

<sup>1</sup>Department of Public Health,

Medical Centre, Rotterdam, The

<sup>2</sup>Department of Epidemiology and Environmental Health,

University at Buffalo, Buffalo,

<sup>3</sup>UNICEF Office of Research -

Innocenti, Florence, Italy

**Correspondence to** Leah Prencipe, Public Health,

Erasmus Medical Center.

Rotterdam 3000 CA, The

l.prencipe@erasmusmc.nl

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# Exploring multilevel social determinants of depressive symptoms for Tanzanian adolescents: evidence from a cross-sectional study

Leah Prencipe (a), <sup>1</sup> Tanja AJ Houweling (a), <sup>1</sup> Frank J van Lenthe (a), <sup>1</sup> Tia M Palermo (a), <sup>2</sup> Lusajo Kajula (a), <sup>3</sup> On Behalf of the Adolescent Cash Plus Evaluation Team

## ABSTRACT

**Background** Depression has substantial and enduring impacts for adolescents, particularly those living in poverty. Yet, evidence on its determinants in low-income countries remains scarce. We examined the social determinants of depressive symptoms for Tanzanian adolescents.

**Methods** We used cross-sectional data for 2458 adolescents (aged 14–19), to describe associations with depressive symptoms within and across five domains—demographic, economic, neighbourhood, environmental and social-cultural—using linear mixed models. We estimated depressive symptoms using the 10-item Centre for Epidemiological Studies Depression Scale, which ranges from 0 to 30 and increases with additional symptoms.

**Results** Factors associated with depressive symptoms in the fully adjusted models included experiencing five or more household economic shocks ( $\beta$ =2.40; 95% CI 1.48 to 3.32), experiencing droughts/floods ( $\beta$ =0.76; 95% CI 0.36 to 1.17), being in a relationship ( $\beta$ =1.82; 95% CI 1.30 to 2.33), and having moderate ( $\beta$ =1.26; 95% CI 0.80 to 1.71) or low ( $\beta$ =2.27; 95% CI 1.81 to 2.74) social support. Exclusive schooling was protective compared with being engaged in both school and paid work ( $\beta$ =1.07; 95% CI 0.05 to 2.61) and not engaged in either ( $\beta$ =0.73; 95% CI 0.24 to 1.22). Household size and relationship status were more important factors for girls, while employment status, and extreme precipitation were more important for boys.

**Conclusion** Mental health is associated with determinants from multiple domains. Results suggest that environmental shocks related to climate change contribute to poor mental health in adolescents, highlighting an important area for intervention and research.

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## INTRODUCTION

Poor mental health causes the highest disease burden for youth.<sup>1</sup> Depression in adolescence contributes to diminished educational achievement, substance use, delinquency and suicide, one of the leading causes of mortality for adolescents.<sup>2</sup> Adolescentonset mental health disorders often persist through adulthood,<sup>3</sup> are associated with other poor outcomes later in life,<sup>4</sup> and perpetuate into future generations.<sup>5</sup> Poor populations are acutely vulnerable, as social and economic conditions of poverty increase the likelihood of having depressive disorders, and depressive orders themselves decrease overall economic well-being.<sup>6</sup>

Mental health is influenced by numerous interwoven biological and social mechanisms that exist in various domains.<sup>7</sup> While identifying the social determinants of poor mental health is crucial to inform interventions which target these mechanisms, research gaps on the influence of environmental events, macroeconomic determinants, and household economics remain.<sup>8</sup> Recent studies have explored determinants of poor mental health among African youth,<sup>9</sup> although the evidence has largely been focused on specific subgroups, such as youth living with HIV,<sup>10</sup> school-going children,<sup>11–13</sup> pregnant women,<sup>14</sup> and orphans or adults.<sup>15–17</sup> With the majority of the population younger than 18 years,<sup>18</sup> understanding the determinants of adolescent mental health in Tanzania is crucial.

Using the conceptual framework developed by Lund *et al*,<sup>7</sup> we categorise potential determinants of mental health into five domains (demographic, economic, neighbourhood, environmental, and social and cultural). Lund's conceptual framework follows Bronfenbrenner's ecological approach to childhood,<sup>19</sup> wherein proximal, intermediate, and distal factors are conceptualised to capture the complex multidimensional ways in which social determinants influence child health. Despite increased understanding that factors within cultures, families, communities, and environments work together to influence outcomes, ecological approaches to child health are still largely theoretical in studies of African populations.<sup>20</sup> The evidence remains fixed on attributes and behaviours of individuals and largely ignores the environmental and contextual factors which help shape those individualistic characteristics. Few studies have evaluated such a comprehensive set of social determinants on adolescent mental health in Africa.

#### METHODS Study population

The cross-sectional data come from the evaluation of an adolescent-focused intervention designed to complement the Productive Social Safety Net (PSSN), a governmental social protection programme. Information on the study design and intervention are provided in the evaluation report.<sup>21</sup> Data were collected in 130 villages from four districts within Iringa and Mbeya regions of mainland Tanzania. All adolescents who (1) were living in a PSSN household and (2) were 14-19 years of age, were eligible for inclusion, resulting in a sample of 2458 youth. While data used in this study come from baseline (April to June 2017), select indicators were only available at the first follow-up (May to June 2018) and included 2104 adolescents.

#### Measures

Data come from village, household, and youth surveys, which were translated to Swahili and pilot tested. Informed consent was obtained from respondents 18 or older and married youth; caregiver/parental consent and youth assent were obtained for unmarried youth under 18 years.

## Mental health

The 10-item Centre for Epidemiological Studies Depression Scale (CES-D10) is an internationally validated screening tool.<sup>22</sup> Youth responses to 10 questions regarding feelings and behaviours over the prior 7 days (online supplemental table 1) were summed to create a scale ranging from 0 to 30, with higher scores reflecting more depressive symptoms. The CES-D10 has been validated as a reliable measurement of depression in Tanzania, with full measurement invariance of the scale supported by gender.<sup>23</sup> We further included a binary indicator of  $\geq 10$  on the CES-D10 to denote depressive symptomology for descriptive purposes. While a recent validation of the CES-D10 in South Africa recommended cut-offs between 11 and 13, depending on the language of population, the study was unable to estimate the prevalence of depression among adolescents.<sup>24</sup> Therefore, we used the recommended cut-off, which is the most commonly used threshold among similar populations.<sup>23</sup>

## Potential determinants

Indicators were selected based on data availability and overlap with determinants from Lund  $et al^7$  online supplemental appendix. Domain definitions from the Lund study and variable construction are provided in online supplemental table 2. The demographic domain included sex, age, female-headed household, household with five or more members, and region. The economic domain included household wealth level (created with an asset-based index), number of household economic shocks experienced during the prior year, and cell phone ownership. The neighbourhood domain included access to basic services level (created with a summary index of resources available within the village). The environmental domain included household affected by drought or flood and household affected by livestock or crop disease, both during the prior year. Finally, the social and cultural domain included education/employment status, relationship status, religious attendance, number of adverse child experiences (ACE) (based on a subset of the ACE International Questionnaire<sup>25</sup>), and level of social support (based on a modified version of the Multidimensional Scale of Perceived Social Support).<sup>26</sup>

## Psychosocial indicators

Although psychosocial factors are important pathways between determinants and health, we explored these indicators descriptively as they may overlap with other predictors.<sup>27</sup> Subjective quality of life (QOL), self-esteem", and locus of control (LOC), the extent of feeling internal control over outcomes (eg, a person has control over one's own life) versus external (ie, life is

## RESULTS

influential results.

Analysis

Of the 2458 youth interviewed at baseline, just over half (1322) were boys and 18% reported being in a relationship (table 1). During the year prior to the survey, nearly one-third (32%) were affected by droughts or flooding and 8% lived in households with five or more economic shocks.

shown to process stressors differently, a particularly important

factor considering the hormonal fluctuations experienced during

adolescence,<sup>35</sup> results were reported for the full sample and sepa-

rately by sex. Religious attendance and ACE were not included

in multivariate models due to smaller sample size and lack of

While 29% of the sample reported depressive symptomology, the rates varied by characteristic. Higher rates were found for youth affected by droughts or floods (35%) than not (26%), and for youth with low social support (37%) compared with high (22%). Nearly half of youth with five or more economic shocks reported depressive symptomology (48%). Findings were mostly similar by sex, with some notable distinctions: boys in Iringa had higher rates of depression (42%) when compared with those in Mbeya (18%), depressive symptomology was higher among boys who experienced droughts or floods (40%) than boys who did not (26%), and, among girls, cell phone owners had higher depression (36%), compared with non-owners (25%).

Among psychosocial indicators (table 2), youth with low self-esteem exhibited higher rates of depression (33%) than their counterparts (29% moderate and 25% high), while youth with a high internal LOC had lower rates (19%) than those with moderate (32%) or low (38%) levels. While rates by selfperceived QOL were less different overall, the differences were larger for girls: 32% who reported poor QOL had depressive symptoms compared with 20% for girls who did not. For boys with a low internal LOC, nearly half (46%) reported depressive symptoms, compared with 31% and 18% for those with moderate and high levels, respectively.

Table 1   Charae	cteristics of sample population	by domain fo	or the full sa	imple and	separately by	y sex				
		Pooled sampl	e		Females			Males		
Domain	Variable	n (% in each category)	% Depressed	χ <sup>2</sup> P value	n (% in each category)	% Depressed	χ <sup>2</sup> P value	n (% in each category)	% Depressed	χ <sup>2</sup> P value
Demographic	Total	2458 (100)	29		1136 (100)	27		1322 (100)	30	
	Sex			0.088						
	Female	1136 (46)	27		-	-		-	-	
	Male	1322 (54)	30		-	-		-	-	
	Age in years			<0.001			0.002			0.142
	14	502 (20)	22		270 (24)	19		232 (18)	25	
	15	498 (20)	26		250 (22)	26		248 (19)	27	
	16	456 (19)	30		200 (18)	29		256 (19)	31	
	17	469 (19)	33		190 (17)	32		279 (21)	33	
	18	296 (12)	30		119 (10)	29		177 (13)	31	
	19	237 (10)	38		107 (9)	38		130 (10)	37	
	Five or more household members	207 (10)	50	0.013		50	0.073	150 (10)	5.	0.075
	No	1121 (46)	26	0.015	505 (44)	25	0.075	616 (47)	28	0.075
	Vec	1227 (E4)	20		621 (EC)	20		706 (52)	20	
	Tess	1557 (54)	21	0.550	(00) 100	29	0 5 40	700 (55)	52	0.102
	remaie-neaded nousenoid	0.40 (2.4)	20	0.550	207 (24)	26	0.548	452 (24)	22	0.182
	NO	840 (34)	30		387 (34)	26		453 (34)	33	
	Yes	1618 (66)	28		749 (66)	28		869 (66)	29	
	Region			<0.001			0.306			<0.001
	Mbeya	1171 (48)	23		538 (47)	29		633 (48)	18	
	Iringa	1287 (52)	34		598 (53)	26		689 (52)	42	
Economic	Wealth level of household	04.0 (0.0)		0.387			0.198	(22)	22	0.381
	Richest	818 (33)	29		383 (34)	25		435 (33)	32	
	Poorest	819 (33) 819 (33)	31 27		397 (33) 355 (31)	30 27		422 (32) 464 (35)	31 28	
	Number of economic shocks (past ve	ar)	21	<0.001	JJJ (JL)	27	<0.001	(00)	20	0.010
	0	626 (25)	27		291 (26)	27		335 (25)	27	
	1	666 (27)	29		309 (27)	27		357 (27)	31	
	2	498 (20)	26		226 (20)	21		272 (21)	30	
	3	299 (12)	24		134 (12)	24		165 (12)	25	
	4	163 (7)	29		73 (6)	15		90 (7)	40	
	5+	206 (8)	48	0.020	103 (9)	53	0.004	103 (8)	42	0.045
	Youth owns a cell phone	1046 (70)	20	0.028	020 (02)	25	0.001	1009 (76)	20	0.915
	NU Yes	512 (21)	20		956 (65) 198 (17)	25 36		314 (24)	30	
Neighbourbood/	Access to services level	512 (21)	55	0.400	150 (17)	50	0 500	511(21)	51	0 513
environmental				0.100			0.500			0.515
	High	884 (36)	29		412 (36)	26		472 (36)	31	
	Middle	802 (33)	30		374 (33)	29		428 (32)	31	
	Low	772 (31)	27		350 (31)	26		422 (32)	28	
	Drought/flood (past year)			<0.001			0.296			<0.001
	No	1662 (68)	26		784 (69)	26		878 (66)	26	
	Yes	796 (32)	35		352 (31)	29		444 (34)	40	
	Livestock/cron disease (nast year)	,50 (52)	55	0 366	552 (51)	25	0.607	111(31)	10	0.484
	No	1/123 (58)	28	0.500	672 (59)	27	0.007	751 (57)	30	0.404
	Voc	1025 (42)	20		A6A (A1)	20		571 (42)	21	
Social and cultural	Fducation/employment	1035 (42)	30	<0.001	404 (41)	28	<0.001	571 (43)	31	0.037
Social and cultural	Attending school/training	1254 (51)	24	~0.001	662 (58)	21	<u>_</u> 0.001	592 (45)	26	5.057
	Engaged in paid work	300 (12)	35%		64 (6)	36		236 (18)	35	
	In school/training and paid work	85 (3)	32		26 (2)	27		59 (4)	34	
	Not in education, employment, or training	819 (33)	34		384 (34)	36		435 (33)	33	
	Has a spouse, boyfriend or girlfriend			<0.001			<0.001			0.002

#### Table 1 Continued

		Pooled sample	e		Females			Males		
Domain	Variable	n (% in each category)	% Depressed	$\chi^2 P$ value	n (% in each category)	% Depressed	$\chi^2 P$ value	n (% in each category)	% Depressed	$\chi^2 P$ value
	No	2023 (82)	26		834 (73)	22		1189 (90)	29	
	Yes	435 (18)	42		302 (27)	42		133 (10)	42	
	Social support			<0.001			<0.001			0.001
	High	951 (39)	22		353 (31)	16		598 (45)	25	
	Moderate	790 (32)	30		368 (32)	27		422 (32)	33	
	Low	717 (29)	37		415 (37)	36		302 (23)	37	
	Attends weekly religious ceremony*			0.338			0.278			0.963
	No	992 (47)	30		374 (39)	29		618 (54)	30	
	Yes	1113 (53)	28		582 (61)	26		531 (46)	30	
	Number of adverse childhood experie	ences*		0.830			0.296			0.981
	0–1	399 (20)	27		161 (19)	22		238 (22)	31	
	2	549 (28)	30		246 (29)	28		303 (28)	31	
	3	402 (21)	28		172 (20)	26		230 (21)	29	
	4	284 (15)	30		135 (16)	30		149 (14)	30	
	5+	314 (16)	31		144 (17)	33		170 (16)	29	

Depression is defined using a cut-off of 10 or higher on the 10-item Centre for Epidemiological Studies Depression Scale.

\*Total N differs due to attrition. Data come from wave 2 for these indicators.

As seen in the pooled sample, all psychosocial indicators were associated with depressive symptoms (table 3). Having a poor self-perceived QOL was associated with nearly one-point higher CES-D10 than the reference category ( $\beta$ =0.81; 95% CI 0.40 to 1.21), and having a low level of internal LOC was associated with a nearly two-point higher LOC than those with a high level ( $\beta$ =1.98; 95% CI 1.52 to 2.44). Lacking internal LOC and self-esteem were more strongly associated with mental health for boys, while poor QOL was more influential for girls.

## Social determinants of depressive symptoms

#### Demographic domain

Increased age was associated with higher CES-D10 in bivariate analyses for the full sample (table 4). This association was partly (and for girls fully) explained by social and cultural characteristics (model 3, online supplemental tables 4 and 5). While living in a household with five or more people had no clear association with CES-D10 in the full sample, girls from large households had higher CES-D10 in all models (online supplemental table 5), including model 4 ( $\beta$ =0.62; 95% CI 0.06 to 1.18). Living in Iringa also had a modest association with depressive symptoms in bivariate regressions (table 4;  $\beta$ =0.56; 95% CI -0.03 to 0.75), with results driven by boys (table 5;  $\beta$ =1.68; 95% CI 0.79 to 2.57). Boys overall had higher CES-D10 than girls in Model 4 (table 4;  $\beta$ =0.70; 95% CI 0.31 to 1.10) but not in bivariate regressions.

## Economic domain

Five or more economic shocks were associated with nearly three points higher CES-D10 in bivariate regressions (table 4;  $\beta$ =2.72; 95% CI 1.95 to 3.49), when compared with no shocks. Controlling for other determinants did not mitigate this relationship, as seen in model 4 ( $\beta$ =2.40; 95% CI 1.48 to 3.32) and when disaggregating by sex (table 5). However, results on fewer than five shocks varied for girls—in bivariate regressions girls who experienced four shocks had a 1.45 points lower CES-D10 (95% CI -2.70 to -0.21), than those that had no shocks. These results were consistent across multivariate models (online supplemental table 5). Household wealth was associated with CES-D10 when adjusting for demographics only (model 1, online supplemental table 4), with no clear associations when

Table 2         Psychosocial character	ristics of sampl	e population	for the full s	ample and sep	arately by se	x			
	Pooled sample	2		Females			Males		
Variable	n (% in each category)	% Depressed	$\chi^2$ P value	n (% in each category)	% Depressed	$\chi^2$ P value	n (% in each category)	% Depressed	$\chi^2$ P value
Poor self-perceived quality of life			0.018			<0.001			0.716
No	1130 (46)	27		451 (40)	20		679 (51)	31	
Yes	1328 (54)	31		685 (60)	32		643 (49)	30	
Self-esteem			0.001			<0.001			0.009
High	775 (32)	25		321 (28)	22		454 (34)	27	
Moderate	906 (37)	29		454 (40)	22		452 (34)	36	
Low	777 (32)	33		361 (32)	38		416 (31)	29	
Locus of control			<0.001			0.001			<0.001
High	948 (39)	19		420 (37)	21		528 (40)	18	
Moderate	730 (30)	32		358 (32)	33		372 (28)	31	
Low	780 (32)	38		358 (32)	28		422 (32)	46	
Depression is defined using a cut-off of 10	or higher on the 10-	item Centre for	Epidemiological	Studies Depression 9	Scale				

 Table 3
 Bivariate associations of psychosocial characteristics and depressive symptoms for the full sample and separately by sex

	Full sample			Females			Males		
Variable	Mean CES-D10	Estimate (95% CI)	P value	Mean CES-D10	Estimate (95% CI)	P value	Mean CES-D10	Estimate (95% CI)	P value
Poor self-perceived	quality of life								
No	6.51	Reference category		5.86	Reference category		6.94	Reference category	
Yes	6.86	0.81 (0.40 to 1.21)	< 0.001	7.11	1.39 (0.80 to 1.99)	< 0.001	6.59	0.29 (-0.25 to 0.84)	0.292
Self-esteem									
High	6.21	Reference category		6.30	Reference category		6.15	Reference category	
Moderate	6.53	0.65 (0.18 to 1.13)	0.007	5.74	-0.30 (-1.01 to 0.41)	0.405	7.33	1.73 (1.12 to 2.34)	< 0.001
Low	7.38	1.43 (0.95 to 1.92)	< 0.001	7.99	1.82 (1.09 to 2.56)	< 0.001	6.84	1.20 (0.58 to 1.82)	< 0.001
Locus of control									
High	5.57	Reference category		5.91	Reference category		5.31	Reference category	
Moderate	7.06	1.52 (1.06 to 1.98)	<0.001	7.23	1.31 (0.63 to 2.00)	< 0.001	6.90	1.33 (0.72 to 1.93)	< 0.001
Low	7.73	1.98 (1.52 to 2.44)	< 0.001	6.82	0.91 (0.22 to 1.61)	0.010	8.50	2.24 (1.62 to 2.86)	< 0.001

Reported CES-D10 means are unadjusted. Bivariate regressions tested associations of psychosocial characteristics with depressive symptoms and adjusted for stratification variables. Linear mixed models were used to account for clustering of CES-D10 within and between villages. Random effects are not shown.

CES-D10, 10-item Centre for Epidemiological Studies Depression Scale.

adjusting for all domains. Owning a cell phone was associated with more symptoms for girls in bivariate regressions (table 5), however, this relationship was explained by demographics (model 1, online supplemental table 5).

#### Neighbourhood and environmental domains

Youth living in households affected by droughts or floods had nearly one-point higher CES-D10 than those who did not in bivariate regressions (table 4;  $\beta$ =0.93; 95% CI 0.51 to 1.34). Adjusting for demographics (online supplemental table 4, model 1;  $\beta$ =0.91; 95% CI 0.49 to 1.33) or all domains (model 4;  $\beta$ =0.76; 95% CI 0.36 to 1.17) did not affect this relationship. The association between extreme precipitation and depressive symptoms was driven by boys (online supplemental table 6), as we can see a one-point increase in CES-D10 after adjusting for demographics (model 2;  $\beta$ =1.15; 95% CI 0.61 to 1.69) and in the fully adjusted model for boys ( $\beta$ =1.03; 95% CI 0.51 to 1.90), and no relationship for girls (table 5).

## Social and cultural domain

Having a romantic partner was strongly associated with depressive symptoms overall in bivariate regressions (table 4;  $\beta = 1.47$ ; 95% CI 1.04 to 1.90). Controlling for other domains only increased the strength of this relationship: youth with romantic partners had nearly a two-point higher CES-D10 ( $\beta$ =1.82; 95%) CI 1.30 to 2.33) when compared with single youth in model 4. While results were consistent by sex, the association was stronger for girls (table 5). Not having a high social support level was associated with depressive symptoms overall, with model 4 (table 4) showing increased CES-D10 for youth with moderate  $(\beta = 1.26; 95\% \text{ CI } 0.80 \text{ to } 1.71)$  and low  $(\beta = 2.27; 95\% \text{ CI } 1.81)$ to 2.74) levels. While exclusive school had a protective association in bivariate regressions, when compared with engaged in paid work ( $\beta$ =1.38; 95% CI 0.76 to 1.99); both school and paid work ( $\beta$ =1.28; 95% CI 0.23 to 2.34); and neither  $(\beta=1.47; 95\%$  CI 1.04 to 1.90), the relationship was mitigated when including other domains, resulting in a negligible association for youth in paid work and reduced associations for those in both school and paid work ( $\beta$ =1.07; 95% CI 0.05 to 2.09) and neither ( $\beta$ =0.73; 95% CI 0.24 to 1.22), in the final model. Associations with employment status were stronger for boys (table 5). Experiencing five or more adverse childhood experiences was associated with more depressive symptoms for girls only ( $\beta$ =1.17; 95% CI 0.05 to 2.28).

## Village variance

The ICC ranges from 6.5% to 7.4% in full sample multivariate models, as seen in the bottom rows of online supplemental table 4. Results by sex indicate that the village-level variance accounted for a much larger proportion of depressive symptoms for boys, with an ICC three times that of girls in the final model (table 5) (ICC 16.8% vs 4.9%, respectively).

## DISCUSSION

This paper has examined social determinants of adolescent mental health for a vastly understudied and high-risk group. Consistent with existing evidence on the multifactorial causes of poor mental health, we found that depressive symptoms were associated with social determinants across domains. Depressive symptoms were associated with demographic (increased age, being male), economic (five or more economic shocks), environmental (droughts/floods), and social and cultural (romantic partnerships, education/employment status, social support) determinants, in the fully adjusted model. Although all psychosocial indicators were associated with depressive symptoms, the association was stronger among boys lacking internal LOC and self-esteem, while poor QOL was more influential for girls. Neighbourhood access to services had no association, although multilevel models suggest village variance contributed to individual-level depressive symptoms.

The proportion of variance attributable to the village-level remained stable, accounting for 6.9% of symptoms in the empty model (not shown) and 6.5% in the final model, meaning that our selected characteristics do not explain away the village-level contribution to depressive symptoms. When conducting observational research on neighbourhood-level health effects, it may be preferable to select outcome-specific resources as opposed to proxy indicators with wide-ranging characteristics.<sup>36</sup> As such, the services index that we used may have lacked meaning for our outcome. The unexplained village variance could denote other factors represented within villages, such as school characteristics, which have been found to be more influential on depression among adolescents than neighbourhoods alone.<sup>37</sup> In either case, the adverse effects found at the village level are

Table 4 Bivariate and mul	tivariate associations of potential deter	minants and depr	essive symptoms, full s	sample		
			Bivariate		Multivariate model	1
Domain	Variable	Mean CES-D10	Estimate (95% CI)	P value	Estimate (95% CI)	P value
Demographic	Total	6.70				
	Sex					
	Female	6.77	Reference category		Reference category	
	Male	6.61	0.20 (-0.19 to 0.58)	0.314	0.70 (0.31 to 1.10)	<0.001
	Age in years					
	14	5.75	Reference category		Reference category	
	15	6.39	0.62 (0.02 to 1.22)	0.043	0.60 (0.03 to 1.18)	0.039
	16	6.69	0.96 (0.35 to 1.57)	0.002	0.73 (0.14 to 1.32)	0.016
	17	7.17	1.39 (0.79 to 2.00)	< 0.001	0.95 (0.33 to 1.58)	0.003
	18	7 25	1 53 (0 84 to 2 22)	<0.001	0.86 (0.10 to 1.62)	0.027
	19	7 76	1.87 (1.13 to 2.62)	<0.001	1.09 (0.26 to 1.92)	0.010
	Eive or more bousehold members	7.70	1.07 (1.15 to 2.02)	<0.001	1.05 (0.20 to 1.52)	0.010
	No	6.46	Deference category		Deference cotogony	
	No	6.46		0.070	Reference category	0.057
	Yes	6.90	0.36 (-0.03 to 0.75)	0.073	0.37 (-0.01 to 0.76)	0.057
	Female-headed household					
	No	6.71	Reference category		Reference category	
	Yes	6.69	0.04 (-0.37 to 0.45)	0.847	0.16 (-0.24 to 0.56)	0.426
	Region*					
	Mbeya	6.31	Reference category		-	
	Iringa	7.06	0.56 (-0.05 to 1.17)	0.074	-	
Economic	Wealth level of household					
	Richest	6.54	Reference category		Reference category	
	Middle	6.77	0.40 (-0.10 to 0.90)	0.114	0.45 (-0.02 to 0.93)	0.063
	Poorest	6.78	0.41 (-0.13 to 0.95)	0.137	0.47 (–0.05 to 0.99)	0.076
	Number of economic shocks (past year)	6 67	Defense esteren		Deference esterar	
	1	0.57	Reference category $0.02(0.050 \text{ to } 0.56)$	0.016	Reference category	0.064
	7	6.22	-0.03(-0.30(0.0.30))	0.910	-0.39(-1.03  to  0.24)	0.904
	2	6.23	-0.19 (-0.87 to 0.48)	0.400	-0.03(-0.87  to  0.70)	0.834
	4	6.76	0.07 (-0.76 to 0.91)	0.860	0.35 (-0.58 to 1.28)	0.463
	5+	9.10	2.72 (1.95 to 3.49)	< 0.001	2.40 (1.48 to 3.32)	<0.001
	Youth owns a cell phone					
	No	6.57	Reference category		Reference category	
	Yes	7.20	0.68 (0.20 to 1.15)	0.005	-0.44 (-1.01 to 0.12)	0.123
Neighbourhood/environmental	Access to services level					
	High	6.69	Reference category		Reference category	
	Middle	6.83	-0.05 (-0.78 to 0.69)	0.899	-0.03 (-0.72 to 0.65)	0.927
	Low	6.57	0.12 (-0.62 to 0.87)	0.747	0.02 (-0.68 to 0.72)	0.947
	Drought/flood (past year)		,		,	
	No	6 35	Reference category		Reference category	
	Vec	7 42	0.93 (0.51 to 1.34)	<0.001	0.76 (0.36 to 1.17)	<0.001
	Livertock/crop.disease (past year)	7.42	0.55 (0.51 (0 1.54)	0.001	0.70 (0.50 (0 1.17)	<0.001
	Livestock/crop uisease (past year)	6 50	Deferrer		Defense	
	NO	0.59	Reference category		Reference category	
	Yes	6.84	0.36 (-0.04 to 0.75)	0.075	-0.25 (-0.78 to 0.28)	0.354

#### Table 4 Continued

			Bivariate		Multivariate model	4
Domain	Variable	Mean CES-D10	Estimate (95% CI)	P value	Estimate (95% CI)	P value
Social and cultural	Education/employment					
	Attending school/training	6.07	Reference category		Reference category	
	Engaged in paid work	7.22	1.38 (0.76 to 1.99)	< 0.001	0.56 (-0.10 to 1.23)	0.098
	School & paid work	7.20	1.28 (0.23 to 2.34)	0.017	1.07 (0.05 to 2.09)	0.040
	Neither	7.42	1.47 (1.04 to 1.90)	< 0.001	0.73 (0.24 to 1.22)	0.003
	Has a partner					
	No	6.35	Reference category		Reference category	
	Yes	8.34	2.01 (1.52 to 2.51)	< 0.001	1.82 (1.30 to 2.33)	< 0.001
	Social support					
	High	5.69	Reference category		Reference category	
	Moderate	6.76	1.37 (0.91 to 1.83)	< 0.001	1.26 (0.80 to 1.71)	< 0.001
	Low	7.97	2.41 (1.94 to 2.88)	< 0.001	2.27 (1.81 to 2.74)	< 0.001
	Attends weekly religious ceremony†					
	No	6.73	Reference category		-	
	Yes	6.65	-0.23 (-0.64 to 0.19)	0.285	-	
	Number of adverse childhood experiencest					
	0–1	6.77	Reference category		-	
	2	6.52	-0.24 (-0.86 to 0.39)	0.454	-	
	3	6.55	-0.23 (-0.90 to 0.44)	0.503	-	
	4	6.76	-0.05 (-0.79 to 0.70)	0.903	-	
	5+	6.93	0.13 (-0.60 to 0.85)	0.727	-	
Random effects						
Village variance (SE)			-		1.41 (0.325)	
Intraclass correlation coefficie	ent %		-		6.5	

Reported CES-D10 means are unadjusted. All regressions adjust for stratification variables. Multivariate model 4 adjusts for all domains within a single regression. Models 1–3, which adjust for domains separately, are shown in the appendix. Linear mixed models were used to account for clustering of CES-D10 within and between villages (random effects are not shown for bivariate regressions).

\*All other bivariate and multivariate regressions adjust for region as part of sample stratification; therefore estimates are not shown elsewhere.

†Total N differs due to attrition. Data come from wave 2 for these indicators.

CES-D10, 10-item Centre for Epidemiological Studies Depression Scale.

likely the result of an unobserved mechanism specific to where these youth live. Other studies have found neighbourhood-level ICCs for depression/depressive symptoms, ranging from 0.4% to 2.9% for adults, and 11% for young children,<sup>38</sup> although no studies, to our knowledge, report neighbourhood-level variance of depression in Africa.

One potential explanation for regional disparities among boys relates to inequalities in household economic opportunities. Mbeya households owned more livestock and grew more cash crops, providing more income-generating opportunities within their households. While overall labour-hours were similar, Iringa boys spent eight fewer hours on economic activities and six additional hours on domestic chores. In Tanzania, the division of labour is highly gendered, wherein women are responsible for domestic duties on top of any income generating activities.<sup>39</sup> Although less discussed, patriarchal gender stereotypes can also burden men, as fulfilling the masculine role of provider becomes increasingly difficult, particularly in settings with few opportunities.<sup>40</sup> On further investigation, 43% of Iringa boys reported low internal LOC (compared with 20% in Mbeya), but not poorer self-esteem. Our two-item self-esteem measurement may lack the sensitivity needed to capture dimensions of self-worth in relation to societal pressures. Failing to live up to typical 'masculine' cultural expectations may have led to decreased autonomy and poorer mental health.

We hypothesise that factors related to having a romantic partner increased psychological distress, particularly among girls. Among those in a relationship from our sample, 31% of girls reported ever being pregnant, compared with just 4% of single girls. Qualitative findings from the main evaluation cite pregnancy as a source of major stress for girls.<sup>21</sup> Pregnancy in adolescence can lead to disrupted schooling, relationship difficulties, poorer health, and decreased economic stability.<sup>41</sup>

While a recent study in Africa explored associations of school enrolment and income-generating activities with depression among adolescents in Tanzania, with results suggesting incomegenerating activities were associated with depression in fully adjusted models,<sup>9</sup> they did not explore the additional burden of employment on in-school youth, nor did they examine associations of depression among youth neither in education, employment or training (NEET). Similar to our results, a study conducted in Mexico found higher odds of mental health disorders for employed youth, youth who worked and studied, and NEET youth, compared with those who exclusively studied.<sup>42</sup> To our knowledge, this is the first study in Tanzania or neighbouring countries to measure how this state of social and economic exclusion associates with poorer mental health during adolescence, only after NEET youth have reached adulthood.

Climate change has been cited as the largest threat to global health in the 21st century.<sup>43</sup> Despite increased recognition of the negative effects that climate change has on mental health, there are remarkably few studies examining this relationship,<sup>44</sup> particularly for adolescents.<sup>45</sup> As populations in Africa are disproportionately at risk for the effects of climate change,<sup>43</sup> it is critical

		remales					NIGIC3				
		Mean	Bivariate		Multivariate model 4		Mean	Bivariate		Multivariate model 4	
imain	Variable	CES-D10	Estimate (95% CI)	P value	Estimate (95% CI)	P value	CES-D10	Estimate (95% CI)	P value	Estimate (95% CI)	P value
mographic	Age in years										
	14	5.77	Reference category		Reference category		5.73	Reference category		Reference category	
	15	6.12	0.16 (-0.67 to 1.00)	0.699	0.34 (-0.45 to 1.13)	0.401	6.66	0.92 (0.10 to 1.74)	0.028	0.85 (0.05 to 1.64)	0.037
	16	6.58	0.63 (-0.26 to 1.52)	0.163	0.57 (-0.27 to 1.41)	0.184	6.77	1.08 (0.27 to 1.89)	00.0	0.93 (0.14 to 1.73)	0.022
	17	7.09	1.16 (0.26 to 2.06)	0.011	0.50 (-0.41 to 1.41)	0.278	7.22	1.29 (0.50 to 2.09)	0.001	1.21 (0.38 to 2.04)	0.004
	18	7.95	2.04 (1.00 to 3.09)	<0.001	0.98 (-0.15 to 2.11)	0.089	6.77	1.07 (0.18 to 1.96)	0.018	0.75 (-0.24 to 1.74)	0.138
	19	7.63	1.82 (0.72 to 2.91)	0.001	0.39 (-0.85 to 1.62)	0.539	7.88	1.94 (0.95 to 2.92)	<0.001	1.72 (0.62 to 2.81)	0.002
	Five or more household membe	SIS									
	No	6.21	Reference category		Reference category		6.67	Reference category		Reference category	
	Yes	6.94	0.63 (0.05 to 1.21)	0.033	0.62 (0.06 to 1.18)	0.029	6.87	-0.10 (-0.60 to 0.41)	0.702	-0.10 (-0.60 to 0.41)	0.703
	Female-headed household										
	No	6.39	Reference category		Reference category		6.99	Reference category		Reference category	
	Yes	6.73	0.26 (-0.35 to 0.87)	0.401	0.30 (-0.28 to 0.89)	0.305	6.66	-0.18 (-0.71 to 0.35)	0.514	-0.02 (-0.55 to 0.51)	0.933
	Region*										
	Mbeya	6.90	Reference category		I		5.80	Reference category		1	
	Iringa	6.35	-0.60 (-1.32 to 0.13)	0.106	I		7.67	1.68 (0.79 to 2.57)	<0.001	I	
nomic	Wealth level of household										
	Richest	6.36	Reference category		Reference category		6.70	Reference category		Reference category	
	Middle	6.79	0.54 (-0.17 to 1.26)	0.137	0.44 (-0.23 to 1.11)	0.193	6.76	0.24 (-0.43 to 0.91)	0.477	0.39 (-0.26 to 1.04)	0.239
	Poorest	6.69	0.26 (-0.52 to 1.03)	0.517	0.27 (-0.46 to 1.01)	0.464	6.84	0.37 (-0.35 to 1.08)	0.311	0.42 (-0.29 to 1.12)	0.245
	Number of economic shocks (pi	ast year)									
	0	6.65	Reference category		Reference category		6.50	Reference category		Reference category	
	1	6.54	-0.16 (-0.93 to 0.62)	0.693	-0.36 (-1.13 to 0.40)	0.353	6.71	0.17 (-0.53 to 0.86)	0.643	0.45 (-0.25 to 1.15)	0.209
	2	5.69	-1.07 (-1.92 to -0.23)	0.013	-1.39 (-2.30 to -0.47)	0.003	6.67	0.40 (-0.34 to 1.15)	0.288	0.57 (-0.27 to 1.41)	0.181
	ß	6.49	-0.32 (-1.32 to 0.68)	0.528	-0.46 (-1.61 to 0.69)	0.430	6.01	-0.02 (-0.90 to 0.86)	0.958	0.59 (-0.46 to 1.63)	0.271
	4	5.49	-1.45 (-2.70 to -0.21)	0.022	-1.24 (-2.62 to 0.14)	0.079	7.79	1.37 (0.30 to 2.44)	0.012	1.89 (0.69 to 3.09)	0.002
	5+	9.70	2.70 (1.57 to 3.82)	<0.001	1.96 (0.63 to 3.29)	0.004	8.50	2.10 (1.07 to 3.14)	<0.001	2.43 (1.19 to 3.67)	<0.001
	Youth owns a cell phone										
	No	6.35	Reference category		Reference category		6.77	Reference category		Reference category	
	Yes	7.88	1.54 (0.79 to 2.29)	<0.001	-0.44 (-1.01 to 0.12)	0.123	6.77	0.15 (-0.44 to 0.75)	0.612	-0.61 (-1.32 to 0.10)	0.094

Manual control         Manua contro         Manual contro         Manual con	Image         Image <th< th=""><th>Indicator</th><th></th><th></th><th>Females</th><th></th><th></th><th></th><th></th><th>Males</th><th></th><th></th><th></th><th></th></th<>	Indicator			Females					Males				
Mode         Gold         Enner OSA CI         Fame         OSA CI         Enner OSA CI         Fame         OSA CI         Enner OSA CI         <	Dunktion         Make         Gate         Make         Gate	Dubbit         Oxidity         Oxidity         Color         Entendency         Forma         Game of Sector         Forma         Entendency         Entendency <t< th=""><th></th><th></th><th>Mean</th><th>Bivariate</th><th></th><th>Multivariate model 4</th><th></th><th>Mean</th><th>Bivariate</th><th></th><th>Multivariate model 4</th><th></th></t<>			Mean	Bivariate		Multivariate model 4		Mean	Bivariate		Multivariate model 4	
Model         Accord barrely into and	Model         Model <th< th=""><th>Match for the control of the contro of the control of the contro of the control of the c</th><th>Domain</th><th>Variable</th><th>CES-D10</th><th>Estimate (95% CI)</th><th>P value</th><th>Estimate (95% CI)</th><th>P value</th><th>CES-D10</th><th>Estimate (95% CI)</th><th>P value</th><th>Estimate (95% CI)</th><th>P value</th></th<>	Match for the control of the contro of the control of the contro of the control of the c	Domain	Variable	CES-D10	Estimate (95% CI)	P value	Estimate (95% CI)	P value	CES-D10	Estimate (95% CI)	P value	Estimate (95% CI)	P value
(h)         61         (h)	(b)         (c)         (c) <td>(b)         (b)         (b)         (b)         (b)         (b)         (b)         (c)         (c)<td>Neighbourhood/ environmental</td><td>Access to services level</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td>	(b)         (b)         (b)         (b)         (b)         (b)         (b)         (c)         (c) <td>Neighbourhood/ environmental</td> <td>Access to services level</td> <td></td>	Neighbourhood/ environmental	Access to services level										
Mdl         Gdd         Gdd <td>Mole         Eq.         ORI         Gal         ORI         Gal         Cal         Cal<td>Mddia         6<td></td><td>High</td><td>6.41</td><td>Reference category</td><td></td><td>Reference category</td><td></td><td>6.93</td><td>Reference category</td><td></td><td>Reference category</td><td></td></td></td>	Mole         Eq.         ORI         Gal         ORI         Gal         Cal         Cal <td>Mddia         6<td></td><td>High</td><td>6.41</td><td>Reference category</td><td></td><td>Reference category</td><td></td><td>6.93</td><td>Reference category</td><td></td><td>Reference category</td><td></td></td>	Mddia         6 <td></td> <td>High</td> <td>6.41</td> <td>Reference category</td> <td></td> <td>Reference category</td> <td></td> <td>6.93</td> <td>Reference category</td> <td></td> <td>Reference category</td> <td></td>		High	6.41	Reference category		Reference category		6.93	Reference category		Reference category	
(b)         (b)         (b)         (b)         (b)         (b)         (c)         (c) <td>Index         Index         <th< td=""><td>100         61         064</td><td></td><td>Middle</td><td>6.96</td><td>0.45 (-0.41 to 1.31)</td><td>0.303</td><td>0.24 (-0.54 to 1.03)</td><td>0.543</td><td>6.72</td><td>-0.56 (-1.64 to 0.51)</td><td>0.305</td><td>-0.32 (-1.34 to 0.70)</td><td>0.533</td></th<></td>	Index         Index <th< td=""><td>100         61         064</td><td></td><td>Middle</td><td>6.96</td><td>0.45 (-0.41 to 1.31)</td><td>0.303</td><td>0.24 (-0.54 to 1.03)</td><td>0.543</td><td>6.72</td><td>-0.56 (-1.64 to 0.51)</td><td>0.305</td><td>-0.32 (-1.34 to 0.70)</td><td>0.533</td></th<>	100         61         064		Middle	6.96	0.45 (-0.41 to 1.31)	0.303	0.24 (-0.54 to 1.03)	0.543	6.72	-0.56 (-1.64 to 0.51)	0.305	-0.32 (-1.34 to 0.70)	0.533
Image: constraint of the	Inequality           Inequality         (intercal intercal int	Indification in the control of the control		Low	6.48	0.06 (-0.83 to 0.94)	0.902	-0.18 (-1.00 to 0.63)	0.659	6.65	0.18 (-0.92 to 1.27)	0.751	0.22 (-0.82 to 1.26)	0.683
1         0         6         6         6         6         6         6         6         6         6         6         7         5         7         6         7         6         7         6         7	0         0	10         10         100		Drought/flood (past year)										
No.         150         0.057         0.027         0.026         0.0	Ne.         136         61         6	1         1		No	6.40	Reference category		Reference category		6.31	Reference category		Reference category	
Instructional general parameter         Instruction         Instruction         Instr	Immediate part of the part of t	Increasing the property of the property		Yes	7.09	0.57 (-0.06 to 1.20)	0.075	0.42 (-0.19 to 1.02)	0.180	7.68	1.15 (0.62 to 1.69)	<0.001	1.03 (0.51 to 1.56)	<0.001
16         64         Reference enterprise         57         Reference enterprise         73         Reference enterpris         73         Reference en	10         64<	No.         Edited calibity         All column calibity         Column calibity <td></td> <td>Livestock/crop disease (past year)</td> <td></td>		Livestock/crop disease (past year)										
We         Other         1         0.11 (-0.16 the O.1)         0.11 (-0.16 the O.1)         0.11 (-0.16 the O.1)         0.12 (-0.16 the O.1)         0.13 (-0.16 the O.1)         0.14 (-0.16 the O.1) <td>ist         112         012         012         023<td>NG         OID         OID</td><td></td><td>No</td><td>6.48</td><td>Reference category</td><td></td><td>Reference category</td><td></td><td>6.70</td><td>Reference category</td><td></td><td>Reference category</td><td></td></td>	ist         112         012         012         023 <td>NG         OID         OID</td> <td></td> <td>No</td> <td>6.48</td> <td>Reference category</td> <td></td> <td>Reference category</td> <td></td> <td>6.70</td> <td>Reference category</td> <td></td> <td>Reference category</td> <td></td>	NG         OID		No	6.48	Reference category		Reference category		6.70	Reference category		Reference category	
Scala and calma <sup>1</sup> (action for information of the fore calcing) (constant for information of the fore calcing) (constant for information of the fore calcing) (constant for information in the fore calcing) (constant for information inf	is classical and clarad         is classical a	Standard dual         Encodention         Encodention <thencodention< th=""> <thencodention< th=""></thencodention<></thencodention<>		Yes	6.81	0.11 (-0.48 to 0.71)	0.714	-0.12 (-0.89 to 0.66)	0.762	6.87	0.38 (-0.12 to 0.89)	0.139	-0.60 (-1.30 to 0.09)	0.088
Attending scholubraning         54         Reference calegoy         Col         Re	Attending colore/training         S (a)         Reference clargyry in the formed clargyryry in the formed clargyry in the formed clargyry in t	Appendix         51         Reference clargy         71         Clarge         Cla	Social and cultural	Education/employment										
England indication         744         100 035-104 (515)         0.032         0.13	Final point in the interval of the inte	Figued inpaid work         1.44         1.00         2.35(-1.500-1.50)         0.00         0.55(-1.500-1.500         0.00         0.111		Attending school/training	5.94	Reference category		Reference category		6.21	Reference category		Reference category	
Should paid work         615         120;1-160:02,19         0.761         0.24(-155 to 2.06)         0.71         716         171(02,10.210)         0.001           Neither         750         8 partner         720         124(-155 to 2.28)         0.178         720         124(02,10.50)         0.001         0.14(02,20.015)         0.001         0.14(02,001,163)         0.001         0.14(02,001,163)         0.001         0.016(00,001,163)         0.001         0.016(00,001,163)         0.001         0.017(01,100,201,10)         0.001           No         Sale         2.29(01,150,3.333)         <0.001         2.21(158 u2.288)         <0.001         738         130(0.480,0133)         0.003         0.011         0.013         0.011         0.011         0.011         0.011 <td>Kind kind kind         (13)         (13)         (13)         (13)         (14)</td> <td>Kindia (kalify the field)         G13         Q13(175.0.24)         Q13         Q14(155.0.24)         Q13         Q14(155.0.24)         Q10         Q113(120.121)         Q10         Q101         Q101</td> <td></td> <td>Engaged in paid work</td> <td>7.44</td> <td>1.60 (0.35 to 2.84)</td> <td>0.012</td> <td>0.26 (-1.00 to 1.53)</td> <td>0.683</td> <td>7.17</td> <td>1.21 (0.50 to 1.93)</td> <td>0.001</td> <td>0.63 (-0.15 to 1.40)</td> <td>0.113</td>	Kind kind kind         (13)         (13)         (13)         (13)         (14)	Kindia (kalify the field)         G13         Q13(175.0.24)         Q13         Q14(155.0.24)         Q13         Q14(155.0.24)         Q10         Q113(120.121)         Q10         Q101		Engaged in paid work	7.44	1.60 (0.35 to 2.84)	0.012	0.26 (-1.00 to 1.53)	0.683	7.17	1.21 (0.50 to 1.93)	0.001	0.63 (-0.15 to 1.40)	0.113
Neither         767         1.73 (1.17 to 2.40)         6.001         0.138         7.20         1.08 (0.50 to 1.56)         -6.001         0.66 (0.02 to 1.31)         0.003           Neise aparter         5.9         Reference canegory         6.65         Reference canegory         8.6         1.73 (1.17 to 2.34)         0.002         1.07 (0.23 to 1.93)         0.003           Yes         8.6         2.39 (1.55 to 2.43)         <001	Wether         15         128 (117 b 2.40)         6001         053 (-0.23 b 1.28)         0178         220         108 (050 b 1.66)         6001         066 (02 b 1.31)         0003           Nas a partner         Na         8         6         7         7         8         8         8         8         8         8         8         8         8         9         7         107 (0.23 a 1.90)         0003         107 (0.23 a 1.90)         0003         0003         100 (08 (0.2 b 1.30)         0003         100 (08 (0.2 b 1.30)         0003         0003         100 (08 (0.2 b 1.30)         0003         0003         0003         100 (08 (0.2 b 1.30)         0003	White         137         138 (1,17 to 2,40)         <001         051         138 (0,20 to 15i)         000         068 (0,02 to 13)         000           Ho         5 a partnet         5 a         Reference category         5 4         Reference category         5 4         Reference category         000         107 (0,23 to 190)         000		School & paid work	6.15	0.29 (-1.60 to 2.19)	0.761	0.24 (-1.55 to 2.04)	0.791	7.66	1.70 (0.47 to 2.93)	0.007	1.41 (0.22 to 2.61)	0.021
Is a partner           No         5.91         Reference category         6.65         Reference category         6.61         Reference category         Reference category         Reference category         Reference category         Reference category         Reference category         0.001         2.33 (1.58 to 2.88)         6.001         2.34 (1.30 (0.48 to 2.13)         0.002         1.30 (0.48 to 2.13)         0.002         1.01 (0.23 to 1.90)         0.013         1.01 (0.43 to 1.80)         0.013         1.01 (0.43 to 1.80)         0.013         1.01 (1.41 to 2.14)         0.011	Is a pattere No         Solid support         Reference category No         Solid 1:14,14,12,148,012,0         NO         Solid 1:14,147,0124,0130         Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6">Colspan="6"         Colspan="6"	Heat a partner16 <td></td> <td>Neither</td> <td>7.67</td> <td>1.78 (1.17 to 2.40)</td> <td>&lt;0.001</td> <td>0.51 (-0.23 to 1.25)</td> <td>0.178</td> <td>7.20</td> <td>1.08 (0.50 to 1.66)</td> <td>&lt;0.001</td> <td>0.66 (0.02 to 1.31)</td> <td>0.043</td>		Neither	7.67	1.78 (1.17 to 2.40)	<0.001	0.51 (-0.23 to 1.25)	0.178	7.20	1.08 (0.50 to 1.66)	<0.001	0.66 (0.02 to 1.31)	0.043
No         531         Reference category         665         Reference category         610         133 (135 to 2.38)         61001         734         130 (1.48 to 2.13)         700         117 (1023 to 1.30)         701           Ves         534         Reference category         534         Reference category         734         130 (1.48 to 2.13)         0.001         734         130 (1.48 to 2.13)         0.012           Ves         534         Reference category         632         117 (0.45 to 1.49)         0.001         734         142 (0.33 to 2.00)         6.001         131 (0.74 to 1.39)         0.012           Ves         632         117 (0.45 to 1.49)         0.001         734         142 (0.33 to 2.00)         6.001         131 (0.74 to 1.39)         6.001           Ves         53         Reference category         7.14         1.42 (0.33 to 2.00)         6.001         131 (0.74 to 1.39)         6.001           Ves         630         0.0152 to 2.80)         0.0101         7.84         7.84         6.001         131 (0.74 to 1.89)         6.001           Number of cabresce childhood experiencest         Ves         0.0115 to 2.86         0.0117 to 1.37 to 0.010         0.34         111 (1.47 to 2.74)         0.0101         1.41         0.011 (1.17 to 2.74)	(b)         591         Reference category         565         Reference category         665         Reference category         710<	No536 defence category536 defence category536 defence category6 defence cate		Has a partner										
Visional support         Size         2.79(2.15 to 3.43)         < C001         7.24         1.30 (0.48 to 2.13)         0.002         1.07 (0.23 to 1.90)         0.001           High         5.3         11.10 (0.45 to 1.80)         0.001         7.44         1.30 (0.48 to 2.14)         0.001         1.07 (0.23 to 1.90)         0.001           Noteinate         6.32         11.10 (0.45 to 1.80)         0.001         7.14         1.42 (0.83 to 2.00)         <0.001	Not         Static         S 279(21515 a 343)         < 0001         244         130 (0.46 to 2.13)         0.002         107 (0.21 to 1.90)         0.001         131 (0.71 to 1.24)         0.001         0.011 <th< td=""><td>Net         S56         279(215 to 343)         &lt;0001         231(158 to 288)         &lt;0001         734         130 (0.48 to 213)         0002         110 (0.23 to 190)         0003         107 (0.23 to 190)</td><td></td><td>No</td><td>5.91</td><td>Reference category</td><td></td><td>Reference category</td><td></td><td>6.65</td><td>Reference category</td><td></td><td>Reference category</td><td></td></th<>	Net         S56         279(215 to 343)         <0001         231(158 to 288)         <0001         734         130 (0.48 to 213)         0002         110 (0.23 to 190)         0003         107 (0.23 to 190)		No	5.91	Reference category		Reference category		6.65	Reference category		Reference category	
Social support         Social support         Belience category         Relience category         Social support         Relience category         Role	Social support         Social support         Reference category         Reference category         Reference category         Reference category         Color         131 (0.147 to 1274)         Color         131 (0.147 to 1274)         Color         131 (0.147 to 1274)         Color         Color         131 (0.147 to 1274)         Color	Social support         Social support         Social support         Reference category         Reference category         Reference category         Reference category         Colop 131 (1/3 fot 13.9)         Colop 131 (1/		Yes	8.56	2.79 (2.15 to 3.43)	<0.001	2.23 (1.58 to 2.88)	<0.001	7.84	1.30 (0.48 to 2.13)	0.002	1.07 (0.23 to 1.90)	0.012
High         534         Reference category         84         Reference category         84         Reference category         84	High534Reference category500Reference category500Reference categoryReference categoryReference categoryReference categoryReference category8000131 (0.74 to 1.34)0.001131 (0.74 to 1.	High holdwate bound5.4Reference category (17) (15,15) (13,01,23)5.00Reference category (14)Reference categoryReference category (14)Reference categoryReference category (14)Reference categoryReference category (14)Reference categoryReference cate		Social support										
Moderate         6.32         117 (0.45 to 1.89)         0.002         0.86 (0.17 to 1.56)         0.015         7.14         1.42 (0.83 to 2.00)         7.31 (1.47 to 2.74)         <0.001         1.31 (0.74 to 1.89)         <0.001         1.31 (0.74 to 1.80)	Moderate         6.32         11/1 (0.45 to 1.89)         0.002         0.66 (1.1 fa 1.51 (5)         0.001         7.14         1.42 (0.83 to 2.00)         <0.001         1.31 (1.47 to 2.74)         <0.001           Low         7.96         2.33 (1.83 to 3.23)         <0.001	Moderate         6.22         11/10.45 v 1.89         0.002         0.86 (0.17 v 1.56)         0.015         7.14         1.42 (0.83 v 2.20)         <0.001         1.31 (0.74 v 1.88)         <0.001           Low         7.86         2.31 (1.30 v 2.38)         2.001         2.30 (1.32 v 2.38)         2.001         2.31 (1.39 v 2.86)         <0.001		High	5.34	Reference category		Reference category		5.90	Reference category		Reference category	
Iow         7.96         2.33 (1.33 to 3.23)         < 0.001         7.98         2.22 (1.59 to 2.86)         < 0.001         2.11 (1.47 to 2.74)         < 0.001           Attends weeky religious cremonyt         Name of every religious cremonyt         E	Iow         7.96         2.53 (1.83 to 3.23)         <0.001         7.98         2.22 (1.55 to 2.86)         <0.001         2.11 (1.47 to 2.74)         <0.001           Attends weekly religious cremony:         Attends weekly religious cremony:         A	$ \begin{array}{l lllllllllllllllllllllllllllllllllll$		Moderate	6.32	1.17 (0.45 to 1.89)	0.002	0.86 (0.17 to 1.56)	0.015	7.14	1.42 (0.83 to 2.00)	<0.001	1.31 (0.74 to 1.88)	<0.001
Attends weekly religious caremonyt         Attends weekly religious caremonyt         Coll         Efference category         Coll         Efference category         Coll         Coll <th< td=""><td>Attends weekly religious ceremonytNo6.30Reference category6.3Reference category6.3Reference category6.3Reference category6.3<math>(1,1,1,1,0,0,1,2)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,1,1,0,0,1)</math><math>(1,2,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1</math></td><td>Attends weekly religious cremonytNo6.40-051(-11410.012)0.116-6.43Neference categoryYes6.40-051(-11410.012)0.116-6.43-0.017(-0.0370.010)0.542-Number of advesc childhood experiences7.03Reference category0-10.110.2560.01(-0.05 to 1.12)0.5660.04(-1.17 to 0.38)0.318-126.420.10(-0.05 to 1.15)0.850-6.66-0.04(-0.86 to 0.80)0.925-146.580.28(-0.84 to 1.40)0.625-6.66-0.04(-0.86 to 0.80)0.925-151.17(10.05 to 2.28)0.0400.26-6.640.01(-0.920 to 0.92)0.926-146.580.28(-0.84 to 1.40)0.625-6.66-0.04(-0.86 to 0.90)0.925-11110.2166.640.01(-0.95 to 1.87)0.766-140.28(-0.84 to 1.94)0.625-0.018(-0.86 to 0.90)0.9251111110.016111111111111-11111111111111<td></td><td>Low</td><td>7.96</td><td>2.53 (1.83 to 3.23)</td><td>&lt;0.001</td><td>2.20 (1.52 to 2.88)</td><td>&lt;0.001</td><td>7.98</td><td>2.22 (1.59 to 2.86)</td><td>&lt;0.001</td><td>2.11 (1.47 to 2.74)</td><td>&lt;0.001</td></td></th<>	Attends weekly religious ceremonytNo6.30Reference category6.3Reference category6.3Reference category6.3Reference category6.3 $(1,1,1,1,0,0,1,2)$ $(1,2,1,1,1,0,0,1)$ $(1,2,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,1,1,0,0,1)$ $(1,2,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1$	Attends weekly religious cremonytNo6.40-051(-11410.012)0.116-6.43Neference categoryYes6.40-051(-11410.012)0.116-6.43-0.017(-0.0370.010)0.542-Number of advesc childhood experiences7.03Reference category0-10.110.2560.01(-0.05 to 1.12)0.5660.04(-1.17 to 0.38)0.318-126.420.10(-0.05 to 1.15)0.850-6.66-0.04(-0.86 to 0.80)0.925-146.580.28(-0.84 to 1.40)0.625-6.66-0.04(-0.86 to 0.80)0.925-151.17(10.05 to 2.28)0.0400.26-6.640.01(-0.920 to 0.92)0.926-146.580.28(-0.84 to 1.40)0.625-6.66-0.04(-0.86 to 0.90)0.925-11110.2166.640.01(-0.95 to 1.87)0.766-140.28(-0.84 to 1.94)0.625-0.018(-0.86 to 0.90)0.9251111110.016111111111111-11111111111111 <td></td> <td>Low</td> <td>7.96</td> <td>2.53 (1.83 to 3.23)</td> <td>&lt;0.001</td> <td>2.20 (1.52 to 2.88)</td> <td>&lt;0.001</td> <td>7.98</td> <td>2.22 (1.59 to 2.86)</td> <td>&lt;0.001</td> <td>2.11 (1.47 to 2.74)</td> <td>&lt;0.001</td>		Low	7.96	2.53 (1.83 to 3.23)	<0.001	2.20 (1.52 to 2.88)	<0.001	7.98	2.22 (1.59 to 2.86)	<0.001	2.11 (1.47 to 2.74)	<0.001
No         6.90         Reference category         –         6.63         Reference category         –         –           Yes         6.40         -0.51 (-1.14 to 0.12)         0.116         -         6.92         0.17 (-0.37 to 0.70)         0.542         -           Number of adverse childhood experiencest         -         6.35         Reference category         0.55         -         0.04 (-0.137 to 0.70)         0.36         -           2         0.41         0.25 (-0.71 to 1.23)         0.556         -         0.40 (-1.17 to 0.38)         0.318         -           3         6.42         0.10 (-0.95 to 1.15)         0.850         -         0.40 (-1.17 to 0.38)         0.318         -           4         6.58         0.28 (-0.84 to 1.40)         0.652         -         0.40 (-1.17 to 0.38)         0.716         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.38         -           8         1.11         1.11 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.38         -           10         1.11 to 0.81         0.18 (-0.78 to 1.13)         0.18         -         -         -<	No         6.30         Reference category         5.30         Reference category         5.30           'ks         6.40         -0.51 (-1.14 to 0.12)         0.116         -         6.32         0.17 (-0.37 to 0.70)         0.542         -           Number of adverse childhood experiencest          6.33         Reference category         1.05         Reference category         -         -           2         6.49         0.53         Reference category         -         0.04 (-1.17 to 0.38)         0.318         -           3         6.49         0.10 (-0.95 to 1.12)         0.596         -         -         0.04 (-1.17 to 0.38)         0.318         -           4         6.49         0.10 (-0.95 to 1.12)         0.850         -         6.64         0.018 (-0.78 to 1.13)         0.716         -           5         1.17 (0.05 to 2.28)         0.940         -         6.53         0.18 (-0.78 to 1.13)         0.716         -           6         1.17 (0.05 to 2.28)         0.940         -         6.64         0.01 (-0.90 to 0.92)         0.92         -           7         5         1.17 (0.05 to 2.28)         0.940         -         0.01 (-0.90 to 0.92)         0.92         -           8	No6.00Reference category6.03Reference categoryYes6.00 $-051(-11400(12)$ $0.116$ $ 6.23$ $0.17(-0.37100, 70)$ $0.542$ $-$ Number of adverse childhood experiment $  -$		Attends weekly religious ceremon	ıyt									
Yes       6.40       -0.51 (-1.14 to 0.12)       0.116       -       6.22       0.17 (-0.37 to 0.70)       0.542       -         Number of adverse childhood experiencest       0-1       6.35       Reference category       1	Yes         6.40         -0.51 (-1.14 to 0.12)         0.116         -         6.22         0.17 (-0.37 to 0.70)         0.522         -           Number of adverse childhood experiencest         0-1         6.33         Reference category         0.53         -0.40 (-1.17 to 0.38)         0.318         -           1         0         0.64         0.05 (-0.71 to 1.23)         0.556         -         6.33         0.40 (-1.17 to 0.38)         0.318         -           3         6.42         0.10 (-0.55 to 1.15)         0.850         -         6.65         -0.40 (-1.17 to 0.38)         0.318         -           5         0.10 (-0.55 to 1.15)         0.850         -         6.65         0.01 (-0.03 to 0.92)         0.318         -           6         0.10 (-0.55 to 1.15)         0.850         -         6.64         0.01 (-0.93 to 0.92)         0.316         -           7         7         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.925         -           8 downance         6.53         0.040 (-1.17 to 0.38)         0.18 (-0.78 to 1.13)         0.716         -           1 downance         6.53         0.010 (-0.92)         0.925         -         3.63 (0.74)         <	Yes         6.40         -0.51 (-1.14 to 0.12)         0.116         -         6.92         0.17 (-0.37 to 0.70)         0.542         -           Number of adverse childhood experiencest         -         6.33         Reference category         -		No	6.90	Reference category		I		6.63	Reference category		I	
Number of adverse childhood experiencest         Number of adverse childhood experiencest         Col         Reference category         Col         Co	Number of adverse childhood experiencest $0-1$ 6.35Reference category <td>Number of advece childhood experiences0-16.35Reference category-0.40-0.17 to 0.38)0.318-0.4026.490.26 (-0.71 to 1.23)0.596-0.40 (-1.17 to 0.38)0.318-0.4036.420.10 (-0.95 to 1.15)0.850-0.40 (-1.17 to 0.38)0.318-0.4046.420.10 (-0.95 to 1.15)0.850-0.40 (-0.88 to 0.80)0.925-0.4050.28 (-0.84 to 1.40)0.653-0.40 (-0.88 to 0.80)0.925-0.4051.17 (0.05 to 2.28)0.400-1.240.11 (-0.90 to 0.92)0.925-0.40NoheF7.281.17 (0.51 to 2.28)0.401-0.401 (-0.90 to 0.92)0.925-0.401NoheF7.281.17 (0.51 to 2.28)0.402-1.01 (-0.90 to 0.92)0.925-0.401RohoF7.281.17 (0.51 to 2.28)0.403-1.02 (0.438)-0.401 (-0.90 to 0.92)-0.401NoheF7.281.17 (0.51 to 2.28)0.403-1.02 (0.438)-0.401 (-0.90 to 0.92)-0.401NoheF7.281.10 (-0.91 to 0.91 to 0.92)0.925-0.401 (-0.90 to 0.92)-0.401-0.401NoheF7.281.10 (-0.91 to 0.91 to 0.92)0.916 (-0.91 to 0.92)-0.401-0.401NoheF7.281.10 (0.91 to 0.91 to 0.910)-0.401-0.401-0.401NoheF1.02 (0.439)1.02 (0.439)-0.401-0.401-0.401NohF1.02 (0.430)<!--</td--><td></td><td>Yes</td><td>6.40</td><td>-0.51 (-1.14 to 0.12)</td><td>0.116</td><td>I</td><td></td><td>6.92</td><td>0.17 (-0.37 to 0.70)</td><td>0.542</td><td>I</td><td></td></td>	Number of advece childhood experiences0-16.35Reference category-0.40-0.17 to 0.38)0.318-0.4026.490.26 (-0.71 to 1.23)0.596-0.40 (-1.17 to 0.38)0.318-0.4036.420.10 (-0.95 to 1.15)0.850-0.40 (-1.17 to 0.38)0.318-0.4046.420.10 (-0.95 to 1.15)0.850-0.40 (-0.88 to 0.80)0.925-0.4050.28 (-0.84 to 1.40)0.653-0.40 (-0.88 to 0.80)0.925-0.4051.17 (0.05 to 2.28)0.400-1.240.11 (-0.90 to 0.92)0.925-0.40NoheF7.281.17 (0.51 to 2.28)0.401-0.401 (-0.90 to 0.92)0.925-0.401NoheF7.281.17 (0.51 to 2.28)0.402-1.01 (-0.90 to 0.92)0.925-0.401RohoF7.281.17 (0.51 to 2.28)0.403-1.02 (0.438)-0.401 (-0.90 to 0.92)-0.401NoheF7.281.17 (0.51 to 2.28)0.403-1.02 (0.438)-0.401 (-0.90 to 0.92)-0.401NoheF7.281.10 (-0.91 to 0.91 to 0.92)0.925-0.401 (-0.90 to 0.92)-0.401-0.401NoheF7.281.10 (-0.91 to 0.91 to 0.92)0.916 (-0.91 to 0.92)-0.401-0.401NoheF7.281.10 (0.91 to 0.91 to 0.910)-0.401-0.401-0.401NoheF1.02 (0.439)1.02 (0.439)-0.401-0.401-0.401NohF1.02 (0.430) </td <td></td> <td>Yes</td> <td>6.40</td> <td>-0.51 (-1.14 to 0.12)</td> <td>0.116</td> <td>I</td> <td></td> <td>6.92</td> <td>0.17 (-0.37 to 0.70)</td> <td>0.542</td> <td>I</td> <td></td>		Yes	6.40	-0.51 (-1.14 to 0.12)	0.116	I		6.92	0.17 (-0.37 to 0.70)	0.542	I	
0-1         6.35         Reference category         -         7.05         Reference category         -           2         6.49         0.26 (-0.71 to 1.23)         0.596         -         6.33         -0.01 (-1.17 to 0.38)         0.318         -           3         6.42         0.10 (-0.55 to 1.15)         0.850         -         6.66         -0.04 (-0.88 to 0.80)         0.925         -           4         6.58         0.28 (-0.84 to 1.40)         0.625         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           5         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           6         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           7         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           8         1.11 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           8         1.11 (0.05 to 2.28)         0.040         -         1.02 (0.438)         -          3.63 (0.749)	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	0-1         6.35         Reference category         -         7.05         Reference category         -           2         6.49         0.26 (-0.71 to 1.23)         0.596         -         0.40 (-1.17 to 0.38)         0.318         -           3         6.42         0.10 (-0.55 to 1.15)         0.800         -         0.640         0.18 (-0.78 to 0.13)         0.716         -           4         0.58         0.28 (-0.54 to 1.140)         0.825         -         6.64         0.01 (-0.90 to 0.92)         0.716         -           5         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.716         -            6.53         0.01 (-0.90 to 0.92)         0.78         -         -         -            6.53         0.01 (-0.90 to 0.92)         0.98         -         -         -            1.17 (0.05 to 2.28)         0.040         -         -         0.01 (-0.90 to 0.92)         0.98         -            6.666         0.01 (-0.90 to 0.92)         0.98         -         -         -         -         -         -         -         -         -         -		Number of adverse childhood exp	eriences†									
2       6.49       0.26 (-0.71 to 1.23)       0.596       -       6.53       -0.40 (-1.17 to 0.38)       0.318       -         3       6.42       0.10 (-0.55 to 1.15)       0.850       -       6.66       -0.04 (-0.88 to 0.80)       0.925       -         4       6.58       0.28 (-0.34 to 1.40)       0.625       -       6.64       0.01 (-0.90 to 0.92)       -       -         7       1.17 (0.05 to 2.28)       0.040       -       6.64       0.01 (-0.90 to 0.92)       0.82       -         8ndom effect       .       .       1.17 (0.05 to 2.28)       0.040       -       6.64       0.01 (-0.90 to 0.92)       0.82       -         Nilage variance (5E)       .       1.17 (0.05 to 2.28)       0.040       -       6.64       0.01 (-0.90 to 0.92)       0.82       -         Nilage variance (5E)       .       1.102 (0.438)       -       1.02 (0.438)       -       . <td>2         6.49         0.26 (-0.71 to 1.23)         0.596         -         6.53         -0.40 (-1.17 to 0.38)         0.318         -           3         6.42         0.10 (-0.95 to 1.15)         0.830         -         6.66         -0.04 (-1.08 to 0.80)         0.925         -           4         6.58         0.28 (-0.84 to 1.40)         0.655         -         6.69         0.01 (-0.90 to 0.92)         0.716         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.362         -           8         7         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.362         -           8         1         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           8         1         1.17 (0.05 to 2.28)         0.040         -         1.02 (0.438)         -</td> <td>2         6.49         0.26 (-0.71 to 1.23)         0.596         -         6.53         -0.40 (-1.17 to 0.38)         0.318         -           3         6.42         0.10 (-0.95 to 1.15)         0.850         -         6.66         -0.04 (-0.88 to 0.80)         0.925         -           4         6.58         0.28 (-0.84 to 1.40)         0.625         -         6.64         0.01 (-0.90 to 0.92)         0.925         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.925         -           Kandom effect           All operations officient %         -         1.02 (0.438)         -         6.64         0.01 (-0.90 to 0.92)         0.925         -           Kill operations officient %         -         1.02 (0.438)         -         5.64         0.01 (-0.90 to 0.92)         0.925         -           Kill operation officient %         -         -         1.02 (0.438)         -         -         3.63 (0.744)           Kill operation officient %         -         -         1.02 (0.438)         -         -         3.63 (0.744)           Kill operatoperation officient %         -         &lt;</td> <td></td> <td>0-1</td> <td>6.35</td> <td>Reference category</td> <td></td> <td>I</td> <td></td> <td>7.05</td> <td>Reference category</td> <td></td> <td>I</td> <td></td>	2         6.49         0.26 (-0.71 to 1.23)         0.596         -         6.53         -0.40 (-1.17 to 0.38)         0.318         -           3         6.42         0.10 (-0.95 to 1.15)         0.830         -         6.66         -0.04 (-1.08 to 0.80)         0.925         -           4         6.58         0.28 (-0.84 to 1.40)         0.655         -         6.69         0.01 (-0.90 to 0.92)         0.716         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.362         -           8         7         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.362         -           8         1         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           8         1         1.17 (0.05 to 2.28)         0.040         -         1.02 (0.438)         -	2         6.49         0.26 (-0.71 to 1.23)         0.596         -         6.53         -0.40 (-1.17 to 0.38)         0.318         -           3         6.42         0.10 (-0.95 to 1.15)         0.850         -         6.66         -0.04 (-0.88 to 0.80)         0.925         -           4         6.58         0.28 (-0.84 to 1.40)         0.625         -         6.64         0.01 (-0.90 to 0.92)         0.925         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.925         -           Kandom effect           All operations officient %         -         1.02 (0.438)         -         6.64         0.01 (-0.90 to 0.92)         0.925         -           Kill operations officient %         -         1.02 (0.438)         -         5.64         0.01 (-0.90 to 0.92)         0.925         -           Kill operation officient %         -         -         1.02 (0.438)         -         -         3.63 (0.744)           Kill operation officient %         -         -         1.02 (0.438)         -         -         3.63 (0.744)           Kill operatoperation officient %         -         <		0-1	6.35	Reference category		I		7.05	Reference category		I	
3         6.42         0.10 (-0.55 to 1.15)         0.850         -         6.66         -0.04 (-0.88 to 0.80)         0.925         -           4         6.58         0.28 (-0.84 to 1.40)         0.625         -         6.93         0.18 (-0.78 to 1.13)         0.716         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.925         -           Random effects           Village variance (5E)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.982         -           Village variance (5E)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.982         -           Intraclass correlation coefficient %         -         1.02 (0.438)         -         3.63 (0.744)         -         3.63 (0.744)	3         6.42         0.10 (-0.55 to 1.15)         0.830         -         6.66         -0.04 (-0.88 to 0.80)         0.355         -           4         6.58         0.28 (-0.84 to 1.40)         0.655         -         6.93         0.18 (-0.78 to 1.13)         0.716         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.63         0.01 (-0.90 to 0.92)         0.382         -           Random effects         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           Random effects         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           Random effects         7.28         1.17 (0.05 to 2.28)         0.02 (0.438)         -         6.64         0.01 (-0.90 to 0.92)         0.382         -           Random effects         7.28         1.17 (0.05 to 2.28)         0.02 (0.438)         -         5.64         0.01 (-0.90 to 0.92)         0.382         -           Random effect         7         7         7         3.63 (0.743)         -         5.61 (0.743)         -         5.61 (0.743)         5.61 (0.743)         -         5	3         6.42         0.10 (-0.95 to 1.15)         0.850         -         6.66         -0.04 (-0.86 to 0.80)         0.925         -           4         6.58         0.28 (-0.34 to 1.40)         0.625         -         6.93         0.18 (-0.78 to 1.13)         0.716         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.982         -           Random effects           -         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.982         -           Random effects           -         1.02 (0.438)         -         6.64         0.01 (-0.90 to 0.92)         0.982         -         -         3.63 (0.744)           Village variance (SE)         -         1.02 (0.438)         -         -         3.63 (0.744)         -         -         3.63 (0.744)         -         -         3.63 (0.744)         -         -         3.63 (0.744)         -         -         -         -         -         -         -         -         -         -         -         -         3.63 (0.744)         -         -         -         -<		2	6.49	0.26 (-0.71 to 1.23)	0.596	I		6.53	-0.40 (-1.17 to 0.38)	0.318	I	
4         6.58         0.28 (-0.34 to 1.40)         0.625         -         6.93         0.18 (-0.78 to 1.13)         0.716         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.982         -           Random effects         .         .         .         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.982         -           Nillage variance (SE)         .         1.02 (0.438)         -         1.02 (0.438)         -         3.63 (0.744)           Intraclass correlation coefficient %         .         -         4.9         .         -         3.63 (0.744)	4         6.58         0.28 (-0.84 to 1.40)         0.655         -         6.93         0.18 (-0.78 to 1.13)         0.716         -           5+         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.922         -           Random effects         -         7.28         1.17 (0.05 to 2.28)         0.040         -         6.64         0.01 (-0.90 to 0.92)         0.922         -           Random effects         -         1.02 (0.438)         -         6.64         0.01 (-0.90 to 0.92)         0.922         -           Nillage variance (SE)         -         -         1.02 (0.438)         -         -         3.63 (0.744)           Intraclass correlation coefficient %         -         -         4.9         -         -         3.63 (0.744)           Report for dome effects         -         -         4.9         -         -         3.63 (0.744)           Report for dome effects         -         -         -         4.9         -         -         3.63 (0.744)           Intraclass correlation coefficient %         -         -         -         -         -         3.63 (0.744)           Report focount for double for and on detiver ston and obseti	$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		m	6.42	0.10 (-0.95 to 1.15)	0.850	I		6.66	-0.04 (-0.88 to 0.80)	0.925	I	
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to include their experiences in the evidence-base. The results here suggest that adolescents affected by extreme precipitation had higher rates of depressive symptoms. Although this result cannot be interpreted as causal, it is an important finding, as severe weather events have been linked to poor mental health outcomes in other populations.<sup>44</sup>

While barriers to care including lack of mental healthcare professionals and services are likely to persist, results from this analysis provide valuable entry points to improve adolescent mental health in low-resource settings. Rather than viewing policies as simple determinants of individual change, communitybased interventions can be targeted to areas prone to climate change or economic volatility. Interventions among youth can incorporate components related to sexual and reproductive health, interpersonal relationships, and economic empowerment, and should help youth navigate cultural expectations related to gender norms.

This study has several limitations. First, adolescents in the evaluation lived in households identified as extremely poor using both geographic and village-level targeting. This homogeneity probably led to an underestimation of neighbourhood and economic associations. However, our analysis brings attention to the most at-risk youth within an already vulnerable population, such as the 8% who experienced excessive economic shocks and the 32% affected by extreme precipitation. Second, the use of cross-sectional data does not allow for directional interpretation of results, particularly for time-variant indicators. For example, employment or relationship status may have complex bidirectional relationships with adolescent mental health. However, all determinants were selected based on theory and existing research, and many are persistent and unchanging. By adjusting for a broad range of confounders we believe that these associations are meaningful contributions to the knowledge base.

## What is already known on this subject

- Identifying the social determinants of mental health is crucial to reduce the burden of adolescent depression which profoundly affects youth in real time as well as along the life path.
- While the evidence on social determinants of health in African contexts continues to grow, most research focuses on adults, or on specialised subgroups of adolescents, such as HIV-positive, exclusively in-school, and pregnant/recently pregnant populations.

## What this study adds

- While our results support that multidimensional factors are associated with poor mental health among Tanzanian adolescents, girls and boys have differing risk and protective factors.
- Our results indicate that extreme precipitation is associated with higher levels of depressive symptoms, with stronger effects for boys, and that being in a romantic relationship may disproportionately affect the mental health of girls due to added stressors. Lack of economic opportunities may also lead to worse mental health, especially among boys who may feel societal pressure to be engaged in income-generating activities.

Finally, the lack of temporal associations limited our ability to look at pathways of effects, such as mediating roles of psychosocial indicators. However, as we found strong bivariate associations, we provide context for future research.

In conclusion, our results reinforce that adolescent mental health is associated with diverse, multilevel factors. As social determinants of poor mental health coexist in various domains, effective interventions to improve mental health require an intersectoral approach. These results also highlight the importance of using a gender-focused lens when examining mental health. Future research should better examine how climate change may impact mental health, particularly for African adolescents who represent a large proportion of the at-risk population.

Twitter Leah Prencipe @LeahPrencipe, Tanja AJ Houweling @TanjaHouweling and Tia M Palermo @tiapalermo

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**Collaborators** Adolescent Cash Plus Evaluation Team: UNICEF Office of Research: Tia Palermo (co-Principal Investigator), Lusajo Kajula, Jacobus de Hoop, Leah Prencipe, Valeria Groppo, Jennifer Waidler; EDI Global: Johanna Choumert Nkolo (co-Principal Investigator), Respichius Mitti (co-Principal Investigator), Nathan Sivewright, Koen Leuveld, Bhoke Munanka; Tanzania Social Action Fund: Paul Luchemba, Tumpe Mnyawami Lukongo; Tanzania Commission for AIDS: Aroldia Mulokozi; UNICEF Tanzania: Ulrike Gilbert, Paul Quarles van Ufford, Rikke Le Kirkegaard, Frank Eetaama.

**Contributors** LP and TAJH conceptualised the article. TMP, LP and LK were responsible for the research design and support in data collection activities. LP and TMP verified the underlying data. LP led the statistical analysis. All authors interpreted findings and contributed to writing the manuscript and approved the final version. Members of the evaluation team further contributed to study design and data collection.

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#### ORCID iDs

Leah Prencipe http://orcid.org/0000-0003-2676-5784 Tanja AJ Houweling http://orcid.org/0000-0001-6090-4376 Frank J van Lenthe http://orcid.org/0000-0001-6402-7075 Tia M Palermo http://orcid.org/0000-0003-0419-2049 Lusajo Kajula http://orcid.org/0000-0001-8375-0701

#### REFERENCES

- 1 Murray CJL, Barber RM, Foreman KJ, et al. Global, regional, and national disabilityadjusted life years (DALYs) for 306 diseases and injuries and healthy life expectancy (HALE) for 188 countries, 1990–2013: quantifying the epidemiological transition. *The Lancet* 2015;386:2145–91.
- 2 Thapar A, Collishaw S, Pine DS, et al. Depression in adolescence. The Lancet 2012;379:1056–67.
- 3 Kieling C, Baker-Henningham H, Belfer M, *et al*. Child and adolescent mental health worldwide: evidence for action. *Lancet* 2011;378:1515–25.
- 4 Keenan-Miller D, Hammen CL, Brennan PA. Health outcomes related to early adolescent depression. JAdolesc Health 2007;41:256–62.
- 5 Mthembu S, Eyal K. Nurture surpasses nature: The intergenerational transmission of depression from African mothers to their adolescent children. In: 228 SWPN, ED. SALDRU working paper number 228. Cape Town: SALDRU Working Paper Number 228, 2018.
- 6 Lund C, Breen A, Flisher AJ, et al. Poverty and common mental disorders in low and middle income countries: a systematic review. Soc Sci Med 2010;71:517–28.
- 7 Lund C, Brooke-Sumner C, Baingana F, et al. Social determinants of mental disorders and the sustainable development goals: a systematic review of reviews. Lancet Psychiatry 2018;5:357–69.
- 8 Rose-Clarke K, Gurung D, Brooke-Sumner C, *et al.* Rethinking research on the social determinants of global mental health. *Lancet Psychiatry* 2020;7:659–62.
- 9 Nyundo A, Manu A, Regan M, et al. Factors associated with depressive symptoms and suicidal ideation and behaviours amongst sub-Saharan African adolescents aged 10-19 years: cross-sectional study. Trop Med Int Health 2020;25:54–69.
- 10 Kim MH, Mazenga AC, Yu X, et al. Factors associated with depression among adolescents living with HIV in Malawi. *BMC Psychiatry* 2015;15:264.
- 11 Das-Munshi J, Lund C, Mathews C, et al. Mental health inequalities in adolescents growing up in post-apartheid South Africa: cross-sectional survey, Shaw study. PLoS One 2016;11:e0154478.
- 12 Govender K, Reardon C, Quinlan T, et al. Children's psychosocial wellbeing in the context of HIV/AIDS and poverty: a comparative investigation of orphaned and nonorphaned children living in South Africa. BMC Public Health 2014;14:615.
- 13 Nabunya P, Damulira C, Byansi W, et al. Prevalence and correlates of depressive symptoms among high school adolescent girls in southern Uganda. BMC Public Health 2020;20:1–11.
- 14 Tsai AC, Tomlinson M, Comulada WS, et al. Food insufficiency, depression, and the modifying role of social support: evidence from a population-based, prospective cohort of pregnant women in peri-urban South Africa. Soc Sci Med 2016;151:69–77.
- 15 Hamad R, Fernald LCH, Karlan DS, et al. Social and economic correlates of depressive symptoms and perceived stress in South African adults. J Epidemiol Community Health 2008;62:538–44.
- 16 Kalomo EN, Lightfoot E, Lee KH. Gender-Based violence: risk and protective factors for depressive symptoms among couples in the Kavango region, Northern Namibia. *Journal of Human Behavior in the Social Environment* 2019:1–15.
- 17 Stewart RC, Umar E, Tomenson B, et al. A cross-sectional study of antenatal depression and associated factors in Malawi. Arch Womens Ment Health 2014;17:145–54.
- 18 United Nations. World population prospects (2019 Revision).

- 19 Bronfenbrenner U. The ecology of human development. Harvard university press, 1979.
- 20 Atilola O. Child mental-health policy development in sub-Saharan Africa: broadening the perspectives using Bronfenbrenner's ecological model. *Health Promot Int* 2017;32:380–91.

**Original research** 

- 21 Tanzania Cash Plus Evaluation Team. *Ujana Salama: a cash plus model on youth well-being and safe, healthy transitions: trial design, methods and baseline findings.* Florence, Italy: UNICEF Office of Research - Innocenti, 2018.
- 22 Boey KW. Cross-Validation of a short form of the CES-D in Chinese elderly. *Int J Geriatr Psychiatry* 1999;14:608–17.
- 23 Kilburn K, Prencipe L, Hjelm L, et al. Examination of performance of the center for epidemiologic studies depression scale short form 10 among African youth in poor, rural households. BMC Psychiatry 2018;18:201.
- 24 Baron EC, Davies T, Lund C. Validation of the 10-item centre for epidemiological studies depression scale (CES-D-10) in Zulu, Xhosa and Afrikaans populations in South Africa. *BMC Psychiatry* 2017;17:1–14.
- 25 World Health Organization. Adverse childhood experiences international questionnaire (ACE-IQ). Geneva: WHO, 2015.
- 26 Zimet GD, Dahlem NW, Zimet SG, et al. The multidimensional scale of perceived social support. J Pers Assess 1988;52:30–41.
- 27 Moor I, Spallek J, Richter M. Explaining socioeconomic inequalities in self-rated health: a systematic review of the relative contribution of material, psychosocial and behavioural factors. *J Epidemiol Community Health* 2017;71:565–75.
- 28 Rotter JB. Generalized expectancies for internal versus external control of reinforcement. *Psychol Monogr* 1966;80:1–28.
- 29 Kuehner C, Buerger C. Determinants of subjective quality of life in depressed patients: the role of self-esteem, response styles, and social support. J Affect Disord 2005;86:205–13.
- 30 Benassi VA, Sweeney PD, Dufour CL. Is there a relation between locus of control orientation and depression? *J Abnorm Psychol* 1988;97:357–67.
- 31 Rosenberg M. The measurement of self-esteem, society and the adolescent self-image. Princeton 1965:16–36.
- 32 Cantril H. *The pattern of human concerns*. New Brunswick, NJ: Rutgers UP[Google Scholar], 1965.
- 33 Levenson H, internality Damong. Powerful others, and chance. Research with the locus of control construct 1981;1:15–63.
- 34 Merlo J, Chaix B, Yang M, et al. A brief conceptual tutorial of multilevel analysis in social epidemiology: linking the statistical concept of clustering to the idea of contextual phenomenon. J Epidemiol Community Health 2005;59:443–9.
- 35 Andersen SL, Teicher MH. Stress, sensitive periods and maturational events in adolescent depression. *Trends Neurosci* 2008;31:183–91.
- 36 O'Campo P, Wheaton B, Nisenbaum R, et al. The neighbourhood effects on health and well-being (NEHW) study. *Health Place* 2015;31:65–74.
- 37 Dunn EC, Milliren CE, Evans CR, et al. Disentangling the relative influence of schools and neighborhoods on adolescents' risk for depressive symptoms. Am J Public Health 2015;105:732–40.
- 38 Mair C, Diez Roux AV, Galea S. Are neighbourhood characteristics associated with depressive symptoms? A review of evidence. J Epidemiol Community Health 2008;62:940–6.
- 39 Dillip A, Mboma ZM, Greer G, et al. 'To be honest, women do everything': understanding roles of men and women in net care and repair in Southern Tanzania. Malar J 2018;17:1–8.
- 40 Izugbara CO. 'Life is Not Designed to be Easy for Men': Masculinity and Poverty Among Urban Marginalized Kenyan Men. *Gender Issues* 2015;32:121–37.
- 41 Patton GC, Sawyer SM, Santelli JS, *et al*. Our future: a Lancet Commission on adolescent health and wellbeing. *Lancet* 2016;387:2423–78.
- 42 Benjet C, Hernández-Montoya D, Borges G, et al. Youth who neither study nor work: mental health, education and employment. Salud Pública de México 2012;54:410–7.
- 43 Costello A, Abbas M, Allen A, et al. Managing the health effects of climate change: Lancet and university College London Institute for global health Commission. Lancet 2009;373:1693–733.
- 44 Berry HL, Waite TD, Dear KBG, *et al*. The case for systems thinking about climate change and mental health. *Nat Clim Chang* 2018;8:282–90.
- 45 Majeed H, Lee J. The impact of climate change on youth depression and mental health. *Lancet Planet Health* 2017;1:e94–5.