depressive symptomatology. The strong association between social support and depressive symptomatology, adds to the evidence demonstrated in similar studies that found an increased odds of depressive symptomatology among caregivers with poor or limited social support (Gutiérrez-Sánchez et al., 2023; Younas et al., 2023; Zhong et al., 2020). Sources of social support among caregivers to boost social support among caregivers of CALHIV could include, but are not limited to, family members, friends, faith-based, community-based organisations and government departments of social welfare (Atanuriba et al., 2023; Hansell et al., 1999; Poindexter & Linsk, 1998).

To promote the mental health and well-being of caregivers of CALHIV, particularly in settings with a high HIV burden, tailored interventions that address the unique factors associated with increased depressive symptoms are recommended. Guided by the results of the current study, caregivers residing in urban or peri-urban areas could be provided with interventions that focus on community-based support networks (Sbaffi et al., 2023) and provide access to mental health services, such as stress management workshops and local counselling options, to alleviate environmental stress (Murray et al., 2017; Skeen et al., 2014). Based on their social support scale, caregivers in peri-urban areas could also be targeted with cash transfer programmes by linking them to social welfare organizations. Caregivers in traditional marriages may benefit from relationship-focused interventions aimed at strengthening communication and promoting shared caregiving responsibilities, thereby reducing emotional burden (Tang et al., 2024). In addition, caregivers facing disabilities or health concerns would benefit from accessible mental health resources designed to meet their specific needs, such as teletherapy and in-home counselling (Hanass-Hancock & Casale, 2014). For caregivers with a history of physical abuse, trauma-informed care, which includes safe spaces for support and self-care, is essential for healing and resilience. These interventions would help restore their dignity and reduce post-traumatic stress. We also recommend intensive routine screening of mental health not only among CALHIV, but also their caregiver to allow for early detection of depressive symptoms (Elkington et al., 2011). In this way, caregivers with signs of depression would be linked to mental health care services. These targeted approaches can collectively enhance mental health outcomes and improve the overall well-being of caregivers of patients with CALHIV.

Our study is among the few that explored depressive symptomatology among caregivers of CALHIV in a high HIV burden setting such as rural KwaZulu-Natal. By conducting the research in a setting with the highest HIV prevalence in South Africa, our findings gain greater contextual relevance and potential generalisability to other similar high-burden rural settings in sub-Saharan Africa. This enhances the ecological validity of our study, as it reflects the realities of caregivers who are often underrepresented in mental health and HIV research. Furthermore, focusing on this geographically and epidemiologically significant area allows us to highlight the intersection of caregiver mental health and HIV care, informing locally responsive support interventions to address the mental health of the caregivers of CALHIV. A key strength of our study is the population-specific insight it provides, shedding light on the psychological challenges caregivers face in resource-limited settings, where healthcare infrastructure may be overburdened, and psychosocial support is often limited.

This study has the following limitations. First, our findings are subject to social desirability bias introduced by those who collected data, despite training enumerators on how to avoid such bias and reporting bias on the participants' side when using the CESD-10 tool. Second, our sample of caregivers, as well as our sampling techniques, was limited to caregivers of CALHIV in one province of South Africa, which can limit the applicability of the findings to caregivers of other diseases or conditions. Thirdly, some of our estimates of the odds of depressive symptomatology had wide confidence intervals due to small sample sizes in certain categories, which may have affected the significance of our estimates. The fourth limitation relates to the lack of information on children's age, number of children, and time since HIV diagnosis at baseline which could affect our estimates. Lastly, causality cannot be inferred from cross-sectional studies since data are collected at a single point in time, only allowing us to identify associations between variables, not the direction or temporal sequence of those relationships.

## Conclusion

The prevalence of depressive symptoms among CALHIV was high. Caregivers with disabilities, existing medical conditions, and a history of physical abuse were found to have significantly increased odds of depressive symptomatology. Future longitudinal studies are needed to establish causal relationships, beyond identifying correlates of depressive symptoms. We recommend the implementation of targeted economic, empowerment, mental health screening in caregivers of CALHIV, and psychosocial interventions to support the mental well-being of caregivers and reduce their risk of depression.

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CRediT: **Eugene Lee Davids:** Conceptualization, Methodology, Supervision, Validation, Writing – original draft, Writing – review & editing; **Lovemore Sigwadi Nyasha:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing; **Stanley Carries:** Conceptualization, Data curation, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing; **Audrey Moyo:** Formal analysis, Methodology, Writing – original draft, Writing – review & editing; **Andrew Gibbs:** Conceptualization, Investigation, Supervision, Writing – original draft, Writing – review & editing; **Nwabisa Shai:** Conceptualization, Resources, Supervision, Writing – original draft, Writing – review & editing; **Kalysha Closson:** Conceptualization, Methodology, Resources, Writing – original draft, Writing – review & editing; **Laura Washington:** Conceptualization, Resources, Writing – original draft, Writing – review & editing; **Nokwanda Sithole:** Data curation, Investigation, Project administration, Supervision, Writing – original draft; **Arvin Bhana:** Conceptualization, Methodology, Project administration, Resources, Writing – original draft, Writing – review & editing; **Nelly Mwandacha:** Writing – original draft, Writing – review & editing; **Angela Kaida:** Conceptualization, Investigation, Project administration, Resources, Writing – original draft, Writing – review & editing; **Darshini Govindasamy:** Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing.

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### Ethics approval

Ethics approval for this trial was granted by the South African Medical Research Council (SAMRC) Human Research Ethics Committee (EC006-2/2023), KwaZulu-Natal Department of Health, South Africa (KZ\_202304\_010), and Simon Fraser University, Canada (30001806), in accordance with the Declaration of Helsinki.

### Data availability statement

Data for this study may be made available upon request from the principal investigator by emailing darshini.govindasamy@mrc.ac.za.

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