



Research paper

Understanding the complex relationship between multidimensional poverty and depressive symptoms among young South Africans: A cross-sectional study

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ABSTRACT

Background: We use the Global Multidimensional Poverty Index (MPI) to explore how different dimensions of poverty more directly linked to young people are associated with depressive symptoms among South African youth.

Methods: Data came from the 2017 wave of the nationally-representative National Income Dynamics Study (NIDS) in South Africa. We focused on a sample of 15–24-year-olds whose depressive symptoms were assessed using an adapted version of the 10-item Centre for Epidemiological Studies Depression Scale. We examine how individual dimensions and indicators of the MPI relate to depression, in comparison to more conventional measures, including household income, subjective social standing, overcrowding and personal assets. Cross-sectional analyses were adjusted for clustering to account for sampling design.

Results: The MPI index was not associated with probable depression (OR = 1.02, 95 % CI 0.81–1.29). Only lack of access to the labour market emerged as a key individual dimension associated with probable depression (OR = 5.29, 95 % CI 1.70–16.47), a relationship driven by an increased odds for those not in employment, education or training. Lack of household assets, living in an informal dwelling and lower perceived social standing were also associated with increased odds for depression. No gender differences were noted.

Limitations: The study is cross-sectional and not suitable to examine the causal nature of the association between multidimensional poverty and depression.

Conclusions: Poverty dimensions that measure youth's access to employment or training have a strong association with depression. Further research is needed to assess whether improved access to employment or training contributes to improving mental health among young South Africans.

1. Introduction

Adolescence and early adulthood are accompanied by key social emotional and behavioural change and an increase disability in a range of mental disorders, including depression (GBD Mental Disorders Collaborators, 2022). Understanding the role of poverty in the development and persistence of mental health problems in this period is therefore important (Ridley et al., 2020). In South Africa, where the prevalence of

depression increases with age (Pengpid and Peltzer, 2018), some studies have reported an association between poverty and mental health among youth, while others have not. For example, Cluver and colleagues reported that several dimensions of poverty (e.g., household food insecurity, social grant receipt) are associated with depression and anxiety among children aged 10–19 in Cape Town (Cluver et al., 2009; Cluver and Orkin, 2009), while Barbarin and Richter (2001) found no such association for internalising or externalising problems among 6-year-old

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children in the Soweto region. Likewise, Turbeville et al. (2019b) found that greater economic wellbeing was associated with fewer internalising symptoms, but not with externalising symptoms or prosocial behaviours among 7 to 10 years olds in KwaZulu Natal (Barbarin and Richter, 2001; Cluver et al., 2009). This is surprising given prior reports that broader markers of socio-economic disadvantage among South African youth, such as race and education, are consistently associated with depression. For example, using the fourth wave of the National Income Dynamics Study, Nzeadibe et al. (2018) found that 15–19 year-old Black African adolescents are more likely to report depressive symptoms compared to non-Black adolescents. In the South African Stress and Health Study, a nationally representative survey conducted in 2002–2003, adults with primary education only were more than twice as likely to live with a mood disorder in the past year compared to individuals with a higher education level (Williams et al., 2008).

A potential reason for this discrepancy in findings is that studies often give more weight to monetary dimensions of poverty, paying less attention to non-monetary dimensions. This is important given calls for a shift away from unidimensional monetary measures of poverty in psychiatric epidemiology (Cooper et al., 2012), highlighting the importance of conceptualising poverty as a lack of resources leading to deprivations along multiple dimensions, such as health, education and social inclusion (Alkire and Santos, 2010). In response, several measures of multidimensional poverty have been developed, such as the Index of Multiple Deprivation (Department of the Environment Transport and the Regions, 2000), the Human Development Index (Watkins, 2006) and the Global Multidimensional Poverty Index (MPI) (Alkire and Foster, 2011). Only recently have studies started to examine how multidimensional measures of poverty relate to youth mental health outcomes. Among these, a recent comparative study found an association between multidimensional poverty and depressive symptoms among youth in Mexico and Colombia, but not South Africa (Zimmerman et al., 2022). There are several explanations as to why this association may be less consistent in South Africa than in other countries.

First, traditional measures of poverty use the household as the unit of measurement, and identify households where average per capita household income or consumption is below a per capita poverty line. However, these measures do not take into account intra-household differences in resource allocation (Vijaya et al., 2014). For example, they are gender blind, as they ignore potential gender differences in intra-household resource allocation. Likewise, they do not capture intra-household differences in resources allocation between youth and other members of the household. Several measures have been developed to capture deprivations that individually refer to children or youth in South Africa, such as Turbeville et al.'s (2019a) biomedical model-based economic wellbeing measure of deprivation, or Noble et al.'s (2006) multidimensional model of child poverty, which focuses on measures of the ability to participate fully in society. The Global MPI was also adapted to measure individual-level poverty among South African youth aged 15–24 (Frame et al., 2016).

Second, Zimmerman et al. (2022) focused on dimensions of poverty and deprivations that were measured in a comparative way across countries, which did not enable a detailed analysis of how other indicators and dimensions of poverty, potentially more directly linked to young people, relate to depressive symptoms. For example, there is evidence that household food insecurity, education, material assets, fiscal capacity (household income, employment, expenditure) and financial appraisals (e.g. savings, healthcare access, burial insurance) are associated with internalising or depressive symptoms among South African children and adolescents (Cluver et al., 2009; Turbeville et al., 2019b). This highlights the need for a more systematic approach to examining how different dimensions of poverty relate to youth mental health in South Africa.

Third, South Africa offers a unique context to study the relationship between poverty and mental health. Nearly half of young South Africans aged 15–24 are considered multidimensionally poor (Zimmerman et al.,

2022), a third of young people are not in employment, education or training (NEET) and 59 % are unemployed (Statistics South Africa, 2021), and only 40 % complete secondary education (Spaull, 2015). Huge inequalities in income, health, education and basic services are the legacy of racial discrimination and exclusion of Black African and Coloured populations¹ during the Apartheid system (Finn et al., 2014). Despite improvements in overall income levels, living conditions and education in the past 20 years (Statistics South Africa, 2014), income and life satisfaction inequalities between race groups still persist (Hino et al., 2018) and social mobility remains limited (Moses et al., 2017). Within-race inequality has emerged as a major source of inequality, accounting for >60 % of overall inequality in the country (Leibbrandt et al., 2012).

Finally, an important question that has not been fully addressed in previous studies, including Zimmerman et al.'s (2022), is the role of gender in understanding the relationship between poverty and mental health. Research on coping models of development posits that girls react differently to adverse events or stress compared to boys, which partly account for gender differences in the prevalence of depression (Rudolph, 2002; Williams et al., 2008). South African literature also suggests that women are more vulnerable to poverty compared to men. Finally, young people but particularly young women in South Africa are expected to take on household and childcare responsibilities, which can limit their future opportunities (Mlatsheni and Rospabé, 2002). This, together with parents' different expectations for their children's education and employment depending on their children's gender (Bardasi and Garcia, 2014), suggests it is possible that deprivation in different dimensions of poverty may thus impact adolescent boys and girls differently.

Thus, the aim of our paper is to better understand how different dimensions of poverty are associated with depressive symptoms among youth in South Africa, and to examine the potentially modifying role of gender in this association.

2. Methods

2.1. Design

Data came from the National Income Dynamics Study (NIDS), a nationally representative panel survey from 2008 to 2017, implemented by the Southern Africa Labour and Development Research Unit at the University of Cape Town, South Africa (Leibbrandt et al., 2012). The survey measures the living conditions and wellbeing of household members approximately every two years. This paper uses data from the most recent wave (2017, wave 5). We focus on a cross-sectional, rather than a longitudinal sample because we are interested in describing the varying associations of depressive symptoms with different dimensions of poverty, rather than trying to establish the causal nature of this association. Documenting the strength of associations is important because it offers a detailed picture of the most important dimensions of poverty, for which we observe inequalities in mental health.

2.2. Sampling and recruitment

A stratified, two-stage cluster sample design was employed to recruit a nationally representative sample of approximately 10,000 households. A total of 400 out of 3000 primary sampling units were identified using a master sample from 2003 Statistics South Africa (Statistics South Africa, 2004). Two clusters within each selected primary unit were identified, and all households within clusters were approached to be included in the study. All household residents were included as continuous sample

¹ In South Africa, the terms White, Black, Coloured and Indian are used to describe ethnic groups. The ethnic group 'Coloured' is composed primarily of persons of mixed race, while 'Indians' are primarily of Indian descent, but also include persons who originate from Bangladesh, Sri Lanka and Pakistan.

members (CSM), providing at least one resident agreed to participate in the study. Individuals who became household residents after Wave 1 were considered Temporary sample members (TSM); they were interviewed at that wave but not followed-up at subsequent waves. Given the cross-sectional nature of the present study, both CSMs and TSMs at Wave 5 were included in the analysis.

A total of 28,226 participants from 7305 households were recruited at Wave 1, representing a household response rate of 69 % (Leibbrandt et al., 2010). Of these, 24,748 CSMs were successfully interviewed at Wave 5. At that wave, an additional 12,660 TSMs were interviewed, as well as a top-up sample of 2016 participants recruited as CSMs to make up for attrition from Wave 1 to Wave 4 (Brophy et al., 2018). A total of 39,424 participants were thus successfully interviewed at Wave 5. Based on the United Nations and WHO definitions of youth (15–24 years) (United Nations, 2022), we selected 7543 (19.1 %) individuals in this age range for our analytical sample.

2.3. Data collection

Data collection for Wave 5 took place between February and December 2017. A household questionnaire was completed by the household head or by a resident who was knowledgeable about the household's expenditure. All participants aged 15 or older completed an individual questionnaire. Responses were captured using computer-assisted software (CAPI) with the use of android mobile devices.

2.4. Measures

Key basic socio-demographic characteristics were obtained from the individual questionnaire: gender, age, ethnicity (Black African, Coloured, Indian, White), years of education and location of residence (urban/rural, based on cluster classification by Statistics South Africa). Parental resident status (urban/rural) and education level (whether completed secondary school), retrieved directly from the participants' parents' individual questionnaire directly, were also considered.

2.4.1. Depressive symptoms

Depressive symptoms were assessed using an adapted version of the 10-item Centre for Epidemiological Studies Depression Scale (CES-D-10) (Andresen et al., 1994). The CES-D-10 assesses symptoms over the past week on a 4-point Likert Scale, with scores ranging from 0 to 30; a higher score suggesting more severe symptoms. The two positively worded items were excluded, as they showed poor internal reliability in a recent study among a representative South African sample (Baron et al., 2017); this modified version has been used previously (Lund and Cois, 2018). With scores ranging from 0 to 24, an optimal cut-off of 8 was established as indicating probable depression using data from Baron et al. (2017) (results not published - see Appendix 1); this cut-off yielded a sensitivity of 80.0 % and specificity of 84.2 %. The optimal cut-off of 9, however, for individuals aged 25–65 was used to determine probable depression among participants' parents (see Appendix 2).

2.4.2. Multidimensional poverty

Frame et al.'s (2016) Youth Multidimensional Poverty Index (MPI) was used to assess multidimensional poverty. This was developed using 2011 South Africa National Census data and draws on Alkire and Foster's (2011) approach of measuring deprivation. While similar to the South Africa MPI developed by Statistics South Africa (2014), in that it takes the South African context into account, the Youth MPI tries to incorporate individual-level indicators which are relevant to South African youth's experience of poverty. The unit of analysis is thus the individual, and not the household, though some indicators are assessed at the household level.

The Youth MPI comprises 11 indicators which fall under four dimensions: household health, education, standard of living and access to the labour market. In the multidimensional poverty literature, a

household is considered deprived in education if no household member aged ≥ 15 years has completed 5 years of schooling. Following a similar approach, but to capture deprivation in education at the young person's, individual level, the Youth MPI includes years of schooling adjusted to age (Frame et al., 2016). An additional indicator was also included in the economic activity dimension, pertaining to individuals who are NEET. The health dimension comprised one indicator, also measured at the individual level, relating to difficulty in one or more functional areas. Because information relating to functioning was not available in NIDS Wave 5, this indicator was replaced by a measure of self-rated health, where participants were asked to rate their present health on a 5-point scale, from poor to excellent. The remainder of indicators are similar to those proposed by Statistics South Africa (2014) (see Appendix 3 for key differences between Statistics SA's South African MPI and the Youth MPI). An in-depth discussion of the indicators and cut-offs chosen is provided in Frame et al. (2016).

Each indicator is measured dichotomously, in that an individual is considered either deprived (score 1) or not deprived (score 0). To calculate the C-weighted sum of deprivation, each indicator score is weighted according to the number of indicators within each dimension. This means that, within each dimension, all indicators are given equal weight (see Appendix 3). All weighted indicator scores are then added together to form the *C-weighted sum of deprivations*, a continuous measure of multidimensional poverty that ranges from 0 to 1. A higher C-weighted sum of deprivations indicates a greater level of poverty (Alkire and Santos, 2013). The same indicator cut-offs and weights used in Frame et al.'s (2016) MPI were used in the present analysis (see Appendix 3). In the absence of local evidence on an overall deprivation cut-off, a *C-weighted sum of deprivations* of ≥ 0.33 , as for the original MPI, was used to identify participants who are multidimensionally poor (Angulo et al., 2016). This cut-off was also used by Frame et al. (2016) and to identify individuals who are multidimensionally poor in other South African populations (Alkire and Santos, 2010; Leibbrandt et al., 2010; Statistics South Africa, 2014). The weighted sum of each dimension was also calculated.

2.4.3. Traditional measures of poverty

In order to compare how mental health is associated with traditional measures of poverty vs. dimensions of the MPI, we incorporated the following measures of poverty at the household level: (i) household monthly grant income, (ii) household monthly total income, calculated using an equivalence-scaled measure which adjusts for household size (Organisation for Economic Co-operation and Development, 1982), (iii) whether participants lived in an overcrowded household, defined as >2 individuals sleeping per room in urban settings, and >3 individuals per room in rural settings (Angulo et al., 2016), and (iv) inadequate housing, defined as living in a household with unimproved roof, floors or walls (made of dirt, sand or dung). Other traditional measures of poverty assessed at the individual level included (i) the participants' perception of whether the household income was below the average household income in their suburb or village, (ii) their perception of the household's social standing on a 5-step ladder, from poorest to richest, (iii) and whether they did not individually own at least one of the following assets: motorcycle, motor vehicle, computer, cell phone, camera, radio, HIFI stereo, CD or MP3 player, or sewing machine.

2.5. Statistical analysis

Analyses were performed using Stata version 16 (StataCorp, 2019). Descriptive statistics are first reported for basic socio-demographic sample characteristics at Wave 5, as well as for the South African MPI indicators and dimensions and other material and proximal measures of poverty. Gender differences in demographic characteristics and poverty indicators were assessed using bivariate logistic regression. Standard errors were adjusted using sampling weights from Wave 5. The association between multidimensional poverty and probable depression was

assessed using multivariate logistic regression, with probable depression as outcome and whether participants were multidimensionally poor (C-weighted score of deprivation ≥ 0.33) as predictor. Standard errors were clustered at the cluster level. Specific covariates were controlled for in the adjusted model. These were identified a priori and included gender, age and residence location (rural/urban) – all of which are known to be associated with both poverty and depression (Lund et al., 2018). Mother's probable depression status was also included as a covariate given extensive literature, including a study based on the NIDS data, suggesting that maternal depressive symptoms are associated with youth participants' own depressive symptoms (Eyal and Burns, 2019). The same adjusted models were used to assess the association between each dimension/indicator of the Youth MPI and probable depression, and to assess associations between material and other individual-level indicators of deprivation and risk for depression. The models were adjusted for the same a priori variables. In these analyses, real income-related variables were transformed using inverse sine hyperbolic transformation (Aihounton and Henningsen, 2021) to account for non-linearities in the relationship between income and probable depression. To assess gender differences in the association between the Youth MPI and other dimensions/indicators of deprivation and probable depression, the same models were performed, this time including a gender interaction term.

2.6. Ethical considerations

The NIDS was approved by the Commerce Faculty Ethics Committee and the Human Research Ethics Committee (HREC) of the Faculty of Health Sciences at the University of Cape Town, South Africa. The current study was also approved by the HREC (Ref: 396/2019). All participants included in the NIDS study consented to participate and provided signed informed consent.

Table 1
Socio-demographic characteristics of the sample, by gender.

	All (N = 6837)		Female participants (N = 3651)		Male participants (N = 3186)		OR	p
	N	%	N	%	N	%		
Ethnicity								
Black African	5815	86.2	3099	85.6	2716	86.9	Ref	–
Coloured	825	8.5	449	9.0	376	7.9	1.16	0.281
Indian	71	1.6	35	1.4	36	1.8	0.81	0.450
White	126	3.7	68	4.0	58	3.4	1.20	0.384
Resides in rural area	3458	39.3	1859	39.6	1599	38.9	1.03	0.673
At risk for depression	929	14.3	529	15.3	400	13.3	1.17	0.211
Living arrangements								
Lives with both parents	3722	55.9	1964	54.9	1758	57.1	Ref	–
Lives with one parent	2266	33.3	1228	34.1	1038	32.5	1.09	0.358
Other	849	10.8	459	11.1	390	10.4	1.10	0.389
Mother completed secondary school	1443	29.7	745	28	698	31.5	0.85	0.052
Mother at risk for depression ^a	689	17.9	368	18.6	321	17.2	1.10	0.528
Father completed secondary school	1271	35.9	651	36.3	620	35.5	1.03	0.751
Father at risk for depression ^b	201	13.1	104	13.2	97	13.1	1.00	0.987

	All (N = 6837)		Female participants (N = 3651)		Male participants (N = 3186)		OR	p
	Mean	SD	Mean	SD	Mean	SD		
Age	19.5	2.85	19.6	2.87	19.5	2.82	1.01	0.263
Education (years)	10.2	1.73	10.4	1.63	10	1.8	1.14	<0.001
CES-D-8 score	3.8	3.38	3.9	3.52	3.7	3.21	1.01	0.290

Estimates are weighted using sampling weights from Wave 5. HH = household.

^a Data only available for 58.0% of participants.

^b Data only available for 23.3% of participants.

3. Results

3.1. Sample characteristics

Of the 7543 participants aged 15 to 24 years old who were successfully interviewed at Wave 5, 153 (2.0 %) had missing data on one or more of the South African MPI indicators, and 599 participants (7.9 %) had missing data on one or more items of the revised CES-D-10, and thus were excluded from the analysis. The final sample consisted of 6837 participants; it was balanced in terms of gender (female: n = 3651, 53.4 %), with a mean age of 19.3 (SD = 2.84; median = 19) (Table 1). Participants had on average 10 years of education (SD = 1.73), though 3802 participants (55.6 %) were still enrolled at school. More than a third lived in a rural area (n = 3458, 39.3 %), with a majority living with both parents (n = 3722, 55.9 %).

A total of 929 participants (14.3 %) were classified as having probable depression. A greater proportion of participants' mothers had probable depression (n = 689, 17.9 %) compared to participants' fathers (n = 201, 13.1 %). No gender differences were noted for probable depression, or across demographic characteristics, other than in participants' and their mothers' years of education (Table 1).

3.2. Multidimensional poverty in the sample

Altogether, 21.2 % (n = 1774) of participants had a C-weighted sum of deprivation above 0.33, suggesting they were multidimensionally poor (Table 2). On average, participants identified as multidimensionally poor were deprived in 49 % of the weighted indicators. Indicators for which participants were the most deprived were poor sanitation (n = 3695, 44.4 %), unimproved heating fuel (n = 2712, 32.7 %) and household unemployment (n = 2493, 32.0 %), while only 2.9 % (n = 202) of the sample reported poor health and 5.6 % (n = 503) reported being deprived in lighting fuel. Poor educational attainment (40.8 %), being NEET (16.8 %) and household unemployment (14.2 %) were the three indicators that contributed the most to the overall poverty index (Appendix 4).

Table 2
South African Youth Multidimensional Poverty Index indicators and dimensions, by gender.

	All (N = 6837)		Female participants (N = 3651)		Male participants (N = 3186)		OR	p
	N	%	N	%	N	%		
Multidimensionally poor ^a	1774	21.2	1019	23	755	19.4	1.25	0.010
Deprivation indicator								
Poor health	202	2.9	126	3.4	76	2.4	1.46	0.120
Education attainment	1833	24.3	918	22.5	915	26.2	0.82	0.009
Lighting fuel	503	5.6	277	5.3	226	5.9	0.89	0.354
Heating fuel	2712	32.7	1448	33.2	1264	32.2	1.04	0.564
Cooking fuel	1289	14.0	697	14.0	592	14.0	1.00	0.980
Drinking water	2305	25.4	1267	25.9	1038	24.8	1.06	0.477
Sanitation	3695	44.4	1986	45.2	1709	43.6	1.07	0.350
Dwelling type	1472	19.3	826	20.4	646	18.2	1.15	0.156
Assets	1517	19.7	846	20.9	671	18.4	1.17	0.121
Unemployment	2493	32.0	1397	33.7	1096	30.3	1.17	0.050
NEET	2058	27.8	1288	33.0	770	22.3	1.71	<0.001

	All (N = 6837)		Female participants (N = 3651)		Male participants (N = 3186)		OR	p
	Mean	SD	Mean	SD	Mean	SD		
C-weighted sum of deprivations	0.20	0.18	0.21	0.18	0.19	0.18	1.53	0.039
Dimension weighted sum								
Health	0.01	0.04	0.01	0.05	0.01	0.04	4.89	0.100
Education	0.06	0.11	0.06	0.10	0.07	0.11	0.44	0.009
Living condition	0.06	0.06	0.06	0.06	0.06	0.06	2.26	0.126
Access to labour market	0.07	0.09	0.08	0.09	0.07	0.08	10.74	<0.001

Estimates are weighted using sampling weights from Wave 5. NEET = Not in education, employment or training.

^a C-weighted sum of deprivations > 0.33.

3.3. Association between poverty dimensions and probable depression

Table 3 presents the results of the unadjusted (Model 1) and adjusted (Model 2) logistic regression models assessing the association between the South African Youth MPI and probable depression. We decided to keep mothers' probable depression status as a covariate in the adjusted model, despite the high proportion of missing values, as this variable was not associated with key participants' socio-demographic

Table 3
Association between South African Youth Multidimensional Poverty Index and probable depression (CES-D-8 ≥ 8).

Poverty indicator	Model 1 (unadjusted)		Model 2 (adjusted) ^b	
	OR	95 % CI	aOR	95 % CI
Multidimensionally poor ^a	1.26	1.07–1.48**	1.02	0.81–1.29
C-weighted sum of deprivations	2.15	1.40–3.31***	1.35	0.74–2.46
Dimension weighted sum				
Health	4.45	0.98–20.18	1.17	0.10–12.41
Education	1.42	0.76–2.64	0.43	0.15–1.22
Living condition	2.01	0.49–8.22	3.56	0.52–24.30
Access to labour market	7.05	2.87–17.31***	5.29	1.70–16.47**
Deprivation indicator				
Poor health	1.49	1.03–2.16*	1.04	0.58–1.88
Education attainment	1.09	0.93–1.27	0.81	0.63–1.05
Lighting fuel	1.09	0.76–1.55	1.04	0.69–1.56
Heating fuel	1.06	0.88–1.28	1.10	0.87–1.40
Cooking fuel	0.93	0.73–1.18	0.98	0.73–1.33
Drinking water	0.98	0.80–1.20	0.92	0.71–1.20
Sanitation	0.94	0.77–1.14	0.88	0.65–1.19
Dwelling type	1.25	1.03–1.52*	1.38	1.08–1.76*
Assets	1.41	1.17–1.70***	1.45	1.15–1.83**
Employment	1.17	0.98–1.40	1.11	0.88–1.40
NEET	1.51	1.29–1.77***	1.48	1.18–1.86**

NEET = Not in education, employment or training; OR = odds ratio; aOR = adjusted odds ratio.

^a Youth MPI C-weighted sum of deprivations ≥ 0.33.

^b Adjusted for gender, age, urban/rural and mother's risk for depression.

* p < 0.05.

** p < 0.01.

*** p < 0.001.

characteristics, such as gender, residence location or education level. When adjusted for gender, age, location of residence (urban/rural) and mother's probable depression, multidimensional poverty was not associated with probable depression (OR = 1.02, 95 % CI 0.81–1.29). There were also no associations between probable depression and most dimensions of poverty (health, education or living condition dimensions). The only exception was lack of access to the labour market, which was associated with higher odds of probable depression (OR = 5.29, 95 % CI 1.17–16.47). Results of models assessing specific indicators of the South African Youth MPI suggest that this association was driven by participants classified as NEET being at greater odds of probable depression (OR = 1.48, 95 % CI 1.18–1.86). The odds of probable depression were also greater for participants residing in informal or traditional dwelling type (OR = 1.38, 95 % CI 1.08–1.76), and living in households with no assets (OR = 1.45, 95 % CI 1.15–1.83). Sensitivity analyses, where all MPI indicators were included in one model, yielded the same results, with the exception that participants reporting poor educational attainment were at lower odds of probable depression in fully adjusted models (OR = 0.74, 95 % CI 0.57–0.96).

Results for the association between probable depression and the C-weighted sum of deprivations and individual dimensions were nearly identical when the continuous CES-D-8 score was used as the outcome (Appendix 5). The main overall results were also similar when missing values for participants' mothers' probable depression were imputed and the entire sample of adolescents at Wave 5 was used (Appendices 6–7). Additional sensitivity analyses, with models including indicators which were part of the Global MPI but excluded from the South African MPI due to missing data from the 2011 Census data (Statistics South Africa, 2014), yielded nearly identical results, with most indicators of poverty other than those associated with the labour market not showing an association with probable depression (Appendix 8). This adjusted version of the South African Youth MPI included (i) a malnutrition indicator in the health dimension, (ii) unimproved household floor (instead of type of household), and (iii) bicycle in the list of potential household assets (see Appendix 9).

3.4. Traditional poverty measures and association with probable depression

A total of 2765 participants (38.9 %) perceived their household income as below their suburb's average (Table 4); 17.0 % (n = 1462) reported inadequate housing (unimproved floor, ceilings or walls) and 9.5 % (n = 717) resided in an overcrowded household. In this sample, 23.4 % (n = 1801) did not own any personal assets.

Table 5 presents the results from unadjusted (Model 1) and adjusted (Model 2) regression models assessing the association between traditional measures of poverty and probable depression. Adjusted results indicate that most household-level and individual-level traditional measures of poverty were not associated with probable depression. Participants who resided in inadequate housing had 1.50 (95 % CI 1.15–1.97) higher odds of probable depression than those living in adequate housing. A trend suggested that a 1 % increase in household income was associated with lower odds of probable depression, although this failed to reach statistical significance (OR = 0.91, 95 % CI 0.81–1.02). Perceiving a higher level of one's household social standing was associated with lower odds of probable depression (OR = 0.88, 95 % CI 0.79–0.99).

3.5. Gender differences

The proportion of participants identified as multidimensionally poor differed by gender: a greater proportion of female participants were identified as poor (n = 1055, 22.5 %) compared to male participants (n = 838, 19.8 %; OR = 1.18, p = 0.036), though this difference was small (Table 2). Female participants were less likely to report low educational attainment for their age (n = 953, 21.8 %) compared to their male counterparts (n = 1008, 26.0 %; OR = 0.79, p = 0.002), but were more likely to be NEET (n = 1331, 31.9 %) and reside in a household where all adults were unemployed (n = 1479, 33.4 %) compared to male participants (NEET: n = 843, 22.2 %; OR = 1.64, p < 0.001; household unemployment: n = 1207, 30.0 %, OR = 1.17, p = 0.039). Gender differences were also identified in relation to overcrowding, household

Table 4
Traditional measures of poverty, by gender.

Household level indicators of poverty	All (N = 6837)		Female participants (N = 3651)		Male participants (N = 3186)		OR	p
	N	%	N	%	N	%		
Living in overcrowded HH	717	9.5	448	11.0	269	7.8	1.46	0.007
Inadequate housing	1462	17.0	789	17.0	673	17.0	1.00	0.995

Household level indicators of poverty	All (N = 6837)		Female participants (N = 3651)		Male participants (N = 3186)		OR	p
	Mean	SD	Mean	SD	Mean	SD		
HH monthly grant income ^a	86.1	105.78	90.7	105.15	81.1	106.24	1	0.011
HH monthly total income ^{a,b}	252.1	412.61	241.7	445.36	263.3	374.37	1	0.317

Individual-level indicators of poverty	All (N = 6837)		Female participants (N = 3651)		Male participants (N = 3186)		OR	p
	N	%	N	%	N	%		
Perceived HH income below suburb's average	2765	38.9	1515	39.7	1250	38.1	1.07	0.397
No personal assets	1801	23.4	915	22.8	886	24.0	0.93	0.455

Individual-level indicators of poverty	All (N = 6837)		Female participants (N = 3651)		Male participants (N = 3186)		OR	p
	Mean	SD	Mean	SD	Mean	SD		
Perceived social standing	2.7	0.99	2.7	0.99	2.7	0.98	0.98	0.698

Estimates are weighted using sampling weights from Wave 5. HH = household.

^a Transformed variable using inverse sine hyperbolic transformation included in the model.

^b Adjusted for household size.

Table 5

Association between traditional measures of poverty and probable depression (CES-D-8 ≥ 8).

Poverty indicator	Model 1		Model 2 ^c	
	OR	95 % CI	aOR	95 % CI
<i>Household-level indicators of poverty</i>				
Living in overcrowded HH	1.07	0.77–1.49	0.99	0.69–1.43
Inadequate housing	1.37	1.08–1.74**	1.50	1.15–1.97**
HH monthly grant income ^a	0.99	0.96–1.03	1.01	0.96–1.06
HH monthly total income ^{a,b}	0.87	0.80–0.96**	0.91	0.81–1.02
<i>Individual-level indicators of poverty</i>				
Perceived HH income below average in neighbourhood	1.22	1.04–1.44*	1.22	0.98–1.51
Perceived social standing	0.88	0.81–0.97*	0.88	0.79–0.99*
No personal assets	1.09	0.92–1.28	1.13	0.88–1.46

HH = household; OR = odds ratio; aOR = adjusted odds ratio.

^a Transformed variable using inverse sine hyperbolic transformation included in the model.

^b Adjusted for household size.

^c Adjusted for gender, age, urban/rural and mother's risk for depression.

* p < 0.05.

** p < 0.01.

monthly grant and total household income (Table 4).

Results of models including a gender interaction term with the MPI, its dimensions and indicators, as well as with other indicators of poverty are presented in Table 6; no gender differences were noted either in relation to the MPI or the traditional measures of poverty with probable depression.

4. Discussion

The aim of our paper was to better understand how different dimensions of poverty are associated with depressive symptoms among youth in South Africa, and to examine the potentially modifying role of gender in this association. Using a version of the MPI that was adapted

Table 6

Gender differences in association between South African Youth Multidimensional Poverty Index and other poverty indicators and probable depression (CES-D-8 \geq 8).

Female interaction with poverty indicator	Model 1 (unadjusted)		Model 2 (adjusted) ^b	
	OR	95 % CI	aOR	95 % CI
<i>South African Youth MPI</i>				
Multidimensionally poor ^a	1.15	0.82–1.59	1.09	0.68–1.73
C-weighted sum of deprivations	1.12	0.51–2.45	0.64	0.22–1.88
Dimension weighted sum				
Health	0.25	0.01–6.15	0.03	0.00–5.14
Education	1.78	0.51–6.27	0.74	0.11–4.85
Living condition	5.21	0.56–48.19	3.40	0.23–50.66
Access to labour market	0.46	0.11–1.98	0.17	0.02–1.40
Deprivation indicator				
Poor health	0.67	0.31–1.45	0.43	0.12–1.51
Education attainment	1.16	0.84–1.58	0.93	0.58–1.48
Lighting fuel	1.36	0.83–2.23	1.38	0.77–2.46
Heating fuel	1.25	0.93–1.70	1.31	0.90–1.90
Cooking fuel	0.94	0.64–1.39	0.97	0.61–1.54
Drinking water	1.25	0.93–1.67	1.16	0.79–1.71
Sanitation	0.97	0.74–1.29	0.77	0.53–1.14
Dwelling type	1.16	0.84–1.58	1.27	0.88–1.84
Assets	1.47	1.07–2.01*	1.45	0.95–2.21
Employment	0.96	0.74–1.24	0.85	0.58–1.23
NEET	0.81	0.61–1.08	0.70	0.46–1.07
<i>Material indicators of poverty</i>				
Living in overcrowded HH	1.02	0.65–1.59	1.31	0.78–2.20
Inadequate housing	0.90	0.65–1.24	0.91	0.61–1.36
HH monthly grant income ^a	1.00	0.94–1.06	0.99	0.91–1.07
HH monthly total income ^{a,b}	0.99	0.84–1.16	1.06	0.87–1.30
<i>Individual-level indicators of poverty</i>				
Perceived HH income below average in neighbourhood	1.28	0.97–1.70	1.33	0.90–1.95
Perceived social standing	0.92	0.80–1.06	0.92	0.76–1.12
No personal assets	0.83	0.60–1.15	0.75	0.47–1.19
No trust in relatives	0.95	0.70–1.30	0.72	0.45–1.14

HH = household; NEET = Not in education, employment or training; OR = odds ratio; aOR = adjusted odds ratio.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

^a Youth MPI C-weighted sum of deprivations ≥ 0.33 .

^b Adjusted for gender, age, urban/rural and mother's risk for depression.

for youth in the country, our findings support results by Zimmerman et al.'s (2022), in that South African youth aged 15–24 years and identified as multidimensionally poor are not more likely to have probable depression compared to those not identified as multidimensionally poor. Our findings indicate that this finding applies to both girls and boys. However, our analysis offer novel results showing that a single aggregate measure of deprivation across different dimensions, such as the Youth MPI, may conceal the complex relationships between specific deprivations and depression. We found no association with probable depression for three of the four dimensions of the Youth MPI (health, education and standard of living). This contradicts findings from Tomita and Burns (2013), who used data from NIDS first wave to show that greater levels of education and self-rated health were associated with lower depression scores among adults. In our study, lack of access to the labour market is the unique dimension of poverty strongly associated with probable depression, and this association was identified among both boys and girls. This association is driven by the higher odds of probable depression among youth not being in employment, education or training (NEET), one of the key indicators that was added to the Youth South African MPI and not originally included in the Global MPI or in the Colombian version of the MPI used in Zimmerman et al.'s (2022) paper.

Our results were maintained when the South African Youth MPI was adjusted to include additional indicators, such as malnutrition, unimproved dwelling floors (as opposed to dwelling type), and bicycle as an asset, which were excluded due to missing data in Frame et al.'s (2016) original paper. We also found similar results when multidimensional poverty was measured using the continuous C-weighted sum of deprivations, or when depressive symptoms were measured using the continuous score on the CES-D-8.

The fact that individuals who were NEET were more likely to suffer from probable depression has been reported in previous studies, such as in Cluver et al. (2009), where children aged 10–19 years who were not enrolled in school were more likely to show symptoms of depression and anxiety. There is also evidence that educational attainment and employment status are tied to mental wellbeing in South Africa (Branson et al., 2019; Paul and Moser, 2009). Of particular importance is the association between unemployment, self-esteem and psychological distress (Alfers and Rogan, 2015; Nwosu, 2018). Youth's access to employment or training, may thus go beyond measuring education or employment status per se, and capture a lack of opportunity, learned hopelessness or helplessness about the future (Araya et al., 2003; Baldry et al., 2019), which could explain the association found with probable depression.

An investigation into specific indicators for each dimension suggests that living in an informal dwelling and reporting fewer household assets were the only other indicators associated with probable depression. Material conditions of the household, no matter the indicator (dwelling type, type of flooring, or inadequate housing), were consistently associated with probable depression in our analyses, supporting previous findings from Latin America (Araya et al., 2003). This, however, contradicts previous research, which reported that lack of access to household amenities and living in an informal dwelling were associated with a decrease in the likelihood of emotional and behavioural problems among orphans in South Africa (Marais et al., 2013). This was attributed to children spending more time outdoors, rather than indoors. In our study, half of participants reported poor sanitation, whereas a minority reported living in informal dwellings. So, poor sanitation may have been considered the norm and not exceptional, while the informal dwelling indicator may be a more important sign of inequality or exclusion, and thus be more likely to be associated with probable depression.

Despite our use of the Youth MPI, which incorporates individual-level dimensions that reflect the young people's circumstances more specifically than the general MPI which considers household factors, it may be that these indicators were too broad and thus did not relate to young people's mental health. For example, our results indicate that the greater the youth's perception of their household's social standing was, the lower their likelihood of probable depression. This suggests that individuals' subjective view of their household's economic wellbeing may be important, as individuals are more likely to consider non-monetary components such as household composition, assets, access to amenities or living conditions in general (Posel and Rogan, 2016). This is consistent with recent evidence from a twin study suggesting that, regardless of objective measures of financial resources, adolescents' perception of hierarchical social standing is associated with mental health problems (Rivenbark et al., 2020). Similar to NEET, perhaps youths' subjective view of their household's social standing reflects their doubt or disengagement from future opportunities or chances of coming out of poverty. It must be noted, however that we did not have an indicator of personal income of youth and this has been shown to be important for depressive symptoms in other studies, both among adults (Adjaye-Gbewonyo and Avendano, 2016) and among adolescents aged 15–19 years old (Nzaidibe et al., 2018).

The present study made use of a large nationally representative sample and validated measure of depressive symptoms to assess probable depression among youth in South Africa. We tried to address the limitations of previous measures of multidimensional poverty by using a version of the Global MPI that was adapted for youth and for the South

African context. However, some limitations should be considered. First, our study focused on describing inequality in mental health according to dimensions of poverty in a cross-sectional analysis framework. Our results, therefore, should not be interpreted as evidence of a causal relationship between multidimensional poverty and probable depression. Given the different sources of endogeneity, such as individuals' predisposition to depression or differences in recall of depressive symptoms, future studies should focus on identifying the causal mechanisms explaining this association exploiting the longitudinal nature of the data and by exploiting changes in both mental health and poverty measures, including access to employment or training. There is also evidence that chronic and transient poverty have different associations with mental and emotional wellbeing (Narayan et al., 1999) and that children are particularly vulnerable to chronic poverty (Omotoso et al., 2020; von Fintel et al., 2017). Thus, there is a need to consider poverty as a dynamic concept in relation to mental health among youth, measuring changes in poverty and mental health longitudinally, and assessing how change in poverty impacts changes in mental health, and vice versa. Second, the use of BMI as an indicator for the health dimension in the Adjusted Youth BMI is problematic, given that poor children are more likely to be both stunted and overweight (Symington et al., 2016), which is often referred to as the "double burden of malnutrition" (Nyati et al., 2019). Finally, we did not assess types of mental health problems other than depression. It is important that future research also investigate the association between poverty and anxiety, as well as other behavioural problems which are common among youth in South Africa (Kleintjes et al., 2006).

The direction of the relationship between NEET status and depression is an important area of enquiry for future longitudinal studies. More research on how depression impacts educational attainment and vice versa is important (Lund et al., 2022): depression in youth may make it more difficult for young people to engage in or remain in education or employment (Lee et al., 2009; McDaid et al., 2020). If depression causes poor employment and educational outcomes, this may point towards the importance of psychosocial support in schools to prevent drop-out and developing systems to support youth in their transition from education to the labour market. There is also evidence that unemployment causes distress (Paul and Moser, 2009), so such interventions would help promote mental health among South African youth too. This is especially important given recent calls to address child and adolescent mental illness using a lifecourse approach (Tomlinson et al., 2022). For example, the Basic Package of Support for youth programme, recently launched in South Africa, aims to reconnect youth who are NEET to the labour market or education system, through tailored and multicomponent interventions including pro-active outreach, guidance counselling, referrals and continued support (Graham et al., 2019).

5. Conclusion

The MPI offers a more comprehensive measure of poverty than single assessments based on income or material resources, which our findings indicate are not consistently associated with depression. However, even the MPI as an aggregate measure may not be sufficiently specific to reflect the complex nature of poverty and its relationship with mental health during youth. Future research should focus on considering specific dimensions and indicators of poverty when assessing the association between poverty and mental health, such as those that reflect economic opportunities and access to employment or training. While none were identified in the present paper, further research should consider gender differences on secondary caring responsibilities among young people in poor households, and how these might impact on depression outcomes. Unpacking the specific relationship between dimensions of poverty and youth depression can pave the way for future longitudinal observational and intervention studies aiming at breaking the cycle of poverty and mental illness, which can in turn identify key causal pathways and targets for policy intervention. Such longitudinal

studies would also help explore the causal nature of the relationship between poverty and mental health, which so far have focused monetary or material indicators of poverty (Lund and Cois, 2018; Stoop et al., 2019), overlooking other dimensions of poverty. Given the high rates of youth unemployment in South Africa relative to other LMICs, our findings suggest the need for further research examining whether improving retention in education, providing young people with opportunities for training and improving access to the labour market, may also offer potential entry points to improve the mental health of young people. Likewise, further research should establish whether mental health care for depressed youth may be an important means of improving educational and labour market outcomes.

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CRediT authorship contribution statement

EG and CL conceptualised the manuscript, with support from AM; EG drafted the manuscript, with support from AR, AM, SE, DM, ZA and CL. All authors reviewed and approved the final version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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Appendix A. Supplementary data

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