



# Racial disparities in psychological distress in post-apartheid South Africa: results from the SANHANES-1 survey

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## Abstract

**Purpose** South Africa has long endured a high prevalence of mental disorders at the national level, and its unique social and historical context could be a contributor to an increased risk of mental health problems. Our current understanding is limited regarding the relative importance of various social determinants to mental health challenges in South Africa, and how existing racial inequities may be explained by these determinants.

**Methods** This study attempted to elucidate potential social determinants of mental health in South Africa using data from the nationally representative South African National Health and Nutrition Examination Survey (SANHANES-1). The main outcome of interest was psychological distress, measured with the Kessler-10 scale. Hierarchical linear regression models included covariates for demographic and socioeconomic factors, count of traumatic events, and a series of stress-related constructs. Analyses were conducted on two populations: the entire sample ( $n = 15,981$ ), and the African subpopulation ( $n = 10,723$ ).

**Results** Regression models on the entire sample indicated racial disparities in psychological distress, with Africans experiencing higher distress than White and Coloured individuals. Results within the African sub-population indicated geo-spatial disparities, with Africans in formal urban settings experiencing higher psychological distress than those living in formal and informal rural locales. Across both samples, results indicated a cumulative association between count of stressors and traumatic events and distress.

**Conclusion** We found racial disparities across several mental health-related domains. Africans had greater exposure to traumatic events, social stressors, and psychological distress. This research is a necessary foundation for public health interventions and policy change to effectively reduce inequities in psychological distress.

**Keywords** Psychological distress · Racial disparities · Stressors · Traumatic events · South Africa

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## Introduction

South Africa has long endured a high prevalence of mental disorders. The 2004 South African Stress and Health (SASH) study found that its lifetime prevalence of anxiety and mood disorders was nearly three times that of Nigeria, the only other African country surveyed [1]. The prevalence of any mental disorder was also higher than other low-middle income countries, such as China, Lebanon, and Mexico [2–4].

South Africa's unique social and historical context may contribute to an increased risk of mental health problems. Social and economic inequities that were created by Apartheid-era colonialism and institutional racism persist in contemporary society, with striking inequities present along racial lines [5–8]. South Africa is one of the most unequal societies in the world, as racial disparities exist in housing, healthcare access, health, and multiple indicators of socioeconomic status (SES), all of which can contribute to an increased risk of poor mental health [9–12]. Indeed, a strong consensus in the stress literature indicates that socio-contextual factors play a role in shaping population mental health risks, especially those factors that reflect exposure to chronic and acute stressors linked to living and working conditions [13, 14]. For example, studies using the Pearlin's Stress Process Model have documented a negative association between social stressors and mental health, especially in low income and marginalized populations [15–17]. While prior research has documented the prevalence of mental health disorders in South Africa, the contextual determinants of mental health, especially those linked to racial inequities, or social conditions that might be amenable to clinical or policy interventions, have received limited research attention.

Psychological distress is an aspect of mental health that has received increasing research attention in the South African context. Many studies investigating psychological distress utilize the Kessler-10 and Kessler-6, brief measures that demonstrate acceptable psychometric properties and have been shown to predict both depression and anxiety disorders within the South African general population [18–21]. Further research is needed into how specific conditions of life captured by stressors differentially influence psychological distress. This empirical understanding is a necessary foundation for public health interventions to effectively reduce inequities in psychological distress.

To our knowledge, there have been three nationally representative probability surveys that include measures of psychological distress in South Africa since the end of Apartheid. Conducted between 2002 and 2004, the SASH study examined social correlates of psychological distress, particularly those captured by specific stressors related to social context [22, 23] This study found that cumulative

exposure to multiple traumatic events, including racial-political violence, was linked to increased distress [24]. Other analyses of these data indicated that there were racial inequities in psychological distress; with African, Coloured, and Indian subpopulations all reporting greater psychological distress than Whites. Such differences were partially explained by social stressors, including stressful life events and unfair treatment [25]. Another finding from the SASH study revealed that social stressors contributed to explaining racial differences in self-esteem and mastery—the degree to which individuals perceive they can control their life situation [26, 27]. Since the findings from the SASH study, no other nationally representative studies have examined the association between social conditions captured by stressors and mental health outcomes.

The National HIV Prevalence, Incidence, and Behavior Survey, a longstanding, nationally representative survey aimed at investigating the epidemiology of HIV in South Africa, began to include questions about psychological distress in 2012 [28, 29]. Findings revealed that Africans had more than twice the odds of experiencing psychological distress compared to other racial groups, but the social conditions that could explain these inequities were not examined.

The South African National Health and Nutrition Examination Survey (SANHANES-1) is another nationally representative probability survey that examined the correlates of psychological distress [30]. Analyses of SANHANES-1 data have documented that distress is a risk factor for multiple health outcomes, including insomnia, World Health Organization Disability Assessment Schedule score, serum C-Reactive Protein, and BMI [31–34]. However, although the SANHANES-1 measures multiple contextual stressors, their relationship to psychological distress has yet to be investigated. Thus, the SANHANES data provide a unique opportunity to update and expand on the knowledge base established by the SASH, by providing a more recent assessment of the extent of racial inequities in psychological distress and the contribution of social determinants to these patterns.

Another critical component of South Africa's social context lies in the geospatial distribution of psychological distress among Africans, who constitute about 80% of the general population. Despite the heterogeneity amongst Africans in ethnicity, culture, language, and geographic location, prior research uses a relatively limited conceptualization of race, treating Africans as a homogenous racial group [29, 30]. Most existing research on psychological distress has compared Africans to other major racial groups, with scant attention given to how distress may vary within the African population. While some work has compared the correlates of poor mental health between historically disadvantaged urban and rural communities, this has yet to be examined

nationally [35]. To our knowledge, the only nationally representative study that examines geographic differences in health amongst Africans found that urban youth were more likely to smoke, have high salt intake, be physically inactive, and be obese, compared to youth in rural geographies [36]. Examining geographic variation in psychological distress among Africans and how exposure to socio-contextual stressors influences that variation will allow future research to more critically assess how differential social conditions experienced by Africans may influence mental health.

To address the knowledge gaps regarding racial inequities in psychological distress, the role of social conditions as reflected in stressors contributing to racial inequities, and the extent to which the socio-geographic context of Africans is related to their risk of psychological distress, this study aims to:

- (1) Assess the extent of racial disparities in psychological distress in a nationally representative population in South Africa
- (2) Explore the relationship between psychological distress and the social conditions of life in South Africa as captured by stressors and traumas
- (3) Examine the differences in psychological distress across formal/informal and urban/rural locales within the African subpopulation.

## Methods

### Data

This study analyzed data from the SANHANES-1, a cross-sectional national survey conducted in 2011–2012 which included interviews and medical examinations with biomarker analyses [30]. Sample households were selected using a multi-stage, disproportionate, stratified cluster sampling approach, with 500 enumeration areas (EAs) selected based on province, geographic type, and race. A random sample of 20 households was selected from each of the enumeration areas, yielding a 10,000-household sample of eligible participants. At the household level, 8166 of the 10,000 households were occupied; these households yielded 27,580 individuals of all ages who were eligible to be interviewed and agreed to participate, 25,532 (92.6%) of whom completed the interview.

### Variables

The main outcome of interest was psychological distress, measured with the Kessler-10 [18, 37]. The K-10 was developed as part of the National Health Interview Survey (NHIS) to measure the frequency of non-specific anxiety and

depressive symptoms experienced in the past month [37]. It has demonstrated adequate psychometric properties for predicting both depression and anxiety in South Africa [20, 21].

The analysis included covariates for demographics, SES, count of traumatic events, and a series of stress-related constructs. Race was reported as per Statistics South Africa's standard population groups: African, Coloured, White, and Indian. In the South African context, the term "Coloured" refers to a heterogeneous racial group which primarily consists of persons of mixed racial ancestry. Marked racial stratification developed during the Apartheid era in South Africa placed Whites at the top, Indians and Coloureds in the middle, and Africans at the bottom [38]. Geographic location was categorized as formal urban, informal urban, formal rural, or informal rural [39–42]. Age was categorized into 10-year groups. Education was partitioned into three categories: 'No Formal Education', 'Educated through grades 8–12', or 'Higher Education (with or without matriculation)'. Income was cut at intervals that correspond roughly to the expected exponential distribution of income. A wealth index was created by summing various household amenities and asset ownership, and this index was categorized into quintiles [43]. We included multiple indicators of stress-related constructs were used in the analysis. First, we included a variable that was a count of traumatic events, based on a checklist including, experiencing a violent personal assault, a severe automobile accident, or a natural disaster. Second, we included indicators for seven indicators of chronic stressors in the analysis: food insecurity (hunger-related stress), alcohol-related stress in the household, household crowding, neighborhood inaccessibility, economic stress, interpersonal conflict, and crime and alcohol-related stress in the neighborhood. Our food insecurity measure was based on the Community Childhood Hunger Identification Project index, which ranges from 0 to 8. Scores from 5 to 8 indicate household food shortages which we utilized as our indicator of hunger-related stress [44, 45]. The other constructs were created by standardizing and summing the items related to those constructs, then dichotomously scoring each variable to contrast the top quintile of each ("high stress") versus all others. An additional variable for the total count of high stress domains was created by summing these stress indicators, and categorizing the count as follows: 0, 1, 2, 3+ . Measures of psychological distress, traumatic events, and chronic stressor domains can be found in Supplementary Material 1.

### Analyses

First, we calculated descriptive statistics (mean and standard errors) for psychological distress, demographic, SES, and stressor variables, by race, and then by geographic type within the African population. To maintain the power of our

analyses, we imputed missing values for all the variables included in the analyses using chained equations. When correctly implemented, multiple imputation procedures help to produce asymptotic unbiased estimates and standard errors [46]. The chained equation procedure allows us to impute multiple missing variables. We produced and performed analyses on 25 imputations of our dataset. While smaller numbers of imputations are commonly accepted for the validity of point estimates, a greater number of imputations gives us confidence in the replicability of our standard error estimates as well [47]. Then, using the imputed data, we weighted our dataset using Stata's `svyset` prefix based on the SANHANES study design and performed a series of multi-variable linear regressions predicting psychological distress.

We utilized hierarchical linear regression models consistent with Pearlman's Stress Process framework to investigate predictors of psychological distress with the following analytic strategy: Model a estimated the association between distress and demographic variables (race, geographic locale, sex, and age). Model b added variables for SES (education, household income, household wealth) to model a. Model c added a variable for the count of traumatic events to model b. Model d added a variable for a count of high chronic stress domains to model c. The fifth model, (model e), added the seven indicator variables for each of the chronic stressor domains simultaneously to model c. The regression models were run on two samples: (1) the entire South African sample and (2) the African sub-sample.

## Results for South African population

### Sample characteristics

Table 1 presents the distributions of our main covariates and outcome variables in the sample population by race. Whites had the largest percentage of individuals with higher education, followed by Indian, Coloured, and African participants. A similar pattern is evident for the distribution of income and wealth. Africans had the highest percentage of individuals experiencing high stress in all the domains measured, except Crowding (Coloured, 23.1%). Africans also had the highest proportion of individuals with 3 or more high stress domains (24.2%), while Whites had the highest proportion of individuals reporting 4 or more traumatic events (5%). Africans had the highest mean K-10 score of all the racial groups.

### Linear regression models for psychological distress

Table 2 presents a series of linear regression models for psychological distress with each column representing a separate regression model. Model 1a, which includes demographic

variables, indicates that Africans report higher distress than both White and Coloured participants. In Model 1b, with the inclusion of SES variables, disparities in psychological distress between the races remain significant, however, the disparity decreased between Africans and Whites by 55%, and by 16% between African and Coloured participants. Across measures of SES, higher levels of education and wealth were associated with lower psychological distress.

In Model 1c, after including count of traumatic events, a significant disparity in psychological distress between Africans and Whites remains evident, with a reduction of only 3%. Disparities between African and Coloured participants revealed a similar trend, falling 6%. Education and the difference between the bottom and top quintiles of wealth remained significant, with little change in their coefficients. We also observed a graded association between the count of traumatic events and psychological distress.

In Model 1d, after adjusting for count of high chronic stress domains, disparities between African and White and Coloured participants remained significant but were reduced by 27% and 19%, respectively. A graded association between the number of traumatic events and psychological distress persisted. Similarly, we observed a graded association between stressor count and psychological distress.

In Model 1e, hunger, interpersonal conflict, and neighborhood crime and alcohol-related offenses were associated with elevated psychological distress. Disparities between African and White participants were no longer significant; those between African and Coloured participants remained significant, but were reduced by 31%.

## Results for the African population

### Sample characteristics

Table 3 presents the distributions of our main covariates and outcome variables among Africans by geographic locale. Africans living in formal urban settings had the largest percentage of individuals with higher education and in the top quintile of income and wealth. Prevalence of stressors varied by geographic locale. Africans living in formal rural settings had the highest proportion of individuals with 3 or more high chronic stress domains (37.7%), while those living in formal urban settings had the highest proportion of individuals reporting 4 or more traumatic events (4.5%). Africans living in formal urban settings had the highest mean K-10 score.

### Linear regression models for psychological distress

Linear regression models were fit for psychological distress among Africans using the same hierarchical models described earlier, with a focus on geographic variation.

**Table 1** Descriptive statistics by race

	African (N=10,854)			White (N=741)			Coloured (N=3199)			Indian (N=1383)			p value*
	N	%	SE	N	%	SE	N	%	SE	N	%	SE	
Age < 25	3359	31%	<0.01	100	13.5%	0.01	845	26.4%	0.01	261	18.9%	0.01	<0.01
> 25 and < 35	2268	20.9%	<0.01	99	13.4%	0.01	589	18.4%	0.01	207	15%	0.01	
> 35 and < 45	1666	15.4%	<0.01	148	2%	0.01	561	17.6%	0.01	253	18.3%	0.01	
> 45 and < 55	1463	13.5%	<0.01	130	17.5%	0.01	571	17.9%	0.01	264	19.1%	0.01	
> 55 and < 65	1104	10.2%	<0.01	145	19.6%	0.01	377	11.8%	0.01	236	17.1%	0.01	
> 65	985	9.1%	<0.01	119	16.1%	0.01	253	7.9%	<0.01	162	11.7%	0.01	
Female	6429	59.3%	<0.01	395	53.5%	0.02	1877	58.9%	0.01	763	55.4%	0.01	<0.01
Male	4412	40.7%	<0.01	343	46.5%	0.02	1310	41.1%	0.01	615	44.6%	0.01	
No formal education	2839	31.6%	<0.01	27	4.1%	0.01	706	25.6%	0.01	171	13.6%	0.01	<0.01
Grade 8–12	5554	61.8%	0.01	349	53.2%	0.02	1860	67.5%	0.01	873	69.4%	0.01	
Higher education	595	6.6%	<0.01	280	42.7%	0.02	189	6.9%	<0.01	214	17%	0.01	
Income < R5000	3484	37.4%	0.01	57	9.4%	0.01	590	21%	0.01	254	24.6%	0.01	<0.01
> 5000 and < 10,000	2017	21.7%	<0.01	25	4.1%	0.01	557	19.9%	0.01	92	8.9%	0.01	
> 10,000 and < 25,000	2099	22.6%	<0.01	79	13%	0.01	831	29.6%	0.01	211	20.5%	0.01	
> 25,000 and < 50,000	876	9.4%	<0.01	72	11.9%	0.01	406	14.5%	0.01	178	17.3%	0.01	
> 50,000	832	8.9%	<0.01	374	61.6%	0.02	419	14.9%	0.01	296	28.7%	0.01	
Wealth Index Quintile 1 (Lowest)	2519	27.9%	<0.01	8	1.3%	<0.01	256	9.8%	0.01	1	0.1%	<0.01	<0.01
2	2362	26.2%	<0.01	12	1.9%	0.01	309	11.8%	0.01	40	3.4%	0.01	
3	1978	21.9%	<0.01	19	3.1%	0.01	603	23%	0.01	108	9%	0.01	
4	1405	15.6%	<0.01	97	15.7%	0.01	820	31.3%	0.01	303	25.4%	0.01	
5	758	8.4%	<0.01	482	78%	0.02	630	24.1%	0.01	742	62.1%	0.01	
Low hunger	6370	64.2%	<0.01	664	97.5%	0.01	2385	84.6%	0.01	1245	96.1%	0.01	<0.01
High hunger	3557	35.8%	<0.01	17	2.5%	0.01	434	15.4%	0.01	50	3.9%	0.01	
Low home alcohol stress	7838	78.2%	<0.01	598	86.2%	0.01	2361	82.3%	0.01	1211	92.1%	0.01	<0.01
High home alcohol stress	2189	21.8%	<0.01	96	13.8%	0.01	509	17.7%	0.01	104	7.9%	0.01	
Low crowding	7843	77.8%	<0.01	676	97.5%	0.01	2233	76.9%	0.01	1294	97.7%	<0.01	<0.01
High crowding	2239	22.2%	<0.01	17	2.5%	0.01	672	23.1%	0.01	31	2.3%	<0.01	
Low neighborhood inaccessibility	7721	77.3%	<0.01	573	82.6%	0.01	2424	84.8%	0.01	1258	96.6%	0.01	<0.01
High neighborhood inaccessibility	2266	22.7%	<0.01	121	17.4%	0.01	434	15.2%	0.01	44	3.4%	0.01	
Low economic stress	7648	78.8%	<0.01	614	93.5%	0.01	2344	85.6%	0.01	1026	84.1%	0.01	<0.01
High economic stress	2059	21.2%	<0.01	43	6.5%	0.01	394	14.4%	0.01	194	15.9%	0.01	
Low interpersonal conflict	8035	79.7%	<0.01	576	80.8%	0.01	2598	86.8%	0.01	1084	84.6%	0.01	<0.01
High interpersonal conflict	2048	20.3%	<0.01	137	19.2%	0.01	395	13.2%	0.01	198	15.4%	0.01	
Low neighborhood crime and alcohol	7575	77.2%	<0.01	657	95.4%	0.01	2290	80.7%	0.01	1135	87.6%	0.01	<0.01
High neighborhood crime and alcohol	2243	22.8%	<0.01	32	4.6%	0.01	547	19.3%	0.01	160	12.4%	0.01	
0 stressors	1538	18.5%	<0.01	275	48.5%	0.02	786	33.2%	0.01	578	57.1%	0.02	<0.01
1	2513	30.2%	0.01	217	38.3%	0.02	793	33.5%	0.01	305	30.1%	0.01	
2	2248	27.1%	<0.01	65	11.5%	0.01	490	20.7%	0.01	95	9.4%	0.01	
3+	2010	24.2%	<0.01	10	1.8%	0.01	300	12.7%	0.01	34	3.4%	0.01	
0 Traumatic events	8056	81.8%	<0.01	550	78.5%	0.02	2443	83.1%	0.01	1041	84.3%	0.01	<0.01
1	607	6.2%	<0.01	53	7.6%	0.01	224	7.6%	<0.01	86	7%	0.01	
2	467	4.7%	<0.01	36	5.1%	0.01	138	4.7%	<0.01	50	4%	0.01	
3	330	3.4%	<0.01	27	3.9%	0.01	76	2.6%	<0.01	32	2.6%	<0.01	
4+	385	3.9%	<0.01	35	5%	0.01	59	2%	<0.01	26	2.1%	<0.01	
Kessler10 Score**	9901	14.57	0.06	708	12.89	0.19	2957	13.17	0.1	1250	12.95	0.14	<0.01

Unweighted N and weighted percentages

\*Differences between multi-group comparisons using ANOVA and  $\chi^2$  distribution

\*\*Kessler10 Score values refer to mean and standard deviation

**Table 2** Linear regression models for psychological distress score ( $N=15,981$ )

	1 <sup>a</sup> $R^2=0.052$ $\beta$ (SE)	1 <sup>b</sup> $R^2=0.065$ $\beta$ (SE)	1 <sup>c</sup> $R^2=0.105$ $\beta$ (SE)	1 <sup>***d</sup> $R^2=0.139$ $\beta$ (SE)	1 <sup>***e</sup> $R^2=0.251$ $\beta$ (SE)
African	<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
White	− 2.395 (0.35)**	− 1.068 (0.4)**	− 1.04 (0.38)**	− 0.758 (0.37)*	− 0.564 (0.31)
Coloured	− 2.082 (0.25)**	− 1.753 (0.27)**	− 1.649 (0.25)**	− 1.336 (0.24)**	− 0.923 (0.21)**
Indian	− 0.591 (0.77)	0.148 (0.66)	0.077 (0.57)	0.334 (0.48)	0.309 (0.53)
Female	<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
Male	− 0.743 (0.11)**	− 0.71 (0.11)**	− 0.774 (0.11)**	− 0.723 (0.11)**	− 0.624 (0.1)**
Age	0.056 (<0.01)**	0.048 (<0.01)**	0.043 (<0.01)**	0.045 (<0.01)**	0.029 (<0.01)**
No formal schooling		<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
Grade 8–12		− 0.813 (0.19)**	− 0.849 (0.19)**	− 0.628 (0.18)**	− 0.482 (0.17)**
Higher education		− 0.706 (0.27)**	− 0.692 (0.26)**	− 0.306 (0.25)	− 0.37 (0.24)
Income < R5000		<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
> = 5000; < 10,000		0.177 (0.25)	0.172 (0.24)	0.152 (0.23)	0.146 (0.21)
> = 10,000; < 25,000		− 0.042 (0.23)	− 0.065 (0.23)	− 0.002 (0.23)	0.005 (0.19)
> = 25,000; < 50,000		− 0.124 (0.27)	− 0.163 (0.25)	0.087 (0.27)	− 0.063 (0.25)
> = 50,000		− 0.437 (0.23)	− 0.521 (0.23)*	− 0.229 (0.22)	− 0.352 (0.2)
Wealth Index Quintile 1 (Lowest)		<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
2		− 0.191 (0.27)	− 0.171 (0.25)	0.112 (0.26)	− 0.21 (0.22)
3		0.203 (0.31)	0.19 (0.29)	0.542 (0.31)	0.158 (0.25)
4		− 0.124 (0.34)	− 0.11 (0.32)	0.465 (0.34)	− 0.119 (0.29)
5		− 1.185 (0.4)**	− 1.083 (0.36)**	− 0.23 (0.39)	− 0.911 (0.31)**
0 Traumatic events			<i>ref</i>	<i>ref</i>	<i>ref</i>
1			1.69 (0.25)**	1.581 (0.24)**	1.353 (0.22)**
2			2.157 (0.35)**	1.991 (0.34)**	1.583 (0.31)**
3			3.492 (0.51)**	3.188 (0.48)**	2.398 (0.41)**
4+			4.017 (0.49)**	3.752 (0.47)**	2.974 (0.45)**
0 Stressors				<i>ref</i>	
1				1.302 (0.19)**	
2				2.079 (0.22)**	
3+				3.328 (0.3)**	
Hunger					0.698 (0.17)**
Home alcohol stress					0.567 (0.29)
Crowding					− 0.325 (0.18)
Neighborhood inaccessibility					− 0.177 (0.19)
Economic stress					0.021 (0.21)
Conflict					5.383 (0.26)**
Neighborhood crime and alcohol					0.523 (0.21)*

Data were analyzed on individuals aged 15 years and older who were interviewed. Therefore, data on 15,981 individuals of all race groups were analyzed for Table 2. The sample size presented in Table 2 is an unweighted  $N$  and the regression analyses presented in Table 2 was conducted after multiple imputation

\* $p < 0.05$

\*\* $p < 0.01$

\*\*\*Model also adjusts for alcohol in home

<sup>a</sup>Demographic variables

<sup>b</sup>Model 1a + SES variables

<sup>c</sup>Model 1b + traumatic events

<sup>d</sup>Model 1c + stressor count

<sup>e</sup>Model 1c + stressors

**Table 3** Descriptive statistics of African population by geographic locale

	Formal urban (N=4207)			Informal urban (N=1810)			Informal rural [tribal] (N=3494)			Formal rural [farms] (N=1343)			p value*
	N	Mean	SE	N	Mean	SE	N	Mean	SE	N	Mean	SE	
Age <25	1221	29%	0.01	579	32%	0.01	1159	33.2%	0.01	400	29.8%	0.01	<0.01
>25 and <35	875	20.8%	0.01	476	26.3%	0.01	608	17.4%	0.01	309	23%	0.01	
>35 and <45	664	15.8%	0.01	345	19.1%	0.01	436	12.5%	0.01	221	16.5%	0.01	
>45 and <55	671	16%	0.01	217	12%	0.01	393	11.3%	0.01	182	13.6%	0.01	
>55 and <65	433	10.3%	<0.01	121	6.7%	0.01	417	12%	0.01	133	9.9%	0.01	
>65	342	8.1%	<0.01	71	3.9%	<0.01	476	13.6%	0.01	96	7.2%	0.01	
Female	2449	58.3%	0.01	1104	61%	0.01	2134	61.2%	0.01	742	55.3%	0.01	<0.01
Male	1751	41.7%	0.01	706	39%	0.01	1355	38.8%	0.01	600	44.7%	0.01	
No formal education	768	21.9%	0.01	486	32.2%	0.01	1039	36.1%	0.01	546	50%	0.02	<0.01
Grade 8–12	2325	66.2%	0.01	993	65.7%	0.01	1700	59.1%	0.01	536	49.1%	0.02	
Higher education	417	11.9%	0.01	32	2.1%	<0.01	137	4.8%	<0.01	9	0.8%	<0.01	
Income <R5000	1111	30.7%	0.01	601	39.4%	0.01	1373	44.6%	0.01	399	36.8%	0.01	<0.01
>5000 and <10,000	601	16.6%	0.01	331	21.7%	0.01	800	26%	0.01	285	26.3%	0.01	
>10,000 and <25,000	846	23.4%	0.01	382	25.1%	0.01	563	18.3%	0.01	308	28.4%	0.01	
>25,000 and <50,000	479	13.2%	0.01	170	11.2%	0.01	170	5.5%	<0.01	57	5.3%	0.01	
>50,000	582	16.1%	0.01	40	2.6%	<0.01	175	5.7%	<0.01	35	3.2%	0.01	
Wealth Index Quintile 1 (Lowest)	242	6.9%	<0.01	657	43.7%	0.01	951	32.9%	0.01	669	60.3%	0.01	<0.01
2	561	15.9%	0.01	419	27.9%	0.01	1139	39.5%	0.01	243	21.9%	0.01	
3	1029	29.2%	0.01	266	17.7%	0.01	540	18.7%	0.01	143	12.9%	0.01	
4	990	28.1%	0.01	145	9.6%	0.01	229	7.9%	0.01	41	3.7%	0.01	
5	701	19.9%	0.01	16	1.1%	<0.01	28	1%	<0.01	13	1.2%	<0.01	
Low hunger	2803	72.7%	0.01	1026	61.8%	0.01	1868	59.5%	0.01	673	53.1%	0.01	<0.01
High hunger	1055	27.3%	0.01	633	38.2%	0.01	1274	40.5%	0.01	595	46.9%	0.01	
Low home alcohol stress	3031	77.9%	0.01	1226	73.7%	0.01	2622	81.9%	0.01	959	75.6%	0.01	<0.01
High home alcohol stress	861	22.1%	0.01	438	26.3%	0.01	580	18.1%	0.01	310	24.4%	0.01	
Low crowding	3122	79.5%	0.01	1197	70.8%	0.01	2744	84.7%	0.01	780	63.5%	0.01	<0.01
High crowding	803	20.5%	0.01	493	29.2%	0.01	495	15.3%	0.01	448	36.5%	0.01	
Low neighborhood inaccessibility	3525	91.9%	<0.01	1361	81%	0.01	2297	71.4%	0.01	538	42.8%	0.01	<0.01
High neighborhood inaccessibility	309	8.1%	<0.01	319	19%	0.01	920	28.6%	0.01	718	57.2%	0.01	
Low economic stress	3112	83.3%	0.01	1228	74.4%	0.01	2317	74.8%	0.01	991	81.2%	0.01	<0.01
High economic stress	625	16.7%	0.01	423	25.6%	0.01	781	25.2%	0.01	230	18.8%	0.01	
Low interpersonal conflict	3131	79.3%	0.01	1413	82.2%	0.01	2475	77.2%	0.01	1016	83.9%	0.01	<0.01
High interpersonal conflict	819	20.7%	0.01	305	17.8%	0.01	729	22.8%	0.01	195	16.1%	0.01	
Low neighborhood crime and alcohol	2777	72.8%	0.01	1079	65.4%	0.01	2596	83.3%	0.01	1123	90.9%	0.01	<0.01
High neighborhood crime and alcohol	1039	27.2%	0.01	571	34.6%	0.01	520	16.7%	0.01	113	9.1%	0.01	
0 Stressors	798	24.9%	0.01	199	13.5%	0.01	422	16.2%	0.01	119	11.5%	0.01	<0.01
1	1015	31.7%	0.01	417	28.4%	0.01	823	31.6%	0.01	258	24.9%	0.01	
2	857	26.8%	0.01	392	26.7%	0.01	729	28%	0.01	270	26%	0.01	
3+	529	16.5%	0.01	461	31.4%	0.01	629	24.2%	0.01	391	37.7%	0.02	
0 Traumatic events	3080	80.6%	0.01	1375	81.4%	0.01	2528	80.5%	0.01	1073	89.9%	0.01	<0.01
1	263	6.9%	<0.01	91	5.4%	0.01	208	6.6%	<0.01	45	3.8%	0.01	
2	186	4.9%	<0.01	90	5.3%	0.01	157	5%	<0.01	34	2.8%	<0.01	
3	122	3.2%	<0.01	65	3.8%	<0.01	130	4.1%	<0.01	13	1.1%	<0.01	
4+	171	4.5%	<0.01	68	4%	<0.01	118	3.8%	<0.01	28	2.3%	<0.01	
Kessler10 Score**	3886	14.82	0.1	1690	14.27	0.14	3134	14.68	0.11	1191	13.92	0.17	<0.01

Unweighted N and Weighted Percentages

\*Differences between multi-group comparisons using ANOVA and  $\chi^2$  distribution

\*\*Kessler10 Score values refer to mean and standard deviation

Model 2a did not indicate any significant geographic disparities in psychological distress. In Model 2b, Africans living in formal urban settings reported significantly higher distress than those in the three other regions. Compared to the lowest quintile, those in the highest quintile of household income and wealth reported lower psychological distress. Educational attainment was inversely related to psychological distress.

In Model 2c, we did not observe any changes to the direction or significance of the results reported in Model 2b. Africans living in formal urban settings continued to report higher psychological distress than all other geographic locales. Those in the highest quintile of household income and wealth, as well as those who received a high school education or higher, continued to report lower psychological distress. The count of traumatic events demonstrated a graded positive association with psychological distress.

In Model 2d, disparities in psychological distress between Africans living in formal urban settings and those living in informal urban or rural settings were no longer significant. The psychological distress gap between Africans living in formal urban and rural settings decreased by 5%. We also observed reductions in the magnitude of the association between SES and psychological distress. The differences in psychological distress between those in the lowest education category and those in the middle and highest remained significant but were reduced by 24% and 33%, respectively. The difference in psychological distress between those in the bottom and the top quintile of wealth was reduced by 49% but remained significant. The difference between the bottom and top quintile in household income was reduced by 37% and was no longer significant. The counts of traumatic events and high chronic stress domains both displayed positive dose–response associations with psychological distress.

In Model 2e, hunger, interpersonal conflict, and stress related to problematic alcohol use in one's home were all positively associated with psychological distress. The psychological distress gap between Africans in formal urban and rural settings was reduced by 36% and was no longer significant. However, significant disparities in psychological distress emerged between Africans living in formal urban and informal rural locales, with higher psychological distress observed in the former (Table 4).

## Discussion

The present study aimed to (1) assess the extent of racial disparities in psychological distress in a nationally representative sample, (2) explore the relationship between distress and the social conditions of life as captured by stressors and traumas, and (3) examine differences in psychological distress

across formal/informal and urban/rural locales within the African subpopulation.

### Racial disparities in psychological distress

The results provide invaluable insight into the status of mental health and its correlates within a nationally representative sample. We found that Africans had higher psychological distress than other racial groups, consistent with prior studies of race and mental health in South Africa [24, 25, 48]. We also found racial disparities in SES with Africans having the highest proportion of respondents with low education, income, and wealth. Racial disparities in psychological distress persisted after adjusting for SES, however, consideration of SES did reduce the magnitude of these disparities.

When including the count of high chronic stress domains in our model, we observed that wealth was no longer associated with lower psychological distress. However, when we examined the individual stress domains, wealth was again inversely associated with distress. This may suggest that wealth is not sufficiently protective when met with the cumulative burden of high-level stress across multiple domains.

Our findings concerning SES and racial disparities in psychological distress raise important questions. We do not know how well our indicators of SES captured the socioeconomic conditions we attempted to measure. Future research should aim to clarify whether our observed patterns are related to the measurement of SES. It is possible there exist other race-related aspects of economic hardship that are not captured in our measures. Further, there are race-related aspects of social experience, such as racial discrimination, that were not assessed in this study but which prior South African research indicated helps to explain the residual racial gap in psychological distress after adjusting for SES [25, 26].

### Cumulative burden of chronic stressors and traumatic events

Roughly one-quarter of the study population experienced at least one lifetime traumatic event. Prior research has indicated a greater prevalence of traumatic events in South Africa; however, the measure we used contained fewer traumas than those previously utilized [24, 49]. The prevalence of stressors was much higher than that of traumatic events, with some 80 percent of respondents experiencing at least one.

We found that Africans reported the highest prevalence of traumatic events and at least one stressor. Africans were more likely to experience high chronic stress in all but one domain. Results from multiple regression models indicated a dose–response relationship between count of traumatic events and psychological distress, suggesting the cumulative



**Table 4** Linear regression models for psychological distress score among black South Africans (N= 10,723)

	2 <sup>a</sup> R <sup>2</sup> =0.044 β (SE)	2 <sup>b</sup> R <sup>2</sup> =0.063 β (SE)	2 <sup>c</sup> R <sup>2</sup> =0.104 β (SE)	2 <sup>***d</sup> R <sup>2</sup> =0.131 β (SE)	2 <sup>***e</sup> R <sup>2</sup> =0.246 β (SE)
Formal urban	<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
Informal urban	− 0.129 (0.44)	− 0.947 (0.47)*	− 0.862 (0.42)*	− 0.769 (0.41)	− 0.613 (0.35)
Informal rural (tribal)	− 0.099 (0.34)	− 0.887 (0.38)*	− 0.781 (0.34)*	− 0.541 (0.34)	− 0.628 (0.28)*
Formal rural (farms)	− 0.642 (0.54)	− 1.721 (0.56)**	− 1.341 (0.53)*	− 1.27 (0.54)*	− 0.813 (0.44)
Female	<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
Male	− 0.691 (0.13)**	− 0.671 (0.13)**	− 0.736 (0.13)**	− 0.684 (0.13)**	− 0.612 (0.12)**
Age	0.067 (<0.01)**	0.058 (<0.01)**	0.052 (<0.01)**	0.054 (<0.01)**	0.036 (<0.01)**
No formal schooling		<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
Grade 8–12		− 0.851 (0.21)**	− 0.846 (0.21)**	− 0.647 (0.2)**	− 0.465 (0.18)*
Higher education		− 1.122 (0.31)**	− 1.096 (0.3)**	− 0.732 (0.3)*	− 0.675 (0.29)*
Income <R5000		<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
> = 5000; < 10,000		0.106 (0.26)	0.097 (0.25)	0.093 (0.25)	0.057 (0.23)
> = 10,000; < 25,000		− 0.105 (0.27)	− 0.118 (0.26)	− 0.005 (0.26)	− 0.034 (0.22)
> = 25,000; < 50,000		− 0.183 (0.32)	− 0.249 (0.3)	0.009 (0.31)	− 0.194 (0.29)
> = 50,000		− 0.722 (0.28)*	− 0.801 (0.27)**	− 0.505 (0.27)	− 0.613 (0.24)*
Wealth Index Quintile 1 (Lowest)		<i>ref</i>	<i>ref</i>	<i>ref</i>	<i>ref</i>
2		− 0.461 (0.27)	− 0.393 (0.26)	− 0.121 (0.26)	− 0.363 (0.22)
3		− 0.333 (0.33)	− 0.269 (0.32)	0.113 (0.32)	− 0.169 (0.27)
4		− 0.683 (0.38)	− 0.587 (0.36)	0.007 (0.36)	− 0.484 (0.3)
5		− 2.029 (0.49)**	− 1.777 (0.45)**	− 0.912 (0.46)*	− 1.398 (0.38)**
0 traumatic events			<i>ref</i>	<i>ref</i>	<i>ref</i>
1			1.678 (0.28)**	1.561 (0.29)**	1.328 (0.26)**
2			2.436 (0.4)**	2.278 (0.39)**	1.829 (0.36)**
3			3.328 (0.51)**	3.061 (0.49)**	2.407 (0.46)**
4+			4.033 (0.52)**	3.824 (0.51)**	3.072 (0.49)**
0 stressors				<i>ref</i>	
1				1.172 (0.21)**	
2				1.824 (0.24)**	
3+				3 (0.33)**	
Hunger					0.59 (0.18)**
Home alcohol stress					0.728 (0.23)**
Crowding					− 0.332 (0.2)
Neighborhood inaccessibility					− 0.123 (0.2)
Economic stress					− 0.096 (0.22)
Conflict					5.344 (0.3)**
Neighborhood crime and alcohol					0.339 (0.22)

Data were analyzed on individuals aged 15 years and older who were interviewed. Therefore, data on 10,723 Black African individuals were analyzed for Table 4. The sample size presented in Table 4 is an unweighted N and the regression analyses presented in Table 4 was conducted after multiple imputation

\*p < 0.05

\*\*p < 0.01

\*\*\*Model also adjusts for alcohol in home

<sup>a</sup>Demographic variables

<sup>b</sup>Model 2a + SES variables

<sup>c</sup>Model 2b + traumatic events

<sup>d</sup>Model 2c + stressor count

<sup>e</sup>Model 2c + stressors

burden of trauma is adversely affecting the mental health of South Africans. This is consistent with prior research in South Africa, the United States, and elsewhere [24, 50, 51]. We observed an analogous association between the count of high stress domains and psychological distress. To our knowledge, no other study has examined this relationship in South Africa; however, our results are consistent with literature in the United States, suggesting that the accumulation of stressors may be a marker of stress exposure severity and place a heavy burden on mental health [52–54].

We also investigated how these stressors and traumas explained existing racial disparities in psychological distress. After including the count of traumatic events and high chronic stress domains in our multivariable models, racial disparities in psychological distress between African and White, and African and Coloured individuals, decreased but remained significant. This suggests that the cumulative burden of high exposure to multiple stressors does not fully explain the disparity in psychological distress between Africans and Whites. However, our final model replaced count of high chronic stress domains with the individual chronic stressors and demonstrated that stress related to hunger, interpersonal conflict, neighborhood-level crime and alcohol abuse were significantly associated with psychological distress, and explained the gap in psychological distress between Africans and Whites. Previous studies reported that distress is explained by a combination of stressors and that no one measure in isolation is sufficient to explain it [48].

Our findings must be understood within the broader historical context of racism in South Africa. Our measures of stressors should be viewed as downstream effects of the oppressive systems engineered under Apartheid. For example, as a stressor, hunger encapsulates the physiological stress related to malnutrition as well as the culturally influenced psychological stress of failing to provide for one's family [55, 56]. Hunger, particularly within this context, may also be considered as a marker of deprivation. That the multifaceted burden of hunger is differentially borne along racial lines may represent a long-term effect of policies designed to deprive Africans of material resources, including adequate income and good living conditions, manifesting itself in the current study as food-related and psychological disparities [57]. Similarly, neighborhood crime and alcohol abuse should be understood through a systemic lens. Alcohol has a long and insidious history of being used to maintain the imbalanced structure of power within colonial societies, particularly in South Africa, where farm laborers were often compensated with alcohol, and the effects thereof are still prevalent in recent times [58, 59]. Alcohol has been used as a labor control device—a tool to obscure laborers' attention from their own pain and the working conditions that gave rise to it, and a deterrent against organization and protest [60–64]. From a systemic perspective, with diminished

access to community-based mental health services, disadvantaged individuals are vulnerable to corporations' unregulated marketing of alcohol as a way to relieve emotional distress and suffering [65, 66]. Taken together, alcohol abuse itself, and its reciprocal relationship to neighborhood conditions and crime can be traced back to racially based deprivation. To develop policy-level and individual-level interventions to reduce racial disparities in psychological distress, it is important to recognize how colonial-era racially based deprivation, formalized into policy under Apartheid, can continue to drive the racial disparities in exposure to stressors documented in the present study.

### Geographic differences in psychological distress of Africans

Another study aim was to investigate how psychological distress varied across geographic locations within the African subpopulation. Our results indicated Africans living in formal urban settings had higher psychological distress than those living in formal rural settings. We observed a stronger association between SES and psychological distress within the African subpopulation. This may indicate the emergence of class disparities among Africans as an additional determinant over and above racial disparities. Unlike the overall population, we observed a graded relation between education and psychological distress; for Africans, higher education was increasingly associated with lower psychological distress. Similarly, the wealthiest Africans reported lower psychological distress.

These results may appear counterintuitive—from an economic standpoint, Africans living in rural settings were generally more economically deprived, with less access to services and resources. The finding that Africans living in formal urban areas, that generally have more access to services and resources, had higher psychological distress is surprising and raises important questions about stressors that the African middle class may be exposed to. Historically, Apartheid-era geospatial planning ensured Africans were segregated, through the Group Areas Act of 1951 and forced removals, into more peripheral areas of towns and cities; and that “surplus labour” was corralled into so-called Bantustans, far away from urban Whites. These racial geospatial divisions have proved remarkably persistent in the 26 years since the end of Apartheid, and are significant determinants of risk factors to physical and mental health [67]. After the abolition of Apartheid in 1991, middle-class Africans gradually moved into historically White-occupied spaces—spaces that are now formally open to them, but often remain majority White-occupied. Africans living alongside Whites in primarily higher SES environments, like the suburbs or some college campuses, likely represent a challenge to the status quo that was established by and has persisted since

Apartheid. As a result, middle-class Africans may experience stress driven by experiences of discrimination and rejection [68, 69]. For these Africans with higher SES, these experiences may also come in the primarily White workplace, which may be another source of stress [70].

Alternatively, the patterns noted for Africans living in formal urban settings could be a function of the heterogeneity of this group. While formal urban areas include suburbs (which are generally middle-to-high income, with some suburbs being very high income), this category also includes townships—formal high-density housing in urban areas that are not high income but can be middle and even low income, especially for African, Coloured or Indian individuals [71]. Thus, although formal urban areas generally have higher incomes and better access to services, as shown in Table 3, some of the Africans in formal urban areas could be living in townships and could be exposed to other unmeasured stressors such as economic deprivation, fast-paced lifestyle, crowding, and other social stressors linked to urban living. Future research should better characterize the extent of heterogeneity of Africans in formal urban areas and the specific living and working conditions that they experience.

Our results offer important implications for policy development and provide insight into the ways equity and health may be intertwined. Policies aimed at making South Africa a healthier and more equitable society should focus on the nexus of these two constructs. Data on the efficacy of mental health interventions in South Africa remain relatively limited. A 2018 review of available treatments for common mental disorders evaluated with Randomized Controlled Trials indicated that since 2000, only two interventions have been evaluated as treatments for anxiety, while eight were evaluated for depression [72]. Notably, one of the studies identified provided participants with access to small, individual loans. Men who were randomized to receive loans demonstrated lower depressive symptoms scores than those who did not, although this effect was not present among women [73]. Outside South Africa, existing research within the US has identified several different approaches for improving access to and efficacy of mental health treatment within racial minority groups, including hospital-based child wellness programs, linguistic/translational services, and community-based programs that foster positive psychological processes, including purpose and mastery [74–77].

However promising clinically focused initiatives may be, without also addressing the various structural factors which may perpetuate the accumulation of stressors and/or traumatic events, efforts to reduce racial disparities in health are likely to fall short [14]. At the same time, policy changes implemented so far in South Africa may also be insufficient to alleviate racial disparities; despite Apartheid rule ending over 20 years ago, and over 300 of its policies being repealed, racial disparities in mental health persist as

a result of the lingering pernicious effects of these policies [78]. The current racial geospatial landscape provides an excellent example of the above. The laws that implemented racial segregation by forced removals under the Group Areas Act disappeared in the late 1980s, and yet over 30 years later, the geospatial landscape still reflects the Apartheid heritage, restricting access to employment opportunities and mental health services, resulting in increased economic and psychological distress. While South Africa has been bold in its attempts to pass new policies to address the disparities created by Apartheid, existing research has identified several barriers which have slowed policy implementation, including as they relate to integrating mental health services into primary healthcare. Some of these barriers include the stigma of mental illness as a weakness, insufficiently trained nursing and mental health staff, and under-resourced health facilities in terms of staff, infrastructure, and medication [79–81]. For example, in an effort to provide equitable public healthcare to South Africans, the National Health Act was conceived in 2017, and yet the restructuring of the public health system for national health insurance has not yet occurred [82]. Current research on the struggle to provide equitable health services through national health insurance has indicated that a major implementation barrier rests in the disparity of human resources, including understaffing and inadequate management, between the private and public healthcare sectors, which serve, respectively, 18% and 82% of the population [83, 84]. This then manifests itself as inequities in the provision of mental health services between these two sectors. As a result, those who are reliant on public healthcare, including most Africans, are not only more likely to suffer from psychological, social, and economic stressors, but also less likely to receive adequate treatment for them. Therefore, policy change to remove these barriers and improve access to treatment should be considered as approaches that can act in concert, by both changing the policies which have perpetuated racial disparities in mental health, while also alleviating the effects of such policies.

### Limitations and implications for future research

In considering the findings of this study, several limitations are acknowledged. Since our data were cross-sectional, we lack information on the temporal ordering of our variables, and we can make no claims about causality. Furthermore, the data presented in this manuscript are almost a decade old and provide information about psychological distress, but not about mental disorders.

Despite the age of the data, our results are relevant to more recent South African history. In the past decade, South Africa has dealt with many societal and structural challenges that pose a risk for mental health. One such challenge has been persistent racial economic inequality—in 2008, on

average, Africans earned 13 cents for every Rand of income Whites earned (when Apartheid fell, this gap was 12 cents for every Rand) [5, 85]. In 2018, this gap has narrowed but it is still striking with Africans earning 36 cents for every Rand of income Whites earned [86]. This economic inequity is critical to understanding the context of mental healthcare in South Africa. As described above, several barriers to the integration of mental health services into primary care facilities have created the conditions whereby there is extremely limited public access to mental health treatment outside of inpatient care. While private mental health resources exist, the cost of these services ensure that only wealthy South Africans (mostly White) can afford them. This reality suggests that persistent economic stressors—like hunger—will continue to be disproportionately experienced by Black and poor South Africans, and those who experience them will face barriers to receiving affordable treatment.

Our results are also germane to contemporary issues South Africa has faced during the COVID-19 pandemic. COVID-19, and the lockdown it has induced, has caused major disruptions in food supply chains partially due to lack of transportation and accessibility for farming communities [87]. Those South Africans who are insecure in their access to food and depend on social programs have seen cuts to these programs during the pandemic [88]. The lockdown also affected South Africa's struggles with alcohol abuse. After a controversial decision was made by public figures to ban alcohol products during the early stages of the pandemic, the South African healthcare system reported reductions in trauma cases, assault, accidents, sexual assault, and unnatural deaths [89–92].

Our results also have implications for the current political unrest South Africa is contending with, most of which has occurred within African and Indian townships. The rioting and subsequent looting that has taken place in these townships will have a marked negative effect on the psychological distress and economic stress of its residents. Furthermore, the violence that has occurred during the unrest (337 deaths as of July 22, 2021) will have consequences for exposure to traumatic events at the population level and will also be disproportionately experienced by the majority African and Indian inhabitants of those townships [93, 94].

We therefore recommend that the SANHANES study be repeated, to determine the current status of mental health, social inequities in mental health, and the extent of progress in eliminating the racial disparities in psychological distress, especially in the wake of the COVID-19 pandemic and recent political unrest. We also note that SANHANES did not include any items measuring the stress of discrimination. Future nationally representative surveys should include measures of discrimination and other potential negative race-related experiences of

racially disadvantaged South Africans at all SES levels [26]. Furthermore, while this analysis explored the extent to which contextual stressors accumulate, future research should aim to identify the extent of different patterns of stressor clustering and the degree to which such clusters may vary across different racial or socioeconomic groups.

These limitations notwithstanding, the results presented in this manuscript come from a nationally representative, probability sample of adult South Africans. Our findings provide the reader with invaluable insights into the state of racial disparities in mental health, the cumulative adverse associations of stressors and traumatic events with psychological distress, and how it varies by geographic locale within the African population.

## Conclusions

The results of this scientific inquiry have implications for policy change and future research. We found racial disparities across several mental health-related domains. Africans had greater exposure to traumatic events, social stressors, and psychological distress. Within the African population, we observed disparities in psychological distress between urban and rural settings, with higher psychological distress among Africans in formal urban settings. Racial disparities in various domains of health are well documented in South Africa, and the results of this study contribute to an actionable knowledge base in this field. This research can also inform the development of policies that aim to make South Africa a healthier and more equitable society.

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**Author contributions** NH conducted statistical analyses and drafted the introduction, results, and discussion. DRW supervised data analysis and provided feedback on all sections of manuscript drafts. JWM conducted statistical analyses and drafted the methods and tables. RS, supervised data analysis, drafted the methods, and provided written feedback on the introduction, results, and discussion. TM, SS, and MM all provided written feedback on all sections of manuscript drafts. ADM and SPR developed the study design and provided written feedback on all sections of manuscript drafts. All authors have read and agreed to the published version of the manuscript.

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**Code availability** Data analysis code will be made available upon request to the authors.

## Declarations

**Conflict of interest** On behalf of all authors, the corresponding author states that there is no conflict of interest.

**Ethical approval** Ethical approval for the study was obtained from the Research Ethics Committee (REC) of the South African Human Sciences Research Council (HSRC) (REC number: 6/16/11/11). The Helsinki ethics protocol was followed throughout the course of this study.

**Consent to participate/publication** Informed written consent/assent to participate and publish was obtained from all the survey participants. Parental consent was also obtained from participants aged 15–17 years.

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