



Original article

Adolescent Mental Health and School Belonging in KwaZulu-Natal, South Africa: Impact of the COVID-19 Pandemic and Subsequent Government Lockdowns



Roisin E. Drysdale, Ph.D.^{a,*}, Sanele Mvelase^b, Jeremy Kane, Ph.D.^c, Rachel S. Gruver, M.P.H.^c, Chris Desmond, Ph.D.^{d,e}, and Leslie L. Davidson, M.D., M.Sc.^c

^a Wits RHI, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, South Africa

^b DSI-NRF Centre of Excellence in Human Development, University of the Witwatersrand, Johannesburg, South Africa

^c Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, New York

^d Centre for Rural Health, University of KwaZulu-Natal, Durban, South Africa

^e School of Economics and Finance, University of the Witwatersrand, Johannesburg, South Africa

Article history: Received May 15, 2024; Accepted November 26, 2024

Keywords: Mental health; COVID-19; Adolescents; South Africa; Depression; Anxiety

A B S T R A C T

Purpose: We hypothesized that extended exposure to the COVID-19 pandemic and government lockdown was associated with increased depression and anxiety symptoms among South African adolescents and a sense of school belonging mediated these relationships. We also hypothesized that poor mental health or school belonging impacted alcohol consumption.

Methods: Embedded in the Asenze Cohort Study, data were collected from adolescents between 2019 and 2021. The Patient Health Questionnaire, General Anxiety Disorder questionnaire and Psychological Sense of School Membership scale were used to measure depression, anxiety, and school belonging, respectively. Alcohol consumption was a cumulative score of the total number of days alcohol was consumed in the previous 30 days. Lockdown exposure was the number of months participants were exposed to lockdown conditions. Structural equation modeling was used to assess the relationship between the outcome variables.

Results: Among 866 adolescents included in the analysis, approximately 20% met the symptom criteria for moderate or severe depression or anxiety. The mean school belonging score was high (23; SD = 5.79) and alcohol consumption low. Lockdown exposure was not directly or indirectly associated with depression or anxiety symptoms. A greater sense of school belonging reduced both depression and anxiety symptoms.

Discussion: This study contradicts previous studies and suggests that lockdown was not associated with poor mental health in this cohort of adolescents. School belonging was high despite school closures and associated with lower depression and anxiety. Research around school belonging and how it can be promoted to better support isolated students is recommended.

© 2024 Society for Adolescent Health and Medicine. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

IMPLICATIONS AND CONTRIBUTION

This study is one of few able to provide evidence about the COVID-19 pandemic, adolescent mental health and school belonging in South Africa. Contrary to other studies, this study found that lockdown was not associated with poor mental health in this cohort of adolescents, and despite school closures, a sense of school belonging was associated with lower levels of depression and anxiety symptoms.

Conflicts of interest: The authors have no conflicts of interest to disclose.

Disclaimer: The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

* Address correspondence to: Roisin E. Drysdale, Ph.D., Wits RHI, Hillbrow Health Precinct, 22 Esselen Street, Hillbrow, Johannesburg, South Africa.

E-mail address: rdrysdale@wrhi.ac.za (R.E. Drysdale).

In response to the COVID-19 pandemic, several countries implemented strict measures to control the spread of the virus. While they may have been successful in reducing the rate of infection, they also indirectly resulted in significant societal and psychological consequences, particularly among vulnerable

populations, including adolescents living in low- and middle-income countries (LMICs) [1]. In addition to loss of income and increased food insecurity, mental health was also reportedly negatively affected with an increase in reported depression and anxiety symptoms [1–4]. Before the pandemic, adolescents in LMICs already faced a number of psychosocial stressors, including poverty, unemployment, gender based- and interpersonal violence, and an increased risk of HIV, all of which contribute to a heightened risk of poor mental or general health outcomes [5,6]. The COVID-19 pandemic and its associated lockdown exacerbated the risks of poor mental health through isolation, fear of COVID-19 transmission, the removal of safe spaces such as schools, lack of socializing, and increased risk of violence [7,8].

As a result of the pandemic, schools and education campuses across the globe closed, with a move to online learning. This meant that students were unable to attend classes in person, take part in social or sporting activities, and had fewer opportunities to build relationships and socialize [9]. A number of studies found that University students felt isolated and lonely, and experienced a low sense of belonging within their academic institution which were also associated with psychological distress, poor well-being, and depression [9–12]. This was also the case for adolescents attending high school with some reporting feeling lonely, isolated, and worried about not spending time with friends [13–15]. The concept of belongingness plays a crucial role in mental health and overall well-being, not only from an empirical standpoint but also from a theoretical perspective. According to the need-to-belong model proposed by Baumeister [16] and Baumeister and Leary [17], the need for belongingness is a fundamental motivational factor that greatly influences the establishment and maintenance of positive relationships with others. Within this framework and existing literature, social inclusion and exclusion are considered fundamental aspects of the sense of belongingness [17–19]. Social inclusion refers to the feeling of being accepted, valued, encouraged, and welcomed by others in a social context [20]. Experiencing inclusion is associated with improved academic performance, reduced mental health symptoms, and enhanced overall well-being [21].

Another reported impact of COVID-19 lockdowns was a change in alcohol behavior [22]. For adolescents, studies have shown mixed results [23], with some suggesting an increase in alcohol consumption [24–26], and others a decrease [27,28]. For adolescents, socializing and conformity are commonly reported themes for consuming alcohol; they drink to either to have fun with friends or to fit in with peers [29,30]. High schools have also been reported to create a social environment that may encourage alcohol use among adolescents [31]. Having limited interaction with others and being away from the school environment may have limited or reduced the desire for adolescents to drink. On the other hand, drinking alcohol as a way to cope with the social isolation, loneliness and other stressors related to the pandemic, may have increased adolescent alcohol consumption [32–34].

While there is an abundance of research around the impact of the pandemic on adolescent mental health [35–40] and alcohol use [23,33,41], there is little research on the associations between mental health, alcohol use belongingness among school-going adolescents during this time, particularly in LMICs.

The Asenze cohort study [42] began the third wave of data collection before the COVID-19 pandemic with only 29% of participant interviews collected by the onset of the pandemic

and initiation of lockdown in March 2020. Data collection began again in August 2020 and presented us with the opportunity to assess mental health and wellbeing in South African adolescents before and throughout the national lockdown. We hypothesized that extended exposure to lockdown conditions negatively affected the presence of depression and anxiety symptoms and that both of these were mediated by school belonging. We also hypothesized that poor mental health or school belonging impacted alcohol consumption (Figure 1).

Methods

Study design

This study uses data from the longitudinal Asenze population-based cohort study [42] that assessed household and caregiver functioning, child health, social well-being, and neuro-development from childhood through adolescence.

Setting

The Asenze cohort study was conducted in the Valley of a Thousand Hills in KwaZulu-Natal, South Africa, a vast settlement comprising a network of villages on traditional land. The area is located 45 km northwest of Durban, the largest city in the province and consists of both rural and periurban communities.

Participants

In 2008, participants were recruited through a door-to-door field survey visiting every household in the 5 contiguous local authority areas that were selected. Children aged between 4 and 6 years and their primary caregiver were eligible to participate.

In total, 1,787 children born between 2003 and 2005, from 1,567 households were initially screened and 1,581 assessed. Three waves of data collection took place between 2008 and 2021 when the children and/or adolescents were aged on average 5, 7, and 16 years, respectively. In wave 3, over 1,200 adolescents were followed-up.

Data collection

This paper uses data that were collected during Wave 3 of the study between August of 2019 and November 2021 from 1,201 adolescents aged between 13 and 17 years. During this time, South Africa experienced a risk-adjusted lockdown with varying restrictions on movement, business, gatherings, and school closures (Table 1) with data collected at different lockdown levels. Data collected included household, parent, other caregiver (if different to parent) and child demographics, adolescent and/or child health, cognitive development, behavior, functioning and psychosocial assessments, and caregiver health, functioning, and psychosocial assessments. With the onset of the COVID-19 pandemic during wave 3 data collection, questions related to the impact of the pandemic were added.

An index of socioeconomic status (SES) was created using principal component analysis based on water, fuel and toilet access, house material and type, as well as the number of families living in the household. Sexual violence was measured as the number of times in the previous 12 months the participant reported experiencing any form of sexual violence, including being forced to conduct any sexual activity, or having

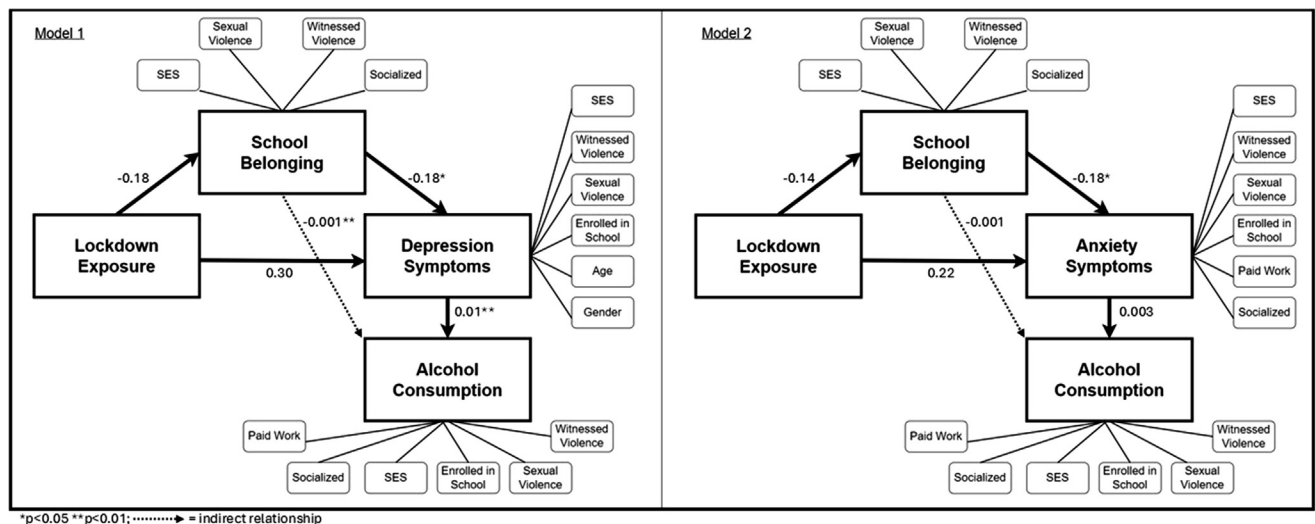


Figure 1. Pathway diagram for models 1 and 2.

sex because they felt threatened. To measure exposure to other types of violence, participants were asked if they had witnessed 12 different types of violence in their community with responses coded as never (0); once (1); a few times (2); or many times (3). Types of violence included, but were not limited to, seeing someone beaten up, shot or stabbed; having their house broken into; and seeing someone get arrested. A cumulative witnessed community violence score was calculated by adding the responses of the 12 items which ranged from 0 to 46. A higher score indicated a participant had witnessed more violence.

Depression was measured using the Patient Health Questionnaire with continuous scores categorized based on the recommended cut-offs (minimal [0–4], mild [5–9], moderate [10–14], moderately severe [15–19], and severe [20–27]) [43]. For anxiety, the generalized anxiety disorder questionnaire was used with continuous scores categorized as per the recommended cut-offs (minimal [0–4], mild [5–9], moderate [10–14], and severe [15–21]) [44]. School belonging was measured using the Psychological Sense of School Membership scale that measures personal acceptance and inclusion, respect and encouragement for participation and perceived response of others, such as students and teachers [45]. Participants were asked about their level of agreement with a number of statements such as, “I feel part of my school,” “Teachers at my school respect me,” and “People at my school notice when I do something good.” The scale creates a cumulative score ranging from 0 to 36 with a higher score indicating a better sense of school belonging. Alcohol consumption was measured using a cumulative score of the total number of days participants consumed an alcoholic drink in the previous 30 days. Lockdown exposure was the number of months participants were exposed to lockdown conditions ranging from 0 to 20 months and determined based on when the data for each participant was collected. For example, those who had data collected between May 31, and June 15, 2021, would have been exposed to lockdown for approximately 15 months, while those with data collected between June 1, and August 17, would have been exposed to lockdown for approximately 5 months.

Data analysis

Data were analyzed using Stata I/C 18 (College Station, TX: StataCorp LLC). Categorical descriptive statistics are presented as frequencies and proportions. Continuous descriptive statistics are presented as minimum, maximum, mean, and standard deviation. Chi-square was used to compare depressive and anxiety symptoms, school belonging and alcohol consumption, sexual violence, and violence witnessed across the different levels of lockdown exposure.

To test the study hypotheses, structural equation modeling (SEM) was used. Simple linear regression was undertaken to identify potential confounding variables for school belonging, anxiety, depression, and alcohol consumption. A threshold of $p < .05$ can often fail to identify variables known to be important [46]. As a result, variables with a p value of $< .20$ were included in the SEM. These included SES, witnessing violence, and experience of sexual violence for school belonging; SES, having worked in the last 12 months and witnessing violence and experiencing sexual violence for anxiety; SES, gender, age, whether they were enrolled in school, witnessed violence and experienced sexual violence for depression; and SES, having worked in the last 12 months, experience of sexual violence, witnessing violence and whether they were enrolled in school for alcohol consumption. Months exposed to lockdown as the categorical variable shown in Table 2, was used in both of the models.

Figure 1 shows the path diagrams used to guide each of the models. Model 1 assessed the relationship between lockdown exposure, school belonging, and depressive symptoms, while model 2 assessed the relationship between lockdown exposure, school belonging, and anxiety symptoms. For the outcome measures (depression, anxiety and school belonging), continuous scores were utilized in the models. The results are presented as total, direct and indirect β coefficients. The fit of each model is assessed using the root square mean error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis index (TLI). A well-fitting model has RMSEA < 0.05 and CFI and TLI > 0.95 . All statistical tests were considered significant with a p value of $< .05$ and 95% confidence intervals are

Table 1
South Africa lockdown restrictions during the study period

Lockdown level	Dates	Key restrictions
5	Mar 26–Apr 30, 2020	• Curfew 8 P.M.–5 A.M. • All individuals confined to home unless an essential worker or to obtain essential services or items • International borders closed • Interprovincial travel banned
4	May 1–May 31, 2020	• Curfew 8 P.M.–5 A.M. • International borders closed • Interprovincial travel banned • Alcohol and cigarette sales remained banned • Schools closed
3	June 1–Aug 17, 2020	• Curfew 9 P.M.–4 A.M. • International borders closed • Interprovincial travel only for exceptional purposes • Alcohol sales permitted only between 9 A.M. and 5 P.M. Monday–Thursday • Cigarette and tobacco sales banned
2	Aug 18–Sept 20, 2020	• Curfew 10 P.M.–4 A.M. • Interprovincial travel permitted • Domestic air travel permitted; international air travel only permitted for business • Cigarette sales permitted
1	Sept 21–Dec 28, 2020	• Curfew 12 P.M.–4 A.M. • All international travel permitted—PCR tests on arrival compulsory • All gatherings permitted with 250 people or less indoors, and 500 people or less outdoors
Adjusted 3	Dec 29, 2020–Feb 28, 2021	• Curfew 9 P.M.–6 A.M. • All travel remains permitted • Alcohol sales banned All establishments (restaurants, gyms, cinemas etc.) to close at 8 P.M. • Bars and taverns closed.
Adjusted 1	Mar 1–May 30, 2021	• Curfew 12 P.M.–4 A.M. • All alcohol sales permitted as per liquor license of premise and curfew • All establishments (restaurants, bars, taverns, gyms, cinemas etc.) to close at 12 P.M.
Adjusted 2	May 31–June 15, 2021	• Curfew 11 P.M.–4 A.M. • All establishments (restaurants, bars, taverns, gyms, cinemas etc.) to close at 10 P.M. • Nightclubs closed • All alcohol sales permitted as per liquor license of premise and curfew
Adjusted 3	June 16–27, 2021	• Curfew 10 P.M.–4 A.M. • All establishments (restaurants, bars, taverns, gyms, cinemas etc.) to close at 9 P.M. • Alcohol sales only permitted between 10 A.M. and 6 P.M. from Monday to Thursday
Adjusted 4	June 28–July 25, 2021	• Curfew 9 P.M.–4 A.M. • Interprovincial travel to Gauteng for leisure not permitted • All establishments (restaurants, bars, cinemas, gyms, markets, museums etc.) closed • Restaurants permitted to sell food for off-site consumption
Adjusted 3	July 26–Sept 12, 2021	• Curfew 10 P.M.–4 A.M. • All establishments (restaurants, bars, taverns, gyms, cinemas etc.) to close at 9 P.M. • Nightclubs closed • Alcohol sales only permitted between 10 A.M. and 6 P.M. from Monday to Thursday

(continued on next page)

Table 1
Continued

Lockdown level	Dates	Key restrictions
Adjusted 2	Sept 13–30, 2021	• Curfew 11 P.M.–4 A.M. • Alcohol sales only permitted between 10 A.M. and 6 P.M. from Monday to Thursday • All establishments (restaurants, bars, taverns, gyms, cinemas etc.) to close at 10 P.M. • Schools open • Funerals permitted with 50 persons or less (no night vigils) • Gatherings permitted for 250 persons or less for indoor venues and 500 or less at outdoor venues

Initial lockdown levels ranged from 5 (highest/strictest) to 1 (lowest). When implemented again, the regulations were slightly different, hence the levels being named *adjusted*.

ICT = information and communication technologies; PCR = polymerase chain reaction.

presented. Only those with complete data were included in the analysis with 335 participants excluded.

A sensitivity analysis comparing different lockdown exposure variables was conducted. We compared lockdown level, number of months exposed to lockdown as a continuous variable, number of months exposed to lockdown as a continuous variable squared, and a binary (yes/no) lockdown exposure variable

(Tables S1–4). The results for each exposure variable did not show significant variation to the main analysis presented below.

Ethical considerations

The study received ethical approval from the Biomedical Research Ethics Committees of the University of KwaZulu-Natal (BE609/18) and the Institutional Review Board of Columbia University Medical Center (IRB No. AAAC2559). We consulted with local authority councils, the local district health committee and the local district board of education. Informed consent was obtained from all participating caregivers and adolescents and youth aged 18 years and older, while informed assent was obtained from adolescents under the age of 18 years.

Results

In total, 866 adolescents were included in the analysis. The mean age of the participants was 16 years ($SD = 0.85$) with the youngest being 13 years and the oldest being 18 years. As shown in Table 2, the participants were almost evenly split between males and females at 48% and 52%, respectively. Nearly all of the participants reported they were enrolled at school at the time of the interview (99%). Fifty-nine percent lived in a standalone house and the majority (84%) of the participants lived in a house built from cement blocks. Most of the participants reported living in a one family household (88%) with only 4% living in a household with 3 or more families. The majority reported having access to piped water (89%) while only 22% had access to a flush toilet. The most common cooking fuel was electricity (62%) followed by gas (20%). Almost a third (32%) of the adolescent participants reported doing some form of paid work in the previous 12 months. A quarter (24%) of the participants were interviewed before the onset of the pandemic and had no exposure to lockdown conditions whereas 14% had between 16–20 months of exposure to the pandemic and lockdown. The majority (31%) had between 11–15 months pandemic and lockdown exposure.

Study outcomes

As shown in Table 3, nearly half (48%) of the total sample of participants met the criteria for minimal depression symptoms with 30% meeting the criteria for mild symptoms. Moderately severe and severe depression symptoms were apparent in 7% and 3%, respectively. The experience of depression symptoms did not differ statistically based on lockdown exposure. Based on the generalized anxiety disorder categories, over half (52%) met the criteria for minimal anxiety symptoms with 11% and 4% meeting the criteria for moderate and severe anxiety symptoms,

Table 2
Household and adolescent sociodemographics

	n (%)
Gender	
Male	413 (47.69)
Female	453 (52.31)
Currently attending school	
Yes	859 (99.19)
No	7 (0.81)
Home type	
Standalone house	510 (58.89)
Homestead	356 (41.11)
House material	
Sticks, mud, stones	48 (5.54)
Mud blocks	55 (6.35)
Cement blocks	729 (84.18)
Brick	4 (0.46)
Mixed materials	21 (2.42)
Other	9 (1.04)
No. of families living in household	
One	765 (88.34)
Two	69 (7.97)
Three or more	32 (3.69)
Drink water access	
Piped	770 (88.1)
Other	96 (11.09)
Toilet facilities	
Flush	193 (22.29)
Other	667 (77.02)
None	6 (0.69)
Cooking fuel	
Wood	114 (13.16)
Paraffin	45 (5.20)
Electricity	537 (62.01)
Gas	170 (19.63)
SES	
Poorer half	429 (49.54)
Richer half	437 (50.46)
Worked in previous 12 months	
Yes	276 (31.87)
No	590 (68.13)
Months exposed to lockdown	
0	216 (24.94)
5–10	260 (30.02)
11–15	269 (31.06)
16–20	121 (13.97)

SES = socioeconomic status.

Table 3

Study outcomes across different levels of lockdown exposure

	Lockdown exposure n (%)				
	Total n (%)	0 months n (%)	5–10 months n (%)	11–15 months n (%)	16–20 months n (%)
Depression symptoms					
Minimal	417 (48.15)	119 (50.0)	152 (54.5)	136 (44.3)	61 (41.5)
Mild	258 (29.79)	63 (26.5)	70 (25.1)	102 (33.2)	50 (34.0)
Moderate	110 (12.70)	27 (11.3)	37 (13.3)	40 (13.0)	18 (12.2)
Moderately severe	58 (6.70)	23 (9.7)	14 (5.0)	19 (6.2)	11 (7.5)
Severe	23 (2.66)	6 (2.5)	6 (2.2)	10 (3.3)	7 (4.8)
Anxiety symptoms*					
Minimal	453 (52.31)	113 (56.1)	149 (52.7)	143 (49.3)	54 (40.0)
Mild	282 (32.56)	64 (27.0)	88 (31.1)	108 (37.2)	50 (37.0)
Moderate	96 (11.09)	30 (12.7)	33 (11.7)	31 (10.7)	20 (14.8)
Severe	35 (4.04)	10 (4.2)	13 (4.6)	8 (2.8)	11 (8.2)
Days consumed alcohol in previous 30 days*					
0	859 (71.5)	274 (77.6)	247 (74.9)	220 (64.3)	118 (67.1)
1–5	297 (24.7)	69 (19.6)	73 (22.1)	107 (31.3)	48 (27.3)
6–10	23 (1.9)	5 (1.4)	5 (1.5)	7 (2.1)	6 (3.4)
≥11	22 (1.8)	5 (1.4)	5 (1.5)	8 (2.3)	4 (2.3)
School belonging score					
5–15	51 (5.89)	17 (4.8)	16 (4.9)	17 (5.0)	9 (5.1)
16–25	331 (38.22)	122 (34.6)	129 (39.1)	138 (40.4)	53 (30.1)
≥26	484 (55.89)	214 (60.6)	185 (56.1)	187 (54.7)	114 (64.8)
No. times experienced sexual violence					
0	685 (79.10)	169 (78.24)	211 (81.15)	213 (79.18)	92 (76.03)
1–4	150 (17.32)	37 (17.13)	41 (15.77)	45 (16.73)	27 (22.31)
5–8	30 (3.46)	10 (4.63)	7 (2.69)	11 (4.09)	2 (1.65)
9–12	1 (0.12)	-	1 (0.38)	-	-
Witness violence score					
1–10	2 (0.23)	-	-	2 (0.74)	-
11–20	379 (43.76)	88 (40.74)	123 (47.31)	122 (45.35)	46 (38.02)
21–30	395 (45.61)	104 (48.15)	115 (44.23)	117 (43.49)	59 (48.76)
≥31	90 (10.39)	24 (11.11)	22 (8.46)	28 (10.41)	16 (13.22)

* $p < .05$ for Chi-Square analysis.

respectively. There was a significant difference in the experience of anxiety symptoms across the different lockdown exposures ($X^2 = 17.38$, $p = .043$) with a higher proportion with 16–20 months lockdown exposure experiencing moderate and severe anxiety symptoms. The mean school belonging score was 23 (SD = 5.79) with a minimum of 5 and a maximum of 36. The majority (56%) had a score ≥ 26 with 6% having a score ≤ 15 . There were no significant differences between school belonging scores and lockdown exposure. Very few of the adolescents reported consuming alcohol in the last 30 days with only 4% reporting consuming alcohol more than 6 days in the previous month. There were significant differences in alcohol consumption across the different lockdown levels with those experiencing more months of lockdown, reportedly consuming alcohol on more days ($X^2 = 30.00$, $p = .003$). The majority of participants (79%) did not report experiencing any sexual violence in the previous 12 months, with 17% experiencing sexual violence between one and 4 times. The experience of sexual violence was similar across the different lockdown exposures. Having witnessed community violence was high with only 2 participants having a score less than 10. Ten percent had a witness violence score above 30 with the scores being similar across the different lockdown exposures.

SEM

As shown in Table 4, model one tested whether the relationship between lockdown exposure and depressive symptoms was mediated by school belonging and whether the experience of depression increased alcohol consumption. The results

indicated that lockdown exposure did not directly or indirectly affect depression or school belonging. School belonging directly reduced the experience of depression symptoms ($\beta_{\text{direct}} = -0.18$, $p < .001$, 95% CI = -0.24 to -0.12). Neither depression nor school belonging affected alcohol consumption. The results of the fit indexes suggest well-fitting models (RMSEA = 0.011, CFI = 0.995, TLI = 0.99).

Model 2 tested whether the relationship between lockdown and anxiety was mediated by school belonging and whether the experience of anxiety increased alcohol consumption. Results indicate that length of lockdown exposure did not indirectly or directly affect school belonging or anxiety. School belonging directly reduced the experience of anxiety symptoms ($\beta_{\text{direct}} = -0.18$, $p < .001$, 95% CI = -0.23 to -0.13). Neither anxiety nor school belonging affected alcohol consumption. The results of fit indexes suggest well-fitting models (RMSEA = 0.00, CFI = 1.00, TLI = 1.04).

Discussion

We hypothesized that the COVID-19 pandemic and lockdown negatively affected the experience of depression and anxiety symptoms in adolescents and that the relationship was mediated by a sense of school belonging.

Contrary to several studies [1,3,37,47], the results indicate that lockdown did not directly or indirectly affect depression or anxiety symptoms in this cohort of South African adolescents in KwaZulu-Natal. Although those exposed to lockdown for longer

Table 4
Structural equation models

	Effect Standardized coefficient (SE)			Model fit statistics		
	Total	Indirect	Direct	RMSEA	CFI	TLI
Model 1 (depression symptoms)				0.011	0.995	0.986
Lockdown exposure → School belonging	−0.18		−0.18			
School belonging → Depression	−0.18*		−0.18*			
Lockdown exposure → Depression	0.30	0.03	0.27			
Depression → Alcohol consumption	0.01**		0.01**			
School belonging → Alcohol consumption	−0.001**	−0.001**				
Model 2 (anxiety symptoms)				0.000	1.000	1.119
Lockdown exposure → School belonging	−0.14		−0.14			
School belonging → Anxiety	−0.18*		−0.18*			
Lockdown exposure → Anxiety	0.22	0.03	0.19			
Anxiety → Alcohol consumption	0.003		0.003			
School belonging → Alcohol consumption	−0.001	−0.001				

CFI = comparative fit index; RMSEA = root square mean error of approximation; TLI = Tucker-Lewis index.

* $p < .05$ ** $p < .01$. School belonging controlled for SES, experience of sexual violence, witnessing violence and whether they socialized with someone outside of their household during lockdown. Depression controlled for SES, whether they are enrolled in school, gender, age and experience of sexual violence and witnessing violence. Anxiety controlled for SES, whether they completed paid work in the previous 12 months and experience of sexual violence and witnessing violence. Alcohol consumption controlled for SES, whether they completed work in the previous 12 months, whether they are enrolled in school, their experience of sexual violence, witnessing violence and whether they socialized with someone outside of their household during lockdown.

periods did experience more severe anxiety symptoms, over 75% of the participants in this study had minimal or mild symptoms of both depression and anxiety. These results are similar to those from a multicountry study conducted in Burkina Faso, Ethiopia, and Nigeria, where the majority of adolescents did not experience any mental health difficulties during early lockdown [48]. Some studies have shown that mental health difficulties were gender, age and school level specific, with younger children and those attending primary school more likely to experience such difficulties [49,50]. In this study, the mean age of the participants was 16 years and most were attending high school. While it is possible that adolescents were more independent and able to socialize through online mechanisms, it was also reported that they had more social contact with those outside of their immediate household than older or younger individuals [49,51,52]. Through this, it is likely that the feeling of loneliness and isolation was lower, thus mitigating the potential for mental health difficulties. In addition, many studies were conducted early or at different time points of the pandemic, with countries having their own versions of lockdown with differing levels of strictness and types of restrictions, all of which may have resulted in varying prevalence of poor mental health across different locations.

Although lockdown was not associated with mental health difficulties, the results of the study did highlight that a sense of belongingness within the school environment reduced the occurrence of both depression and anxiety symptoms. These outcomes are consistent with earlier investigations that have shown a positive correlation between a greater sense of school belonging and improved mental wellness [53–55]. They are also consistent with experiences of youth advisers who described the importance of school connectedness for mental health. One from Indonesia stated that, “Knowing your school is there for you really calms you down, takes one more thought out of your head, and more weight off your shoulders” and another from the Philippines described school as a “second home” [55]. These results underline the significance of being socially integrated. Social inclusion constitutes a fundamental component of belonging [17–19] and has been demonstrated to decrease the

feeling of loneliness and subsequently enhance mental well-being [56]. In this study, the majority of the participants had a high school belonging score with no difference between the levels of lockdown exposure. Although adolescents in this study indicated through a qualitative study that they were missing friends and experiencing some anxiety when missing school [15], schools continued to close and reopen after the initial closure which may have provided some opportunity to socialize, reduce the feeling of loneliness and potentially reduce the experience of depression and anxiety symptoms.

Although the prevalence of depression and anxiety other than minimal or mild symptoms was low in this study, between 15% and 20% of the participants experienced moderate or severe symptoms. Mental health is a key component to a person's ability to function, adapt and cope with daily life. Poor mental health in the younger years may have long-lasting effects on social, emotional, academic and work place achievements and lead to substance or alcohol abuse [57]. There is therefore a need to intervene early with regular screening and an improvement in mental health services for youth. Given the high sense of school belonging, schools remain an underutilized resource in terms of mental health services for adolescents and additional research around the feasibility of offering such services is needed. It would also be useful to understand what contributes towards school belongingness and encourage schools to promote it to buffer the experience of poor mental health and support isolated students.

For this cohort of adolescents, neither mental health nor school belonging influenced alcohol consumption. Reported alcohol use was very low, with only 4% in total reporting drinking alcohol more than 6 days in the previous month. It is possible that participants under-reported their alcohol use due to social desirability or fear of being reprimanded, but it is also important to note that during period of lockdown, South Africa experienced a national alcohol ban. Throughout the different stages of lockdown, this restriction was altered and alcohol was available for sale within set times and from specific places. While some individuals did report being able to purchase alcohol illegally

[58,59], or even brewed their own at home [60], it is possible that the alcohol ban changed alcohol behavior and limited intake for a number of people.

Study limitations

One of the main strengths of this study is the availability of data both before and during the COVID-19 pandemic in South Africa. Data were collected sequentially from different groups of participants between August 2019 and November 2021 allowing a comparison of different outcomes both before and during, but also at different stages of the risk-adjusted lockdown. However, a limitation of the study is that data were not available and could not be disaggregated for the time frame of the strictest levels of lockdown. This is a period where mental health difficulties may have been higher due to the stress and uncertainties around the lockdown. It was also a time when schools were indefinitely closed without any indication as to when they may have opened. Given the nature of the lockdown in South Africa, it was not possible to collect data during this time period. That said, the data available still provide a good overview of the impact the pandemic indirectly had on this cohort of adolescents.

Conclusions

Our study found no association between the number of months exposed to lockdown, anxiety and depression symptoms but did indicate that an increased sense of school belonging was associated with improved mental health. Although the overall experience of anxiety and depression symptoms was low, approximately 20% experienced moderate or severe symptoms, indicating a need to regularly screen and provide youth with mental health services. Given the high sense of school belonging in this study, schools could be a beneficial setting to integrate and offer mental health services and additional research around the feasibility of doing this in under resourced settings is needed. It would also be beneficial to explore what creates a high sense of school belonging to enable schools to promote it and better support isolated students.

Acknowledgments

The authors would like to thank the adolescents and caregivers who participated in the study, the local health authorities, community leaders and the Asenze Study staff, as well as The Valley Trust, without whom this work would not have been possible.

Funding Sources

Award number R01-TW011228 was funded by the National Institute on Drug Abuse and the Fogarty International Center Brain Disorders in Developing Countries Program, the Office of Behavioral and Social Sciences Research and the Office of Disease Prevention of the National Institutes of Health. Award number RF1MH134561 was funded by the National Institute of Mental Health.

Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jadohealth.2024.11.240>.

References

- [1] Mudiriza G, De Lannoy A. Youth emotional well-being during the COVID-19-related lockdown in South Africa. Cape Town: SALDRU, UCT. (SALDRU Working Paper No. 268); 2020.
- [2] Porter C, Favara M, Hittmeyer A, et al. Impact of the COVID-19 pandemic on anxiety and depression symptoms of young people in the global south: Evidence from a four-country cohort study. *BMJ Open* 2021;11:e049653.
- [3] Haag K, Du Toit S, Skeen S, et al. Predictors of COVID-related changes in mental health in a South African sample of adolescents and young adults. *Psychol Health Med* 2022;27:239–55.
- [4] Gichangi PB, Byrne ME, Thiongo MN, et al. Impact of COVID-19 on the mental health of adolescents and youth in Nairobi, Kenya. *Front Psychiatry* 2023;14:1209836.
- [5] Mabrouk A, Mbithi G, Chongwo E, et al. Mental health interventions for adolescents in sub-Saharan Africa: A scoping review. *Front Psychiatry* 2022;13:937723.
- [6] Jörns-Presentati A, Napp A-K, Dessauvagine AS, et al. The prevalence of mental health problems in sub-Saharan adolescents: A systematic review. *PLoS One* 2021;16:e0251689.
- [7] Clemente-Suárez VJ, Martínez-González MB, Benítez-Agudelo JC, et al. The impact of the COVID-19 pandemic on mental disorders. A critical review. *Int J Environ Res Public Health* 2021;18:10041.
- [8] Keilholtz B, Spencer C, Vail S, Palmer M. COVID-19-Related stress and its association with intimate partner violence perpetration and victimization. *Behav Sci (Basel)* 2023;13:593.
- [9] Dingle GA, Han R, Carlyle M. Loneliness, belonging, and mental health in Australian university students pre- and post-COVID-19. *Behav Change* 2022;39:146–56.
- [10] Mugume T. Students' sense of belonging at a South African university during COVID-19. *Perspect Educ* 2023;41:56–73.
- [11] Visser M, Law-van Wyk E. University students' mental health and emotional wellbeing during the COVID-19 pandemic and ensuing lockdown. *S Afr J Psychol* 2021;51:229–43.
- [12] Gopalan M, Linden-Carmichael A, Lanza S. College students' sense of belonging and mental health amidst the COVID-19 pandemic. *J Adolesc Health* 2022;70:228–33.
- [13] McKinlay AR, May T, Dawes J, et al. 'You're just there, alone in your room with your thoughts': A qualitative study about the psychosocial impact of the COVID-19 pandemic among young people living in the UK. *BMJ Open* 2022;12:e053676.
- [14] Widnall E, Adams EA, Plackett R, et al. Adolescent experiences of the COVID-19 pandemic and school closures and implications for mental health, peer relationships and learning: A qualitative study in South-West England. *Int J Environ Res Public Health* 2022;19:7163.
- [15] Kvalsvig JD, Taylor M, Watt KG, Desmond C. The impact of family support and organization on adolescents during school closure under Covid-19 lockdown regulations in an area of South Africa. *PLoS One* 2023;18:e0288501.
- [16] Baumeister RF. Need-to-belong theory. In: Van Lange PAM, Kruglanski AW, Higgins ET, eds. *Handbook of theories of social psychology*, vol. 2. Thousand Oaks, California: Sage Publications Ltd; 2012:121–40.
- [17] Baumeister RF, Leary MR. The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychol Bull* 1995;117:497–529.
- [18] Arslan G, Duru E. Initial development and validation of the school belongingness scale. *Child Indic Res* 2017;10:1043–58.
- [19] Malone GP, Pillow DR, Osman A. The general belongingness scale (GBS): Assessing achieved belongingness. *Pers Indiv Differ* 2012;52:311–6.
- [20] Arslan G. Psychological maltreatment, social acceptance, social connectedness, and subjective well-being in adolescents. *J Happiness Stud* 2018;19:983–1001.
- [21] Chávez-Castillo Y, Zapata-Lamana R, Diaz-Vargas C, et al. Mental health, subjective well-being, and academic performance in Chilean school-children who are part and are not part of the school inclusion program. *Educ Sci* 2023;13:1065.
- [22] Nindenshuti PM, Caire-Juvera G. Changes in diet, physical activity, alcohol consumption, and tobacco use in adults during the COVID-19 pandemic: A systematic review. *Inquiry* 2023;60:00469580231175780.
- [23] Lundahl LH, Cannoy C. COVID-19 and substance use in adolescents. *Pediatr Clin North Am* 2021;68:977–90.
- [24] Zhang C, Ye M, Fu Y, et al. The psychological impact of the COVID-19 pandemic on teenagers in China. *J Adolesc Health* 2020;67:747–55.

- [25] Dumas TM, Ellis W, Litt DM. What does adolescent substance use look like during the COVID-19 pandemic? Examining changes in frequency, social contexts, and pandemic-related predictors. *J Adolesc Health* 2020; 67:354–61.
- [26] MIET AFRICA. The impact of COVID-19 on adolescents and young people in the Southern African Development Community Region. South Africa: MIET AFRICA; 2021.
- [27] Hawke LD, Barbic SP, Voineskos A, et al. Impacts of COVID-19 on youth mental health, substance use, and well-being: A rapid survey of clinical and community samples: Répercussions de la COVID-19 sur la santé mentale, l'utilisation de substances et le bien-être des adolescents: un sondage rapide d'échantillons cliniques et communautaires. *Can J Psychiatry* 2020; 65:701–9.
- [28] Thorisdottir IE, Asgeirsdottir BB, Kristjansson AL, et al. Depressive symptoms, mental wellbeing, and substance use among adolescents before and during the COVID-19 pandemic in Iceland: A longitudinal, population-based study. *Lancet Psychiatry* 2021;8:663–72.
- [29] Patrick ME, Schulenberg JE, O'Malley PM, et al. Adolescents' reported reasons for alcohol and marijuana use as predictors of substance use and problems in adulthood. *J Stud Alcohol Drugs* 2011;72:106–16.
- [30] Smit K, Voogt C, Otten R, et al. Why adolescents engage in early alcohol use: A study of drinking motives. *Exp Clin Psychopharmacol* 2022;30:73–81.
- [31] Mmereki B, Mathibe M, Cele L, Modjadji P. Risk factors for alcohol use among adolescents: The context of township high schools in Tshwane, South Africa. *Front Public Health* 2022;10:969053.
- [32] Lorenzo NE, Zeytinoglu S, Morales S, et al. Transactional associations between parent and late adolescent internalizing symptoms during the COVID-19 pandemic: The moderating role of avoidant coping. *J Youth Adolesc* 2021;50:459–69.
- [33] Temple JR, Baumler E, Wood L, et al. The impact of the COVID-19 pandemic on adolescent mental health and substance use. *J Adolesc Health* 2022;71:277–84.
- [34] Skrzynski CJ, Creswell KG. Associations between solitary drinking and increased alcohol consumption, alcohol problems, and drinking to cope motives in adolescents and young adults: A systematic review and meta-analysis. *Addiction* 2020;115:1989–2007.
- [35] Sayed AA, El-Gendy AA, Aljohani AK, et al. The effects of COVID-19 on the mental health of children and adolescents: A review. *Cureus* 2024;16: e56473.
- [36] Jones EAK, Mitra AK, Bhuiyan AR. Impact of COVID-19 on mental health in adolescents: A systematic review. *Int J Environ Res Public Health* 2021;18: 2470.
- [37] Panchal U, Salazar de Pablo G, Franco M, et al. The impact of COVID-19 lockdown on child and adolescent mental health: Systematic review. *Eur Child Adolesc Psychiatr* 2023;32:1151–77.
- [38] Kauhanen L, Wan Mohd Yunus WMA, Lempinen L, et al. A systematic review of the mental health changes of children and young people before and during the COVID-19 pandemic. *Eur Child Adolesc Psychiatr* 2023;32: 995–1013.
- [39] Harrison L, Carducci B, Klein JD, Bhutta ZA. Indirect effects of COVID-19 on child and adolescent mental health: An overview of systematic reviews. *BMJ Glob Health* 2022;7:e010713.
- [40] Samji H, Wu J, Ladak A, et al. Review: Mental health impacts of the COVID-19 pandemic on children and youth – a systematic review. *Child Adolesc Ment Health* 2022;27:173–89.
- [41] Ntho TA, Themane MJ, Sepadi MD, et al. Prevalence of alcohol use and associated factors since COVID-19 among school-going adolescents within the Southern African development community: A systematic review protocol. *BMJ Open* 2024;14:e080675.
- [42] Desmond C, Norwitz GA, Kvalsvig JD, et al. The Asenze Cohort Study in KwaZulu-Natal, South Africa: protocol and cohort profile. *Epidemiol Health* 2022;44:e2022037.
- [43] Kroenke K, Spitzer RL, Williams JB. The PHQ-9: Validity of a brief depression severity measure. *J Gen Intern Med* 2001;16:606–13.
- [44] Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: The GAD-7. *Arch Intern Med* 2006;166: 1092–7.
- [45] Goodenow C. The psychological sense of school membership among adolescents: Scale development and educational correlates. *Psychol Sch* 1993; 30:79–90.
- [46] Bursac Z, Gauss CH, Williams DK, Hosmer DW. Purposeful selection of variables in logistic regression. *Source Code Biol Med* 2008;3:17.
- [47] Alamolhoda SH, Zare E, Hakimzadeh A, et al. Adolescent mental health during covid-19 pandemics: A systematic review. *Int J Adolesc Med Health* 2023;35:41–60.
- [48] Wang D, Chukwu A, Millogo O, et al. The COVID-19 pandemic and adolescents' experience in sub-Saharan Africa: A cross-country study using a telephone survey. *Am J Trop Med Hyg* 2021;105:331–41.
- [49] Bloom J, Lachman A, Gaxo E, et al. Child, adolescent, and caregiver mental health difficulties and associated risk factors early in the COVID-19 pandemic in South Africa. *Child Adolesc Psychiatr Ment Health* 2022; 16:65.
- [50] Pillay I. The impact of inequality and COVID-19 on education and career planning for South African children of rural and low-socioeconomic backgrounds. *Afr J Career Dev* 2021;3.
- [51] McCreesh N, Dlamini V, Edwards A, et al. Impact of the covid-19 epidemic and related social distancing regulations on social contact and SARS-CoV-2 transmission potential in rural South Africa: Analysis of repeated cross-sectional surveys. *BMC Infect Dis* 2021;21:928.
- [52] Sewpaul R, Mabaso M, Dukhi N, et al. Determinants of social distancing among South Africans from 12 days into the COVID-19 lockdown: A cross sectional study. *Front Public Health* 2021;9:632619.
- [53] Aldridge JM, McChesney K. The relationships between school climate and adolescent mental health and wellbeing: A systematic literature review. *Int J Educ Res* 2018;88:121–45.
- [54] Singla DR, Shinde S, Patton G, Patel V. The mediating effect of school climate on adolescent mental health: Findings from a randomized controlled trial of a school-wide intervention. *J Adolesc Health* 2021;69: 90–9.
- [55] Raniti M, Rakesh D, Patton GC, Sawyer SM. The role of school connectedness in the prevention of youth depression and anxiety: A systematic review with youth consultation. *BMC Publ Health* 2022;22:2152.
- [56] Arslan PDG. School belongingness, well-being, and mental health among adolescents: Exploring the role of loneliness. *Aust J Psychol* 2021;73: 70–80.
- [57] Colizzi M, Lasalvia A, Ruggeri M. Prevention and early intervention in youth mental health: Is it time for a multidisciplinary and trans-diagnostic model for care? *Int J Ment Health Syst* 2020;14:23.
- [58] Theron M, Swart R, Londani M, et al. Did COVID-19-Related Alcohol Sales Restrictions Reduce Alcohol Consumption? Findings from a National Online Survey in South Africa. *Int J Environ Res Public Health* 2022;19:2422.
- [59] Theron M, Swart R, Londani M, et al. Alcohol consumption patterns, suppliers and online alcohol marketing: Before and during COVID-19 alcohol bans. *S Afr J Sci* 2023;119. <https://doi.org/10.17159/sajs.2023/14543>.
- [60] Albernaz ER, Lage da Cruz DM, Braz Dias J. From public problems to social experiences: the alcohol ban in South Africa during the COVID-19 pandemic. *Virtual Braz Anthropol* 2023;20:e20601.