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To cite this article: Katharina Haag, Stefani Du Toit, Sarah Skeen, Kathryn Steventon Roberts, Yeukai Chideya, Vuyolwethu Notholi, Akhona Sambudla, Sarah Gordon, Lorraine Sherr & Mark Tomlinson (2022): Predictors of COVID-related changes in mental health in a South African sample of adolescents and young adults, *Psychology, Health & Medicine*, DOI: [10.1080/13548506.2022.2108087](https://doi.org/10.1080/13548506.2022.2108087)

To link to this article: <https://doi.org/10.1080/13548506.2022.2108087>



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Published online: 11 Aug 2022.



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## Predictors of COVID-related changes in mental health in a South African sample of adolescents and young adults

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### ABSTRACT

The COVID-19 pandemic has substantially affected the lives of young people living in sub-Saharan Africa (SSA), leading to poorer short-term mental health outcomes. However, longitudinal data investigating changes in mental health from pre-COVID levels and their predictors are lacking. Our longitudinal sample comprised  $N = 233$  young people (mean age: 17.8 years at baseline, 55.6% female) living in a deprived neighbourhood near Cape Town, South Africa. Symptoms of depression (PHQ-9), anxiety (GAD-7) and alcohol use (AUDIT) were assessed during two waves of data collection, pre-pandemic (2018/19) and via phone interviews in June to October 2020, during South Africa's first COVID wave and subsequent case decline. Latent change score models were used to investigate predictors of changes in mental health. Controlling for baseline levels, we found increases in depression and anxiety but not alcohol use symptoms during the COVID-19 pandemic. Higher baseline symptoms were associated with smaller increases on all measures. Socio-economic deprivation (lack of household income, food insecurity) before and during COVID were associated with higher anxiety and depression symptom increases. Having had more positive experiences during COVID was associated with lower post-COVID onset anxiety and depression increases, and marginally with less alcohol use, while negative experiences (household arguments, worries) were linked to stronger symptom increases. Overall, in a sample of young people from an adverse environment in South Africa, we found increased mental health difficulties during the COVID-19 pandemic, though higher baseline symptoms did not necessarily predict stronger increases. Several factors pre- and post-COVID onset were identified that could be relevant for determining risk and resilience. In the long term, it will be key to address these structural drivers of well-being and to ensure mental health needs of young people are being met to support SSA countries in building back successfully from COVID-19 and preparing for future shock events.

### ARTICLE HISTORY

Received 15 March 2022  
Accepted 25 July 2022

### KEYWORDS

Mental health; COVID; anxiety; depression; alcohol use; young people; longitudinal

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## Introduction

Adverse life experiences such as poverty and deprivation, exposure to violence and living in environments strongly affected by HIV are commonplace in adolescents and young adults from sub-Saharan Africa (SSA). This can pose a burden on mental health, with a systematic review of community studies suggesting that 14.3% of young people aged 0 to 16 years living in this region suffer from mental health difficulties, and that those living in deprived areas may be disproportionately affected (Cortina et al., 2012). Recent community studies suggest even higher rates of depression and anxiety (Fatiregun & Kumapayi, 2014; Khasakhala et al., 2013; Nkuba et al., 2018; Osborn et al., 2020).

The outbreak of the COVID-19 pandemic in early 2020 encompassed a myriad of additional stressors for young SSA people. This comprised the possibility of direct virus exposure, with its associated risks of illness and mortality not only for the young people themselves, but also for their families and caretakers (Coker et al., 2021; Hillis et al., 2021; Unwin et al., 2022). Furthermore, many countries imposed strict lockdown or curfew measures to limit the spread of the virus. This led to secondary consequences such as loss of family income, increased food insecurity, reduced access to education and other key services (e.g., HIV care, school-delivered meals, sexual and reproductive health services, psychosocial support) and limited social contacts (Banati et al., 2020; Headey et al., 2020; Sherr et al., 2021; Wang et al., 2021). Some studies also suggest higher risks of child marriage, early pregnancy and domestic violence exposure for adolescents living in SSA (African Child Policy Forum (ACFP), 2020; World Health Organization, 2020). All of these factors may have had a substantial impact on young people's well-being.

Initial cross-sectional studies from SSA appear to confirm a high load of mental health problems amongst young people. During the first lockdown in South Africa (March to May 2020), depressive symptoms were found in 72% of young adults (Mudiriza & De Lannoy, 2020), and levels of anxiety symptoms and loneliness appeared to be high and life satisfaction low in a sample of South African undergraduate students (Pretorius & Padmanabhanunni, 2021). Similar findings were made in Zambia and Sierra Leone (Sharpe et al., 2021). Even after the first lockdown ended in Uganda, rates of distress, sadness and hopelessness were still high in adolescent boys and young men, with 1.2% contemplating suicide (Matovu et al., 2021). A cross-country study conducted in Burkina Faso, Ethiopia and Nigeria in July to November 2020, however, suggested that the majority of adolescents did not currently experience mental health difficulties; the prevalence of moderate to severe distress ranged from 4.8–11.9%, depending on the location (Wang et al., 2021). Despite such initial findings, there is a striking lack of longitudinal data from the SSA region that investigate changes in young people's mental health, which is key for determining treatment needs and devising effective support.

Furthermore, to aid with establishing points of intervention and future pandemic planning, it is important to gain a clearer understanding of predictors of risk and resilience. Data from the above-outlined cross-sectional studies suggest being female, of older or younger age (depending on the sample), living in informal areas, better education, as well as pandemic-related loss of family income, food insecurity, poor service access, education loss, reduced social contacts and worry about COVID-19 and the future were cross-sectionally related to worse outcomes, while employment and family care were shown to mitigate effects (Gittings et al., 2021; Mudiriza & De

Lannoy, 2020; Pretorius & Padmanabhanunni, 2021; Sharpe et al., 2021). Longitudinal studies in young people from high income countries suggest important predictive effects of COVID-related impacts (e.g., negative impacts of lifestyle restrictions, reduced financial means, social isolation and COVID-related worries; Elmer et al., 2020; De France et al., 2021; Hafstad et al., 2020), though such findings require replication in SSA contexts, given the different contexts and infrastructures both prior to and during the initial COVID-19 pandemic. In adults living in South Africa, increases in depressive symptoms were predicted by higher perceived COVID-risk, especially in those with histories of childhood maltreatment (Kim et al., 2020). In a seven-country study during early lockdown, mental health difficulties were higher in those unmarried, living in households with six or more people, being unemployed and older ( $\geq 28$  years), while low perceived COVID risk and expectations that the pandemic would end after the first wave were protective (Langsi et al., 2021). Longitudinal data from the UK suggests that mental health impacts may not be universal and may be concentrated in or confined to those with subgroup vulnerabilities (Knowles et al., 2022). To the best of our knowledge, there are no SSA studies to date investigating predictors of changes in young people's mental health following the outbreak of the COVID-19 pandemic.

With young people living in SSA holding key social and economic potential, it is important to understand COVID-related changes in their mental health and to establish their treatment needs and prioritize their well-being to support countries in building back. The current study utilizes longitudinal data on young people's depression and anxiety symptoms, as well as alcohol use collected in an impoverished area of Cape Town, South Africa. Data were obtained in two waves, 1) approximately one year before the pandemic, and 2) during the first year of the pandemic (June to October 2020). We investigate a) changes in mental health over time and b) pre COVID and post COVID onset predictors of such changes.

## Methods

### *Sample and procedure*

The current data were collected as part of a longitudinal study that followed mothers and their children from the antenatal period until ages 19–21 years. Families ( $n = 449$ ) were originally recruited from an impoverished township near Cape Town, South Africa. Half of the mothers ( $n = 220$ ) took part in a 16-session parenting and attachment intervention from the antenatal period until 6 months post birth, while the rest of the mothers received maternity services as usual. Data on the mothers and their children were collected antenatally, at 2, 6, 12, and 18 months (Cooper et al., 2009) and at 13 years of child age (Tomlinson et al., 2022). At 16–19 years of age (data collected in 2018/19),  $n = 319$  now-adolescents were re-randomized into groups, with half receiving a life-skills intervention ('Zifune'; Skeen et al., [in preparation](#)). They were assessed three times: before the intervention, immediately post-intervention (3 months;  $n = 314$ ) and during a 6-month follow-up ( $n = 307$ ). Baseline mental health data utilized in the current study stems from the 6-month Zifune follow-up (ages 16–19), which was the most recent assessment before the COVID-19 outbreak. Data on adolescent/young adult mental health during pandemic was collected through phone interviews between June and

October 2020 ( $n = 237$ ). The overall sample for which mental health data at both time-points were available ( $n = 233$ ) was used as the basis for the current analyses. At both time-points, participants were offered assessments in their language of choice, mostly isiXhosa, by trained data collectors. Consent was obtained either in written form from the caretaker and adolescents, or in case of the COVID follow-up, telephonically. Ethical approval for the current round of data collection was obtained from the Health Research Ethics Committee (HREC) of Stellenbosch University (Ref: N17/10/094).

## **Measures**

### **Depression**

The Patient Health Questionnaire 9 (PHQ-9; Kroenke et al., 2001) was used to assess adolescent depressed mood both pre- and during the pandemic. The presence of 9 symptoms over the past 2 weeks was rated on a scale from 0 ‘*not at all*’ to 3 ‘*nearly every day*’. A total score was derived (0–27), with higher scores indicating higher levels of depressed mood. Scores of 0–4 have been proposed to indicate low, 5–9 mild, 10–14 moderate, 15–19 moderately severe and 20–27 severe depression symptoms. Good internal consistency and specificity, and moderate to good sensitivity have been found for application of the PHQ in South African healthcare settings (Bhana et al., 2015; Cholera et al., 2014).

### **Anxiety**

The General Anxiety Disorder 7 screening tool (GAD-7; Spitzer et al., 2006) was used to assess adolescent symptoms of general anxiety disorder (GAD). This questionnaire measures the presence of 7 symptoms over the past two weeks, each rated on a scale from 0 ‘*not at all*’ to 3 ‘*nearly every day*’. A total score (0–21) can be calculated, with scores of 0–4 representing no GAD, 5–9 mild, 10–14 moderate and 15 or more high GAD levels. The GAD-7 has been found to have good reliability and validity across various contexts (Löwe et al., 2008; Spitzer et al., 2006), including sub-Saharan Africa (Nyongesa et al., 2020).

### **Alcohol use**

The Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) was used to screen for alcohol use. It consists of 10 questions, assessing frequency and amount of alcohol consumption and drinking patterns. Each item is scored 0–4, corresponding to different answering options for each question. A total score (0–40) can be derived, with a higher score indicating higher alcohol use difficulties. Scores of zero are proposed to indicate abstainers; 1–7 low risk consumption, 8–14 hazardous or harmful consumption and 15 or more likely alcohol dependence. The AUDIT has been found to have good sensitivity and specificity in a HIV-affected South African sample (Myer et al., 2008). Of note, alcohol sales were restricted in South Africa from 27<sup>th</sup> March to 1<sup>st</sup> of June, and again from 12<sup>th</sup> July to 17<sup>th</sup> of August of 2020, with restricted outlet opening times in between and subsequently, coinciding with the period of our study. Such measures were taken due to comparatively high rates of both general and problematic alcohol use in South Africa (National Department of Health (n.d.oH), Statistics South Africa (Stats SA), South African Medical Research Council (SAMRC) and ICF, 2019),

with the aim of reducing alcohol-related harm (e.g., injuries, accidents, crime, gender-based violence) and associated emergency hospitalisations (Ngqangashe et al., 2021). However, research suggests that heavy episodic drinkers in particular may have illegally bought and continued to consume alcohol at pre-pandemic levels (Theron et al., 2022), suggesting that while there may be some social desirability effects affecting measures of alcohol use, they may also capture particularly those at risk of alcohol misuse despite COVID-imposed national restrictions. *Pre COVID-19 Predictor Variables*

Based on previous literature, a range of pre-COVID variables hypothesized to influence adolescent stress resilience and thus their COVID-related changes in mental health were included in the models: age, sex (1 = 'female'), whether the young person had repeated a school grade, whether or not someone in the family had a regular job (both 1 = 'yes'), household food insecurity (0–27) (Household Food Insecurity Access Scale (HFIAS), Coates et al., 2007); adolescent externalising symptoms (Youth Self Report (YSR); Ivanova et al., 2007), family functioning (Family Assessment Device, Epstein et al., 1983); peer problems (Strengths and Difficulties Questionnaire- Peer problems subscale; Goodman, 1997), self-esteem (Rosenberg Self-Esteem Scale (RSE); Rosenberg, 1965) and caregiver depression (PHQ-9; Kroenke et al., 2001). We also controlled for receipt of the Zifune lifeskills intervention (1 = 'intervention'), as it may have affected adolescent resilience and well-being.

### **Post COVID-19 onset predictor variables**

Several COVID-19 related variables were assessed that may have predicted changes in mental health. This included time until the initial relaxation of measures in South Africa to alert level 1 (= no COVID-related restrictions) on 21 September 2020, household loss of work as a result of the pandemic, household food insecurity (0–27, HFIAS; Coates et al., 2007), living in informal housing (1 = 'formal housing'), increase of household arguments during COVID (range: 0 'no increase' to 3 = 'nearly every day'), and scores on two newly developed scales assessing the extent of young people's COVID-related worries (0–18) and positive experiences (0–12) during the pandemic.

### **Statistical analyses**

Analyses were conducted using Stata SE 16 and R version 4.1.0. In a first step, sample characteristics and differences between the sub-samples retained and not retained at follow-up were investigated using t- and  $\chi^2$  tests as appropriate. Pearson correlations between pre- and post-COVID onset mental health measures were calculated. Then, latent change score models controlling for baseline levels of mental health difficulties were computed following Kievit et al. (2018). We conducted separate models for anxiety, depression, and alcohol use scores, and ran four models for each outcome: 1) a basic model calculating the latent change scores only, controlling for baseline symptom levels, and split by sex to investigate sex-specific differences, 2) a model including pre-COVID predictor variables, 3) a model including post-COVID onset predictor variables and 4) a final model including all variables significant at  $p = .20$  or below in steps 1 or 2.

## Results

### Descriptive information

The mean age of the sample completing both the pre- and post-COVID onset assessments ( $n = 233$ ) was  $M = 19.6$  years ( $SD = .6$ ; range 19–21) at the COVID follow-up;  $n = 128$  (54.9%) of participants were female. Further descriptive details, including average mental health symptom scores, are presented in Table 1. There was no difference between those who dropped out towards the COVID follow-up ( $n = 233$ ) and those who did not ( $n = 74$ ) in baseline depression ( $t(305) = .03$ ;  $p = .97$ ), anxiety ( $t(305) = 1.12$ ;  $p = .26$ ) and alcohol use symptoms ( $t(305) = 1.14$ ;  $p = .26$ ). There were also no differences in participant sex, age and household employment and whether the young people lived in informal housing, received any household grants, were in the correct class for age, and showed externalising behaviours ( $p = .12-.92$ ).

Average anxiety ( $t = 1.61$   $p = .11$ ), and depression ( $t = 1.44$ ,  $p = .15$ ) scores of those completing both assessments did not change from pre-pandemic to post-COVID onset; alcohol use was on average lower at follow up ( $t = 2.97$ ,  $p = .003$ ). After COVID onset, 33.8% ( $n = 80$ ) of participants showed mild, 6.3% ( $n = 15$ ) moderate and 3.4% ( $n = 8$ ) moderately severe depression symptoms. 19.8% ( $n = 47$ ) exhibited mild, 3.8% ( $n = 9$ ) moderate and .8% ( $n = 2$ ) severe generalised anxiety disorder (GAD) symptoms. Finally, 12.7% ( $n = 30$ ) showed medium risk for alcohol use disorder, 3.4% ( $n = 8$ ) high risk, and a further 3.4% ( $n = 8$ ) possible alcohol dependency. Of note, only a small group of young people had experienced familial COVID infection ( $n = 10$ ) by the time of the assessment;  $n = 2$  had experienced COVID-related deaths in their families, precluding an analysis of these sub-samples specifically.

### Correlations between pre- and post-COVID onset mental health measures

Measures of anxiety and depression were highly correlated at baseline and follow-up (see Table 2); both were associated at moderate strength with alcohol use at the respective time-points. Correlations between pre- and post-COVID onset symptom measures were moderate for all three conditions ( $r = .28-.36$ ).

**Table 1.** Descriptive characteristics of the sample included in latent change analyses ( $n = 233$ ).

	N (%)		P
	Pre COVID	Post COVID Onset	
<b>Demographic Factors</b>			
Sex (1 = female)	128 (54.9%)	-	
Age ( $M$ , $SD$ )	17.18 (.61)	19.55 (.61)	
Living in Formal Housing (1 = yes)	205 (88.7%)	180 (77.3%)	.48
Household Employment (1 = yes)	171 (73.8%)	-	
Correct Class for Age 1 = yes)	92 (39.7%)	-	
Zifune Intervention (1 = intervention)	129 (55.4%)	-	
Food Insecurity (0–27) ( $M$ , $SD$ )	5.54 (5.37)	7.49 (5.93)	<.001
<b>Mental Health Symptoms (<math>M</math>, <math>SD</math>)</b>			
Depression (0–27)	4.31 (3.42)	4.72 (3.94)	.15
Generalised Anxiety (0–21)	2.59 (2.65)	2.97 (3.24)	.11
Alcohol Use (0–40)	5.34 (4.20)	4.12 (5.76)	.003
<b>COVID-Related Factors</b>			
Number of People in Household ( $M$ , $SD$ )	-	3.70 (1.89)	
COVID-Infection Household (1 = yes)	-	10 (4.3%)	
COVID Deaths Household (1 = yes)	-	2 (.9%)	
Loss of Household Income (1 = yes)	-	91 (39.1%)	

**Table 2.** Pearson's correlations between baseline and post COVID mental health symptoms.

	1.	2.	3.	4.	5.
1. Baseline – Anxiety	1.00				
2. Baseline – Depression	.70**	1.00			
3. Baseline – Alcohol Use	.20**	.26**	1.00		
4. Post COVID Onset- Anxiety	.28**	.22*	.18*	1.00	
5. Post COVID Onset – Depression	.21*	.30**	.10	.64**	1.00
6. Post COVID Onset – Alcohol Use	.06	.04	.36**	.27**	.14*

Notes. \*  $p < .05$ ; \*\*  $p < .001$

### Changes in mental health from pre- to post- COVID onset

In the latent change models controlling for baseline mental health symptoms only, we found change scores of 3.24 ( $SD = 3.73$ ) for depression, 2.08 ( $SD = 3.09$ ) for anxiety and 2.00 ( $SD = 5.34$ ) for alcohol use (see, Table 3), suggesting overall increases but also inter-individual variation. Change score results differ from the mean changes due to the conceptualisation of change as a latent variable and inclusion of a correlation between baseline and change scores. Higher pre-COVID symptoms predicted lower symptom increases for all three conditions, with models explaining 24.5–28.6% of variance in change scores. When splitting the analyses by sex, we found that symptom increases were slightly larger in males across all conditions. Higher pre-COVID symptom levels were linked to lower symptom increases for anxiety and depression in males, while for alcohol use, levels were relatively similar between sexes. The variance in change explained by pre-COVID symptom levels was higher for females across all conditions.

### Predictors of changes in mental health

As outlined above, step 2 and 3 models were run including a set of pre- and post-COVID onset predictors (Table A1). All predictors with  $p > .20$  were included into the final predictive models for each outcome (Table 4). For depression symptoms, the final

**Table 3.** Baseline latent change models for depression, anxiety and alcohol use symptoms.

Overall Model:	Depression	Anxiety	Alcohol Use
Latent Change Score (Intercept, SE, p)	3.24 (.40), $p < .001$	2.08 (.29), $p < .001$	2.00 (.45), $p < .001$
Self-regression parameter for pre-COVID symptoms (B, p)	-.66, $p < .001$	-.66, $p < .001$	-.61, $p < .001$
R <sup>2</sup>	.28	.25	.29
<b>Model split by sex:</b>			
<b>Female Sex</b>			
Latent Change Score (Intercept, SD, p)	2.87 (3.67), $p < .001$	1.65(2.46), $p < .001$	1.77 (4.23), $p < .001$
Self-regression parameter for pre-COVID symptoms (B, p)	-.52, $p < .001$	-.58, $p < .001$	-.56, $p < .001$
R <sup>2</sup>	.39	.31	.43
<b>Male Sex</b>			
Latent Change Score (Intercept, SD, p)	3.69 (3.74), $p < .001$	2.73 (3.71), $p < .001$	2.71(6.21), $p < .001$
Self-regression parameter for pre-COVID symptoms (B, p)	-.84, $p < .001$	-.81, $p < .001$	-.53, $p < .001$
R <sup>2</sup>	.20	.22	.22

Notes. Two separate models were performed, a model including the full sample and a model split by sex to investigate sex-specific effects.



adjusted model indicates a change score of 7.61 ( $SE = 3.30$ ; model  $R^2 = .44$ ). Pre-COVID depression symptoms ( $B = -.72$ ,  $p < .001$ ), regular job in household ( $B = -1.26$ ,  $p = .020$ ) and any HIV in the family ( $B = -1.44$ ,  $p = .013$ ) were associated with lower increases, while caregiver depression ( $B = .17$ ,  $p = .021$ ) was linked to higher increases. Positive experiences post-COVID onset ( $B = -.32$ ,  $p = .006$ ) were associated with lower increases, and COVID-related loss of household income marginally ( $B = 1.00$ ,  $p = .057$ ) and increase of household arguments ( $B = 1.99$ ,  $p = .001$ ) with higher increases.

**Table 4.** Final models predicting changes in mental health from pre- and post COVID onset factors.

	B	z	p
<b>Depression Symptoms (n = 190)</b>			
Latent Change Score ( <i>Intercept, SE</i> )	7.61 (3.30)	2.43	.015
<b>Pre COVID predictors</b>			
Self-feedback parameter- pre-COVID symptoms	-.72	-6.80	<.001
Regular Job in HH (1 = yes)	-1.26	-2.10	.036
Externalising Behaviours (0–64)	.05	1.01	.315
Self-esteem (10–40)	-.08	-1.02	.310
Caregiver Depression (0–67)	.17	2.31	.021
Any HIV in Family (1 = yes)	-1.44	-2.49	.013
<b>Post COVID Onset predictors</b>			
Positive COVID experiences (0–12)	-.32	-2.62	.009
HH Income Loss (1 = yes)	1.00	1.90	.057
Increased HH Arguments (0–3)	1.99	3.43	.001
Model $R^2$	.44		
<b>Anxiety Symptoms (n = 232)</b>			
Latent Change Score ( <i>Intercept, SE</i> )	5.55 (2.34)	2.37	.018
<b>Pre COVID predictors</b>			
Self-feedback parameter- pre-COVID symptoms	-.77	-8.89	<.001
Food Insecurity (0–27)	.01	.30	.764
Regular Job in HH (1 = yes)	-1.01	-2.10	.035
Externalising Behaviours (0–64)	.03	.79	.429
Self-Esteem (10–40)	-.08	-1.16	.244
<b>Post COVID Onset predictors</b>			
Food Insecurity (0–27)	.08	2.14	.032
Positive COVID experiences (0–12)	-.21	-2.45	.014
Increased HH Arguments (0–3)	1.32	2.75	.006
<b>Control Variable</b>			
Zifune Intervention (1 = intervention)	.95	2.54	.011
Model $R^2$	.57		
<b>Alcohol Use Symptoms (n = 233)</b>			
Latent Change Score ( <i>Intercept, SE</i> )	-6.44 (8.76)	-7.4	.463
<b>Pre COVID predictors</b>			
Self-feedback parameter- pre-COVID symptoms	-.64	-8.16	<.001
Food Insecurity (0–27)	-.10	-1.65	.100
Sex (1 = female)	-2.46	-3.50	<.001
Age	.60	1.19	.236
<b>Post COVID Onset predictors</b>			
COVID-related worries (0–18)	.17	2.03	.042
Positive COVID experiences (0–12)	-.31	-1.73	.084
Living in Formal Housing (1 = yes)	-1.34	-1.60	.110
<b>Control Variable</b>			
Zifune Intervention (1 = intervention)	1.47	2.26	.024
Model $R^2$	.36		

Notes. Sample size for depression analyses was reduced due to missing data as not all caregivers completed the T2 assessment on caregiver depression.

For anxiety symptoms, the final adjusted model suggested a latent change score of 5.55 ( $SE = 2.75$ ; model  $R^2 = .57$ ). Pre-COVID symptom levels ( $B = -.77$ ,  $p < .001$ ) and a regular job in the household ( $B = -1.01$ ,  $p = .035$ ) were associated with lower increases. Post COVID onset, food insecurity ( $B = .08$ ,  $p = .032$ ) and increased household arguments ( $B = 1.32$ ,  $p = .006$ ) predicted stronger and positive experiences ( $B = -.21$ ,  $p = .014$ ) lower symptom increases.

The final adjusted model did not suggest significant changes in alcohol use (Intercept:  $-6.44$ ,  $SE = 8.76$ ,  $p = .463$ ; model  $R^2 = .36$ ). Female sex ( $B = -2.46$ ,  $p < .001$ ) and higher pre-COVID symptoms ( $B = -.64$ ,  $p < .001$ ) predicted lower increases. COVID-related worries ( $B = .17$ ;  $p = .042$ ) predicted stronger increases, while positive experiences post COVID onset were marginally related to lower increases ( $B = -.31$ ,  $p = .084$ ).

## Discussion

In a sample of young South African people living in challenging circumstances, we found increased depression and anxiety symptoms during the COVID-19 pandemic when controlling for pre-pandemic symptoms. Alcohol use was found to be lower. Higher pre-pandemic symptoms were generally linked to lower increases in mental health difficulties. Several factors pre- and post-COVID onset were identified that predicted symptom changes, including socio-economic status and COVID-related experiences. While limited in sample size and thus analytic power, the current study provides valuable longitudinal data, allowing some tentative conclusions about changes in mental health in young people living in Sub-Saharan Africa during the COVID-19 pandemic.

First, we found increases in anxiety and depression symptoms during COVID-19 when controlling for baseline symptom levels. This extends cross-sectional findings from South Africa and other low- and-middle income countries obtained during the first lockdowns (Matovu et al., 2021; Mudiriza & De Lannoy, 2020; Sharpe et al., 2021). It also mirrors prospective longitudinal studies from HICs suggesting symptom increases in young people during the COVID-19 pandemic (Magson et al., 2021; Upton et al., 2021). Of interest, however, most young people in our sample experienced low to moderate symptom levels. This supports findings from three other SSA countries over the same time period, indicating a prevalence of 4.8–11.9% of moderate to severe distress (Wang et al., 2021). Our findings that higher pre-pandemic symptoms predicted lower symptom increases, in conjunction with a UK study suggesting that changes mainly occur in specific subgroups (Knowles et al., 2022), highlight a need to better characterize the group of young people experiencing the most severe distress, in order to effectively support them through targeted services. Of note, in our unadjusted change model, we also found average alcohol use decreases. This suggests that South Africa's policies of limiting alcohol sales to reduce pressures on the health system may have been effective, though social desirability effects could have biased our results.

Second, we aimed to provide an indication of potential risk and protective factors for future pandemic and vulnerability planning. Our analyses suggest that a poorer socio-economic situation both pre-and during COVID (food insecurity, no household income

and income loss) was linked to stronger increases in anxiety and depression. This supports propositions that it is key to end poverty to increase well-being and resilience across the globe (United Nations Development Group, 2017). Scalable interventions with multiple impacts may be the most relevant pathways to explore to address this. For example, studies showing that social protection interventions such as cash grants can positively affect multiple outcomes, including mental health (Cluver et al., 2019), or accelerator models of combined interventions (Cluver et al., 2020; Mebrahtu et al., 2021), are particularly relevant and promising for future planning and prevention.

COVID-related factors were also predictive of mental health problems, with positive experiences (such as young people enjoying spending more time at home, with their families and on hobbies) exerting protective influences, while COVID-related worries and increased household conflicts led to stronger symptom increases. Findings from HIC also suggest COVID- and future-related worries as key contributors to poorer well-being (Elmer et al., 2020; De France et al., 2021; Hafstad et al., 2020). As such, psychosocial interventions -delivered either through schools or other channels- that could help young people to cope more effectively with pandemic-related worries and strengthen their resilience by fostering positive experiences, may be able to at least partially relieve distress symptoms. Furthermore, parenting programmes (e.g., Parenting for Lifelong Health, Cluver et al., 2018, Ward et al., 2020) may be able to reduce strain on families and thus household conflicts, which could help to improve young people's well-being.

Overall, the current study has several strengths, such as utilizing longitudinal data from Sub-Saharan Africa, which are scarce. However, it also has several limitations. Firstly, the small sample size limited our power to perform sex-specific analyses for risk factors, with studies from HIC suggesting sex differences in symptom trajectories (Stroud & Gutman, 2021). We were also not able to run a structural equation model with correlated outcomes, which would have accounted for comorbidities between mental health conditions. Secondly, some participants were assessed during the first COVID wave in South Africa (July-August 2020), while others were interviewed when measures were lifted (September-October 2020). Timepoint of assessment was not predictive of mental health changes, but there may still have been unmeasured differences between participants. Third, data stemmed from a double intervention study, which could have made the study sample less representative of the general population. As the early parenting intervention was found to not affect adolescent outcomes (Tomlinson et al., 2022), we only controlled for receipt of the adolescent life skills intervention. Detailed effects on this intervention on COVID-related outcomes will be explored in a separate study. Finally, the COVID follow-up study was kept brief as it was conducted remotely, leading to some potentially relevant predictive factors not being explored (e.g., social support, personality factors, risk perceptions).

In sum, we found that young South Africans living in an adverse environment showed increased anxiety and depression symptoms during COVID-19 from pre-pandemic levels. This highlights a need for identifying those most at risk, and for targeted support. Our data strongly suggests that vulnerability begets vulnerability and that strengthening systems as an ongoing agenda will be the best preparation for any future shocks, or indeed continued challenges as the COVID-19 pandemic evolves.

## Acknowledgments

The authors are particularly grateful to the families from Khayelitsha who participated in this research.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

This work was supported by the Grand Challenges Canada (Saving Brains # 0066-03), Economic and Social Research Council (ES/S008101/1), UKRI GCRF Accelerating Achievement for Africa's Adolescents Hub and Wellspring Philanthropic Fund (Grant No. 12830) .

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## Appendix

**Table A1.** Full models including all pre- and post-COVID onset predictors for anxiety, depression and alcohol use symptoms.

	B	z	p
<b>Anxiety Symptoms</b>			
Pre COVID Predictors			
Latent Change Score ( <i>Intercept, SD</i> )	4.17 (6.67)	0.63	.53
Self-feedback parameter – T1 Score	–.83	–6.81	<.001
Food Insecurity (0–27)	.10	1.69	.09
Age	.20	.67	.51
Sex (1 = female)	–.61	–1.25	.21
Regular Job in HH (1 = yes)	–.91	–1.56	.12
Externalising Behaviours (0–64)	.06	1.33	.18
Family Dysfunction (12–48)	–.05	–1.05	.29
Peer Problems (0–10)	.01	.11	.91
Self-esteem (10–40)	–.15	–1.74	.08
Number school grades repeated (0–5)	.34	1.23	.22
Caregiver Depression (0–67)	.02	.32	.75
Zifune intervention (1 = intervention)	1.17	2.45	.01
Any HIV in family (1 = yes)	–.70	–1.27	.21
Model R <sup>2</sup>	.39		
<b>Post COVID onset predictors</b>			
Latent Change Score ( <i>Intercept, SD</i> )	1.87	1.02	.31
Self-feedback parameter – T1 Score	–.70	–9.57	<.001
Food insecurity (0–27)	.07	1.82	.07
COVID-related worries (0–18)	.03	.62	.53
Positive COVID experiences (0–12)	–.23	–2.42	.02
Living in formal housing (1 = yes)	–.25	–.53	.60
HH Income Loss (1 = yes)	1.32	2.58	.01
Increased HH Arguments (0–3)	0.01	.80	.43
Time Since Lockdown			
Model R <sup>2</sup>	.38		
<b>Depression Symptoms</b>			
<b>Pre COVID Predictors</b>			
Latent Change Score ( <i>Intercept, SD</i> )	2.45 (7.97)	0.37	.76
Self-feedback parameter – T1 Score	–.71	–5.64	<.001
Food Insecurity	.08	1.19	.23
Age	.31	.76	.45
Sex (1 = female)	.56	1.01	.31
Regular Job in HH (1 = yes)	–1.13	–1.62	.11
Externalising Behaviours (0–64)	.08	1.47	.14
Family Dysfunction (12–48)	–.05	–.74	.46
Peer Problems (0–10)	–.16	–1.01	.31
Self-esteem (10–40)	–.14	–1.42	.16
Number school grades repeated (0–5)	.23	.68	.50
Caregiver Depression (0–67)	.16	2.42	.02
Zifune intervention (1 = intervention)	.51	.88	.38
Any HIV in family (1 = yes)	–1.79	–2.80	.01
Model R <sup>2</sup>	.38		

(Continued)

**Table A1.** (Continued).

	B	z	p
<b>Post COVID onset predictors</b>			
Latent Change Score ( <i>Intercept, SD</i> )	11.39	8.42	<.001
Self-feedback parameter – T1 Score	–.69	–8.47	<.001
Food insecurity (0–27)	.05	1.23	.22
COVID-related worries (0–18)	.03	.61	.54
Positive COVID experiences (0–12)	–.27	–2.46	.01
Living in formal housing (1 = yes)	.23	–.43	.67
HH Income Loss (1 = yes)	.99	1.94	.05
Increased HH Arguments (0–3)	1.81	4.31	<.001
Time Since Lockdown	.01	.84	.40
Model R <sup>2</sup>	.41		
<b>Alcohol Use Symptoms</b>			
<b>Pre COVID Predictors</b>			
Latent Change Score ( <i>Intercept, SD</i> )	–19.06	–1.64	.10
Self-feedback parameter – T1 Score	–.63	–5.89	<.001
Food Insecurity	–.10	–1.59	.11
Age	1.06	1.85	.06
Sex (1 = female)	–2.68	–3.27	.001
Regular Job in HH (1 = yes)	.53	–.59	.56
Externalising Behaviours (0–64)	.10	1.21	.23
Family Dysfunction (12–48)	.02	.20	.84
Peer Problems (0–10)	–.21	–.93	.35
Self-esteem (10–40)	.09	.61	.55
Number school grades repeated (0–5)	–.24	–.56	.57
Caregiver Depression (0–67)	.05	.46	.64
Zifune intervention (1 = intervention)	1.74	2.25	.02
Any HIV in family (1 = yes)	.94	.86	.39
Model R <sup>2</sup>	.39		
<b>Post COVID onset predictors</b>			
Latent Change Score ( <i>Intercept, SD</i> )	27.05	7.25	<.001
Self-feedback parameter – T1 Score	–.60	–6.87	<.001
Food insecurity (0–27)	–.04	–.62	.53
COVID-related worries (0–18)	.15	1.57	.12
Positive COVID experiences (0–12)	–.37	–1.91	.06
Living in formal housing (1 = yes)	–1.57	–1.87	.06
HH Income Loss (1 = yes)	–.47	–.63	.53
Increased HH Arguments (0–3)	.62	1.19	.24
Time Since Lockdown	.01	.37	.71
Model R <sup>2</sup>	.29		