

Title: Social and Economic Correlates of Depressive Symptoms and Perceived Stress in South African Adults

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ABSTRACT

OBJECTIVES: Adults in South Africa demonstrate rates of mental illness at or above levels elsewhere in the developing world. Yet there is a research gap regarding the social context surrounding mental health in this region. The objective of this analysis was to characterize prevalence and correlates of depressive symptoms and perceived stress among a heterogeneous South African population. METHODS: Low-income adults (n=257) in Capetown, Port Elizabeth, and Durban were interviewed regarding demographics, income, subjective social status, life events, and decision-making. The Center for Epidemiologic Studies Depression Scale (CES-D) and Cohen's Perceived Stress Scale (PSS) were used. RESULTS: CES-D scores were 18.8 ±11.7, with 50.4% of men and 64.5% of women exceeding the cut-off at which professional care is recommended (p = 0.03). PSS scores were 18.6 ±6.7, with a mean of 17.5 among men and 19.6 among women (p = 0.02). In multi-variate regressions, increased CES-D scores were associated with more household members (p < 0.1), lower educational attainment (p = 0.07), less income stability (p < 0.07), lower subjective social status (p < 0.01), and independent decision-making (p = 0.04). Increased PSS scores were associated with female gender (p < 0.05), multi-racial race (p < 0.02), more household members (p < 0.1), lower subjective social status (p < 0.02), and recent birth or catastrophe (p < 0.01). CONCLUSIONS: Depressive symptoms and perceived stress are public health concerns in this sample, with more symptoms among those with fewer resources. The prevention of mental illness is critical, especially in vulnerable populations.

BOX: WHAT THIS PAPER ADDS

In Sub-Saharan Africa, health researchers and practitioners have focused primarily on reducing infectious diseases and promoting conditions relating to physical well-being. However, the protection of mental health is an equally high priority. Some preliminary research from South Africa suggests that there are particular populations at greatest risk for mental illness, but the existing studies are small and have not used multi-variate models for analysis.

The study reported here demonstrates a high number of depressive symptoms and high number of symptoms of perceived stress among low-income South African adults who applied for a high-interest rate loan. Higher levels of depressive symptoms and perceived stress were independently associated with female gender, multi-racial background, greater household size, and lower subjective social status. These results suggest that many South African adults living in poverty are at great risk of experiencing depressive symptoms and perceived stress, and that future interventions should target adults within this population who are particularly vulnerable.

15 INTRODUCTION

Mental illness encompasses a wide variety of psychiatric conditions, including psychotic disorders, anxiety disorders, and mood disorders (e.g. depression). Depression includes symptoms such as feelings of sadness, worthlessness, or guilt, whereas anxiety, involves feelings of tension, fear, and apprehension.[1] Unipolar depressive disorder, a form of depression, is the leading cause of years lost due to disability (YLD) in high-, low-, and middle-income countries, and the seventh leading contributor to disability-adjusted life years (DALYs) worldwide.[2] Yet in many parts of the world the stigma and lack of awareness surrounding depression prevents individuals who suffer from psychiatric illnesses from receiving proper treatment.[3]

In Africa, depression was historically thought to be rare or non-existent,[4] and even today the prevalence of mental illness in general remains underestimated.[2] Newer studies, however, have demonstrated prevalences at or above levels elsewhere in the developing world,[5] with particular vulnerability in certain subgroups such as women and individuals of low socio-economic status (SES).[6-10] In Sub-Saharan Africa, many other conditions including infectious diseases and conditions surrounding maternal and child health compete for the attention of healthcare providers.

Prevalence ranges of mental disorders in South Africa are difficult to report since studies examine different psychiatric conditions and use different measurement techniques even when studying the same conditions. For example, one analysis of a very small sample in a rural village found the prevalence of psychiatric morbidity to be 27%,[9] and a similar study in a rural and largely impoverished area of the KwaZulu-Natal province showed a 23.9% prevalence of depression and anxiety.[6] In another small study, South African college students had higher depression scores than Nigerian or American students but prevalence rates were not reported.[11]

In a *developed* country setting poor mental health has been found to be associated independently with female gender, low educational attainment, poor health, unemployment, low income, and lack of a stable marriage.[12-18] Studies in *developing* countries are fewer in number, but generally produce similar findings, with increased depression or emotional stress associated with lower educational attainment, greater poverty, worse health, lack of a stable marriage,[19] and employment in an informal job rather than a formal job.[20]

In South Africa, depression has been associated with gender and race, albeit in small and non-representative studies. Women have been shown to be more likely to present with

depression, while men are more likely to suffer from substance abuse and psychotic illnesses.[7, 10, 21] South African students of differing African-origin ethnicities have been shown to have similar depression scores, although the study did not include whites, Indians, or those of multi-racial descent for comparative analyses.[11, 22] Other studies in South Africa suggest that higher levels of depressive symptoms are associated with being low income, being unmarried, having low education, and having poor health.[6, 23-25]

While these analyses suggest that correlations between mental illness and various demographic or socio-economic characteristics, there is a gap in the research when it comes to rigorous and multivariate analyses examining the risk factors and social context surrounding depression in Sub-Saharan Africa. We could only find one study that assessed the associations between depression and SES while controlling for other factors, conducted among pregnant women receiving HIV testing at antenatal clinics in KwaZulu-Natal.[8] Integrated models are critical in elucidating the determinants of depression and the ways in which social and environmental factors interact with biological mechanisms to alter mental health.[10]

To address this critical research gap, the analysis reported here will use a more rigorous methodology to better understand mental illness and associated factors in a South African context. The objective of this analysis was to characterize the prevalence of depressive symptoms and perceived stress within this heterogeneous sample and to explore the contextual factors related to variations in these outcomes.

METHODS

Study Design and Sampling

Our sample frame was comprised of individuals who had applied to a microcredit lending organization with branches in Capetown, Port Elizabeth, and Durban; details on the consumer credit market and of the sample collection have been reported previously.[26] Briefly, new applicants to the program were selected between September and November, 2004; these 5 applicants had initially been rejected by the lender but were deemed potentially creditworthy. An independent firm surveyed 787 of these individuals or another person in their household, with an interview that included questions on demographics, socio-economic status, subjective social status, major life events, household decision-making, and various indicators of mental health. Only one individual per household was interviewed. The surveys were conducted in 10 English and translated as needed. Surveyors were able to complete 626 surveys for an 80% response rate. Mental health data were collected in roughly 50% of the cases when the loan applicant could be interviewed, producing the final sample size of 257 of these individuals to achieve the final sample size.

Ethics approval for this research was obtained from the Princeton University Institutional 15 Review Panel, and the research proposal was reviewed and approved by the legal department of the South African lending organization with whom we worked.

Measures

Mental Health

20 Depressive symptoms were assessed using the Center for Epidemiologic Studies Depression Scale (CES-D), a 20-item questionnaire designed to assess intensity of depressive symptoms.[27, 28] Scores range from 0 to 60, with a generally accepted cut-off score of 16 in the United States

for high risk of clinical depression.[28] The CES-D has been used previously in Africa, but not validated.[29, 30] In the current study, Cronbach's alpha for the total CES-D score was 0.88.

5 General perceived stress over the past week was assessed using a 10-item version of Cohen's Perceived Stress Scale (PSS).[31] The test includes questions relating to experiences in the last month. Scores range from 0 to 40, and the test had a Cronbach's alpha of 0.72. The test has not been previously used in the African context, but has been used widely in other countries (e.g., Jordan,[32] Korea,[33] and Spain[34]).

Sociodemographic

10 Details of the subjects' demographic and socio-economic characteristics were ascertained through questions about gender, age, marital status, race, educational attainment, household size, province of residence, and number of people living in the household. The four primary classifications of self-reported race were African, white, Indian, and multi-racial. The three categories of education were defined as: 1) up to grade 7; 2) completion of grades 8 through 12; 15 and 3) completion of some post-secondary education.

Income

We asked about the total household income in the 30 days before the interview. Other income-related variables addressed the source of income, including whether someone in the 20 household had regular employment and whether anyone received non-employment income (including pensions, disability grants, unemployment insurance, and child support).

Events

We also queried participants about various major life events that had occurred in the household in the last 12 months. To simplify the analysis, these were categorized into 1) birth, 2) catastrophe (including fire or flood), and 3) other (such as weddings, funerals, theft, initiation ceremonies, and others). Both mothers and fathers are known to experience poor mental health in the post-partum period,[35, 36] and major disasters also have been associated with mental illnesses such as depression and post-traumatic stress disorder.[37]

Social Status

Subjective social status was assessed using the MacArthur Scale of Subjective Social Status, which asks participants to place themselves on a ladder in reference to a population.[38] The instrument has two parts, one linked to traditional SES indicators (income and education) that asks participants to rate themselves relative to everyone in their country, and one linked to a more immediate, local environment (placement in local community).[35, 39] For the purposes of the assessment described here, we developed an additional subjective social scale, asking the participant where they fit on a 9-point scale ranging from “extremely uncreditworthy” to “very creditworthy.”

Household Decision-Making

Respondents who reported that they were married or living with their partners were queried about who made the decisions in the relationship about various issues (e.g. spending, family planning decisions, and assisting relatives). We asked whether the primary decision-maker on each of these issues was (1) the respondent, (2) both the respondent and his/her spouse or partner, or (3) the spouse/partner alone or someone else. Studies suggest that mental well-being,

particularly that of women, is affected by the role that an individual plays in the household, including decision-making, financial power, and distribution of chores.[40] Because only individuals in relationships were asked these questions, the sample size for this variable was smaller than that for the entire sample (n=83, 32.3.0% of sample).

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Data Analysis

Continuous variables were evaluated for skew. Income was found to have a positive skew and was normalized by taking the logarithm. Then, unadjusted associations between explanatory variables and the two outcome variables (depressive symptoms and perceived stress) were examined using simple linear regression. In these bivariate analyses, we also considered income adjusted for household size by dividing total income in the last 30 days by the number of people in the household. Variables with theoretical importance and those displaying a significant association in the unadjusted model were used to build the multiple regression models for each of the outcome variables. Sample sizes varied in the different models due to missing data. There were no differences by gender in directions of the associations with depressive symptoms and perceived stress, so results for women and men were analyzed together to preserve power.

We then used linear multiple regression techniques to assess the contribution of several variables to our measures of depressive symptoms (Models D1-D5), and perceived stress (Models S1-S5). Model D1 included the demographic variables: gender, age, race, province of residence, and number of people in household; these variables were included in all subsequent models. Model D2 included measures of SES: education, income, and sources of regular and non-employment income. This model included income unadjusted for household size, since household size was included as a separate predictor variable. Model D3 included measures of

subjective social status: place on community, country, and creditworthy ladders. Model D4 included variables representing major life events: birth, catastrophe, and other. Model D5 included variables representing household decision-making: number of decisions made by the respondent alone, and number made by the respondent in conjunction with his/her partner.

5 Models S1-S5 were constructed identically, with perceived stress as the outcome variable.

All data were analyzed using StataSE 9.2 (StataCorp, Inc.). Indicator variables were included in all analyses to account for the three geographic regions where the study took place.

RESULTS

10 The individuals surveyed in this study were diverse with respect to gender, age, ethnicity, and various other demographic factors, as illustrated in Table 1.

Table 1. Variables of interest by gender of respondent.

Variable	Gender		Test of proportions or t-test*
	Male (n=123)	Female (n=133)	
Demographic characteristics			
Age (% in each category)			
< 20 yrs	1.6	0.01	NS
20 to 29 yrs	33.3	31.6	NS
30 to 39 yrs	37.4	31.6	NS
40 to 49 yrs	18.7	25.6	NS
50 to 59 yrs	4.1	7.5	NS
> 59 yrs	4.9	3.0	NS
Marital Status (% in each category)			
Married, living with partner	47.2	32.3	0.02
Single, widowed, separated/divorced	52.9	67.7	0.02
Self-reported race (% in each category)			
African	65.9	71.2	NS
Multi-racial	25.2	22.7	NS
Indian	4.9	4.6	NS
White	4.1	1.5	NS
Province (% in each category)			
Eastern Cape	36.6	27.8	NS

Western Cape	29.3	40.6	0.06
KwaZulu Natal	34.2	31.6	NS
Number in Household (% in each category)			
1 to 2	22.8	13.5	0.05
3 to 8	61.8	71.4	NS
>8	15.4	15.0	NS
Socio-economic characteristics			
Formal education (% in each category)			
< 7 years	15.5	12.0	NS
8 - 12 years	66.7	63.2	NS
> 12 years	17.9	24.8	NS
Income from Regular Employment (%)	77.2	75.9	NS
Sources of Non-Employment Income (mean number of sources)	0.58	0.82	0.03
Income in Last 30 Days (median; US\$) [‡]	279	241	NS
Income in Last 30 Days, Adjusted for Household Size (median; US\$) [‡]	70.8	50.2	NS
Subjective social status			
Community Ladder (mean)	4.50	4.35	NS
Country Ladder (mean)	3.93	4.01	NS
Creditworthy Ladder (mean)	4.60	4.08	NS
Other variables of interest			
Events Not Incl Birth & Catastrophe (mean number of events)	1.60	1.64	NS
Birth in Household (%)	8.9	10.5	NS
Catastrophe in Household (%)	7.3	5.3	NS
Decision-making (mean number of items)			
Respondent Alone	3.37	4.84	0.05
Respondent w/ Partner	6.55	6.41	NS
Partner/Other Alone	3.08	1.75	0.01

* NS = not significant, $p > 0.10$.

[‡] US\$1 = 7.3 South African Rands. For statistical analysis, the logarithm of this variable was computed because of positive skew.

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Depressive symptom scores in the sample overall were 18.8 ± 11.7 , with 57.4% of the sample higher than the standard proposed cut-off of 16 used in US populations (Table 2). Among men, 50.4% had scores that exceeded this cut-off, compared with 64.5% of women. Perceived stress

scores were 18.6 ± 6.7 , with a score of 17.5 among men and 19.6 among women; there is no standard cut-off used for this measure.

Table 2. Summary of mental health indicators.

Indicator	Percent > 16		Test of proportions	Mean		t-test
	Men	Women		Men	Women	
Depressive symptoms ¹	50.4	64.5	0.03	17.9	19.8	NS*
Perceived stress ²	---	---	---	17.5	19.6	0.02

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* NS = not significant, $p > 0.10$.

1. Depressive symptoms measured with Center for Epidemiologic Studies Depression Scale (CES-D). Cut-off above which professional care is recommended is 16.[27, 28]
2. Perceived stress measured with Cohen's Perceived Stress Scale (PSS).[31] No standard cut-off.

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Simple Linear Regressions

Univariate analyses revealed associations between the mental health measures and various independent variables, which have been grouped into several categories including demographic, socio-economic, subjective social status, life events, and decision-making (Table 3). Decreased levels of depressive symptoms were associated with education beyond primary school, white race as compared to African race, and fewer household members. Moreover, regular employment and higher income in the last 30 days were associated with decreased depressive symptoms, while more sources of non-employment income were correlated with increased depressive symptoms. Higher placement of oneself on the community, country, or creditworthy ladder was associated with lower depressive symptom scores. The occurrence of various major life events – birth and catastrophe, in particular – were also associated with increased depressive symptoms. Respondents who reported making more decisions by themselves reported increased

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depressive symptoms, while those who reported making decisions in conjunction with their partners reported lower levels of depressive symptoms.

Increased perceived stress was associated with female gender, multi-racial race as compared to African race, and higher number of household members. More sources of non-employment income was also associated with having a higher perceived stress score, as were lower self-perceived placement on community, country, and creditworthy ladders, and the occurrence of a birth or catastrophe. Finally, decision-making variables were once again significant, associated with higher perceived stress for decision-making alone, and lower perceived stress for those making decisions in coordination with a partner.

10 *Table 3. Simple linear associations between possible explanatory variables and mental health indicators.*

Variable	Depressive symptoms	Perceived stress scale
	β	β
<i>Mental Health</i>		
Depressive symptoms ¹	---	0.37**
Perceived stress scale ²	1.13**	---
<i>Sociodemographic</i>		
Female Gender	1.88	2.04*
Age (years)	0.03	-0.03
Marital Status		
Not married (reference)	---	---
Married	1.82	1.08
Race		
African (reference)	---	---
Colored	-0.31	2.33*
Indian	1.27	2.27
White	-9.62*	-3.32
Province		
Eastern Cape (reference)	---	---
Western Cape	-2.91	0.50
KwaZulu Natal	-2.26	-0.22
Number in Household	0.48*	0.24+
<i>Socio-economic Status</i>		

Education		
<G7 (reference)	---	---
G8-G12	-4.92*	-0.21
>G12	-7.56**	-1.06
Regular employment	-4.02*	-1.27
Sum of non-employment incomes	3.37**	0.89+
Total income last 30 days	-1.73*	-0.31
Total income last 30 days (adjusted for household size)	-2.52**	-0.61
<i>Subjective Social Status</i>		
Place on community ladder	-2.02**	-0.78**
Place on country ladder	-1.09**	-0.54*
Place on creditworthiness ladder	-1.25**	-0.65**
<i>Major Life Events</i>		
Events not incl birth & catastrophe	1.42*	0.33
Birth	6.20*	4.94**
Catastrophe	9.42**	4.76**
<i>Decision-making</i>		
Respondent alone	1.11**	0.53*
Respondent w/partner	-1.11**	-0.50*
Partner/other alone	0.52	0.21

** p < 0.01

* p < 0.05

+ p < 0.10

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1. Depressive symptoms measured with Center for Epidemiologic Studies Depression Scale (CES-D). Cut-off above which professional care is recommended is 16.[27, 28]
2. Perceived stress measured with Cohen's Perceived Stress Scale (PSS).[31] No standard cut-off.

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Multivariate Regressions

In Models D1 to D5 (Table 4), having more depressive symptoms was associated with having a higher number of household members, more sources of non-employment income, lower total income in the last 30 days, high school education as compared to less than high school education, lower self-perceived status on the community and creditworthy ladders, recent

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experience of a birth, catastrophe, or other life event, and making decisions without one's partner. Additionally, in Models D4 and D5 female gender was associated with increased depressive symptoms, while in Model D1 white race was associated with fewer depressive symptoms, and in Model D4 living in the Western Cape was associated with fewer depressive symptoms.

Table 4. Multivariate regression model – depressive symptoms.

	Model D1 β (95% CI)	Model D2 β (95% CI)	Model D3 β (95% CI)	Model D4 β (95% CI)	Model D5 β (95% CI)
Observations	242	195	240	239	78
Gender (1=female)	2.07	0.75	1.32	2.46+	5.74*
	(-0.90 - 5.04)	(-2.43 - 3.93)	(-1.47 - 4.10)	(-0.45 - 5.37)	(0.63 - 10.86)
Age	0.01	-0.14	-0.02	0.01	-0.05
	(-0.12 - 0.14)	(-0.30 - 0.03)	(-0.14 - 0.11)	(-0.12 - 0.14)	(-0.31 - 0.21)
Race: multi-racial	-0.07	1.43	2.85	1.85	0.53
	(-3.85 - 3.72)	(-2.74 - 5.60)	(-0.95 - 6.65)	(-2.03 - 5.73)	(-5.72 - 6.78)
Race: Indian	2.88	0.71	4.12	4.69	-1.03
	(-4.37 - 10.14)	(-7.91 - 9.33)	(-2.85 - 11.08)	(-2.46 - 11.84)	(-12.34 - 10.27)
Race: white	-8.38+	-6.4	-5.26	-7.57	-9
	(-17.91 - 1.14)	(-15.49 - 2.68)	(-14.15 - 3.63)	(-16.86 - 1.72)	(-20.50 - 2.51)
Province: KwaZulu-Natal	-2.41	-2.19	-1.72	-2.4	-2.08
	(-6.24 - 1.41)	(-6.43 - 2.05)	(-5.28 - 1.83)	(-6.15 - 1.36)	(-8.64 - 4.47)
Province: Western Cape	-2.74	-1.87	-2.56	-4.23*	-2.54
	(-6.48 - 1.00)	(-5.76 - 2.02)	(-6.05 - 0.92)	(-8.00 - -0.46)	(-8.41 - 3.34)
Number of people in household	0.41+	0.26	0.42+	0.21	0.92+
	(-0.05 - 0.86)	(-0.32 - 0.84)	(-0.01 - 0.84)	(-0.26 - 0.67)	(-0.03 - 1.87)
Education: G8-G12		-4.99+			
		(-10.44 - 0.47)			
Education: >G12		-4.06			
		(-10.51 - 2.40)			
Regular employment income		0.84			
		(-4.30 - 5.98)			
Non-employment income		2.63*			
		(0.39 - 4.86)			

Total income last 30 days		-1.57+			
		(-3.26 - 0.12)			
Place on community ladder			-1.82**		
			(-2.71 - -0.93)		
Place on country ladder			0.02		
			(-0.86 - 0.90)		
Place on creditworthy ladder			-0.73*		
			(-1.29 - -0.17)		
Events not incl birth & catas				1.67*	
				(0.33 - 3.00)	
Birth				4.89+	
				(-0.20 - 9.99)	
Catastrophe				9.29**	
				(3.28 - 15.31)	
Solo decision-making					0.02
					(-1.19 - 1.23)
Joint decision-making					-1.12*
					(-2.20 - -0.04)
Constant	17.23**	36.70**	28.42**	14.07**	20.31*
	(10.66 - 23.79)	(22.06 - 51.33)	(21.42 - 35.43)	(7.40 - 20.74)	(0.20 - 40.42)
R-squared	0.048	0.133	0.197	0.127	0.31

** p < 0.01

* p < 0.05

+ p < 0.10

5 In Models S1 to S5 (Table 5), increased perceived stress was associated with female gender, multi-racial race, and more household members. Moreover, higher levels of perceived stress were associated with lower increased self-perceived status on the community and creditworthy ladders, recent birth, or catastrophe. Also, in Model S3 Indian race was associated with increased perceived stress.

10 *Table 5. Multivariate regression model – perceived stress.*

	Model S1 β (95% CI)	Model S2 β (95% CI)	Model S3 β (95% CI)	Model S4 β (95% CI)	Model S5 β (95% CI)
Observations	248	200	246	246	82
Gender (1=female)	2.13*	1.95*	1.82*	2.18**	4.11*
	(0.48 - 3.78)	(0.02 - 3.88)	(0.25 - 3.38)	(0.58 - 3.79)	(0.93 - 7.30)
Age	-0.04	-0.06	-0.04	-0.03	-0.08
	(-0.11 - 0.04)	(-0.16 - 0.04)	(-0.12 - 0.03)	(-0.10 - 0.05)	(-0.24 - 0.07)
Race: multi-racial	2.68*	3.08*	4.44**	3.40**	2.84
	(0.61 - 4.76)	(0.58 - 5.58)	(2.33 - 6.55)	(1.28 - 5.53)	(-1.04 - 6.73)
Race: Indian	2.47	1.78	3.93*	2.9	-1.63
	(-1.46 - 6.40)	(-3.17 - 6.73)	(0.12 - 7.74)	(-0.98 - 6.77)	(-8.84 - 5.57)
Race: white	-2.47	-2.27	-0.8	-2.18	-0.76
	(-7.45 - 2.51)	(-7.40 - 2.87)	(-5.51 - 3.91)	(-7.03 - 2.68)	(-7.70 - 6.17)
Province: KwaZulu-Natal	0.37	-0.24	0.7	0.71	0.05
	(-1.75 - 2.48)	(-2.80 - 2.31)	(-1.30 - 2.69)	(-1.37 - 2.79)	(-4.09 - 4.20)
Province: Western Cape	0.02	0.35	0.26	-0.13	-1.93
	(-2.05 - 2.08)	(-1.97 - 2.66)	(-1.70 - 2.21)	(-2.21 - 1.94)	(-5.53 - 1.67)
Number of people in household	0.25+	0.18	0.25*	0.14	0.54+
	(-0.01 - 0.50)	(-0.17 - 0.53)	(0.01 - 0.49)	(-0.12 - 0.40)	(-0.09 - 1.16)
Education: G8-G12		-1.5			
		(-4.64 - 1.63)			
Education: >G12		-1.38			
		(-5.09 - 2.34)			
Regular employment income		0.64			
		(-2.38 - 3.66)			
Non-employment income		0.39			
		(-0.92 - 1.69)			
Total income last 30 days		-0.55			
		(-1.57 - 0.46)			
Place on community ladder			-0.62*		
			(-1.12 - -0.13)		
Place on country ladder			-0.39		
			(-0.88 - 0.10)		
Place on creditworthy ladder			-0.44**		
			(-0.76 - -0.13)		
Events not incl birth & catas				0.53	

				(-0.21 - 1.27)	
Birth				4.40**	
				(1.57 - 7.23)	
Catastrophe				5.31**	
				(1.84 - 8.77)	
Solo decision-making					-0.05
					(-0.82 - 0.72)
Joint decision-making					-0.49
					(-1.17 - 0.19)
Constant	16.73**	22.70**	22.70**	15.05**	19.99**
	(13.04 - 20.42)	(14.13 - 31.27)	(18.72 - 26.69)	(11.27 - 18.83)	(7.29 - 32.68)
R-squared	0.079	0.096	0.2	0.152	0.246

** p < 0.01

* p < 0.05

+ p < 0.10

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DISCUSSION

Findings

Depressive symptom scores were high compared with other studies that have used the CES-D, and 50.4% of men and 64.5% of women exceeded the cut-off of 16, used in the United States to ascertain risk for depression. The mean CES-D score in our sample was 18.8 ±11.7. As a basis of comparison, previous studies have reported CES-D scores that range from 16.2 to 17.9 for low-income individuals in the United States,[41] and 8.9 to 12.9 among the general United States population.[42] Perceived stress scores were also high, with men scoring 17.5 on average, and women scoring 19.6. Increased depressive symptoms were associated with having more household members, non-white race, lower educational attainment, more sources of non-employment income, lower income in the last 30 days, lower subjective social status on the community and creditworthy ladders, and making decisions without a partner. Increased

perceived stress was associated with female gender, multi-racial background, more household members, lower subjective social status on the community and creditworthy ladders, and occurrence of a birth or catastrophe.

Participants in our study had a mean annual income of US\$6,465, which is notably lower than the US\$13,000 estimated GDP per capita for South Africa,[43] indicating the low SES of our sample. These data are confirmed by the placement by study participants on the subjective ladders. Mean self-perceived status in reference to the country of South Africa was 4.0 and mean placement in reference to the community was 4.4, suggesting that the study participants perceived themselves to be of low SES. In addition, they perceived themselves to be lower than the reference population in terms of creditworthiness. Despite this seeming homogeneity, we found that our sample was diverse, with the range of SES profiles among subjects – in particular education and non-employment income – associated with increases in depressive symptoms and perceived stress scores.

The primary limitations to interpreting and generalizing from this study are the design, the sample population, and the instruments. Because the design was cross-sectional, it precludes the possibility of drawing conclusions about the directionality of the associations between the variables. Furthermore, since the study subjects were selected from a pool of marginally creditworthy applicants for a high-interest rate (200% annualized percentage rate) lending product, they represent a potentially marginalized and low SES population, and hence their scores and risk factors may differ from those of the general South African populace. Moreover, we did not collect data on HIV status, a health factor that may significantly affect mental health, economic, and other outcomes in the context of South Africa where the prevalence of HIV is

very high. Finally, the survey instruments have not been previously validated in South Africa, so they may not accurately capture local conceptions or manifestations of mental illness.

There is a shortage of treatment options available for depressive and anxiety disorders in South Africa,[7, 44] with a focus instead on tertiary care for psychotic and substance abuse disorders. Furthermore, primary care providers are generally not trained to detect minor psychiatric disorders such as depression and anxiety.[6, 9, 25] Despite a 1997 White Paper presented by the South African Department of Health that encouraged increasing resources in mental healthcare,[45] the Department's 2006-2007 Annual Health Plan made no mention of mental illness as a public health priority.[46] Moreover, studies assessing community attitudes towards mental illness in South Africa find that there is stigma surrounding the mentally ill, and misunderstanding with respect to the causes of mental illness, both of which may affect the seeking of treatment.[47] Consequently, the results of this study will contribute towards better awareness of the correlates of mental health in South Africa so that interventions can be more effectively designed and executed in the future.

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COMPETING INTERESTS

None.

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REFERENCES

1. Eisendrath SJ, Lichtmacher JE. Psychiatry. In: McPhee SJ, Papadakis MA, Tierney LM, Jr., editors. *Current Medical Diagnosis & Treatment*. New York City: McGraw-Hill Professional, 2007.
- 5 2. Lopez AD, Mathers CD, Ezzati M, et al., editors. *Global Burden of Disease and Risk Factors*. Washington, DC: Oxford University Press and the World Bank, 2006.
3. Jamison DT, Breman JG, Measham AR, et al., editors. *Disease Control Priorities in Developing Countries*. Washington, DC: Oxford University Press and the World Bank, 2006.
- 10 4. Jegede RO. Depression in Africans revisited: a critical review of the literature. *Afr J Med Med Sci* 1979;**8**:125-32.
5. Tomlinson M, Swartz L, Kruger L-M, et al. Manifestations of affective disturbance in sub-Saharan Africa: key themes. *J Affect Disord* 2006;**(in print)**.
6. Bhagwanjee A, Parekh A, Paruk Z, et al. Prevalence of minor psychiatric disorders in an adult African rural community in South Africa. *Psychol Med* 1998;**28**:1137-47.
- 15 7. Pillay AL, Sargent C. Descriptive profile of sex and psychiatric diagnosis among rural and peri-urban clinic attenders in South Africa. *Psychol Rep* 2003;**92**:595-8.
8. Rochat TJ, Richter LM, Doll HA, et al. Depression among pregnant rural South African women undergoing HIV testing. *Jama* 2006;**295**:1376-8.
- 20 9. Rumble S, Swartz L, Parry C, et al. Prevalence of psychiatric morbidity in the adult population of a rural South African village. *Psychol Med* 1996;**26**:997-1007.
10. Strelbel A, Msomi N, Stacey M. A gender and racial epidemiological profile of public psychiatric hospitals in the Western Cape. *S Afr J Psychol* 1999;**29**:53-61.
11. Lester D, Akande A. Patterns of depression in Xhosa and Yoruba students. *J Soc Psychol* 1997;**137**:782-3.
- 25 12. Brown GW, Moran PM. Single mothers, poverty, and depression. *Psychol Med* 1997;**27**:21-33.
13. Costello EJ. Married with children: predictors of mental and physical health in middle-aged women. *Psychiatry* 1991;**54**:292-305.
- 30 14. Bruce ML, Takeuchi DT, Leaf PJ. Poverty and psychiatric status: Longitudinal evidence from the New Haven Epidemiologic Catchment Area Study. *Arch Gen Psych* 1991;**48**:470-474.
15. Koster A, Bosma H, Kempen GI, et al. Socioeconomic differences in incident depression in older adults: The role of psychosocial factors, physical health status, and behavioral factors. *J Psychosom Res* 2006;**61**:619-27.
- 35 16. Ostrove JM, Feldman P. Education, income, wealth, and health among whites and African Americans. *Ann N Y Acad Sci* 1999;**896**:335-7.
17. Piccinelli M, Wilkinson G. Gender differences in depression. Critical review. *Br J Psychiatry* 2000;**177**:486-92.
- 40 18. Reading R, Reynolds S. Debt, social disadvantage and maternal depression. *Soc Sci Med* 2001;**53**:441-53.
19. Ahmed SM, Chowdhury M. Microcredit and emotional well-being: the case of poor rural women from Matlab, Bangladesh. *World Development* 2001;**29**:1957-1966.
- 45 20. Santana VS, Loomis D, Newman B, et al. Informal jobs: another occupational hazard for women's mental health? *Int J Epidemiol* 1997;**26**:1236-42.

21. Strebel A, Stacey M, Msomi N. Gender and Psychiatric Diagnosis: A Profile of Admissions to Mental Hospitals in the Western Cape Province, South Africa. *Arch Womens Ment Health* 1999;**2**:75-81.
- 5 22. Lester D, Akande A. Depression and suicidal preoccupation in South African students. *Psychol Rep* 1999;**85**:242.
23. Morojele NK, Brook JS. Sociodemographic, sociocultural, and individual predictors of reported feelings of meaninglessness among South African adolescents. *Psychol Rep* 2004;**95**:1271-8.
- 10 24. Peltzer K, Cherian VI, Cherian L. Minor psychiatric morbidity in South African secondary school pupils. *Psychol Rep* 1999;**85**:397-402.
25. Pillay AL, Sargent CA. Relationship of age and education with anxiety, depression, and hopelessness in a South African community sample. *Percept Mot Skills* 1999;**89**:881-4.
26. Karlan D, Zinman J. Expanding Credit Access: Using Randomized Supply Decisions to Estimate the Impacts - Working Paper 108. Washington, DC: Center for Global Development, 2006.
- 15 27. Cheung CK, Bagley C. Validating an American scale in Hong Kong: the Center for Epidemiological Studies Depression Scale (CES-D). *J Psychol* 1998;**132**:169-86.
28. Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement* 1977;**1**:385-401.
- 20 29. Kaharuza F, Bunnell R, Moss S, et al. Depression and CD4 cell count among persons with HIV infection in Uganda. *AIDS Behav* 2006;**10**:S105-S111.
30. Poupard M, Ngom Gueye N, Thiam D, et al. Quality of life and depression among HIV-infected patients receiving efavirenz- or protease inhibitor-based therapy in Senegal. *HIV Med* 2007;**8**:92-95.
- 25 31. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983;**24**:385-396.
32. Hattar-Pollara M, Dawani H. Cognitive appraisal of stress and health status of wage working and non-wage working women in Jordan. *J Transcult Nurs* 2006;**17**:349-56.
33. Park JM, Choi MG, Oh JH, et al. Cross-cultural validation of Irritable Bowel Syndrome Quality of Life in Korea. *Dig Dis Sci* 2006;**51**:1478-84.
- 30 34. Remor E. Psychometric properties of a European Spanish version of the Perceived Stress Scale (PSS). *Span J Psychol* 2006;**9**:86-93.
35. Goodman JH. Paternal postpartum depression, its relationship to maternal postpartum depression, and implications for family health. *J Adv Nurs* 2004;**45**:26-35.
- 35 36. Matthey S, Barnett B, Ungerer J, et al. Paternal and maternal depressed mood during the transition to parenthood. *J Affect Disord* 2000;**60**:75-85.
37. Freedy JR, Simpson WM, Jr. Disaster-related physical and mental health: a role for the family physician. *Am Fam Physician* 2007;**75**:841-846.
38. Ostrove JM, Adler NE, Kupperman M, et al. Objective and subjective assessments of socioeconomic status and their relationship to self-rated health in an ethnically diverse sample of pregnant women. *Health Psychol* 2000;**19**:613-618.
- 40 39. Hu P, Adler NE, Goldman N, et al. Relationship Between Subjective Social Status and Measures of Health in Older Taiwanese Persons. *Journal of the American Geriatrics Society* 2005;**53**:483-488.
- 45 40. Tichenor V. Status and Income as Gendered Resources: The Case of Marital Power. *J Marriage Fam* 1999;**61**:638-650.

41. Chung H, Teresi J, Guarnaccia P, et al. Depressive Symptoms and Psychiatric Distress in Low Income Asian and Latino Primary Care Patients: Prevalence and Recognition. *Community Ment Health J* 2003;**39**:33-46.
- 5 42. Henderson C, Diez Roux AV, Jacobs DR, Jr, et al. Neighbourhood characteristics, individual level socioeconomic factors, and depressive symptoms in young adults: the CARDIA study. *J Epidemiol Community Health* 2005;**59**:322-328.
43. CIA. The World Factbook: South Africa, 2007.
44. Thom RG, Zwi RM, Reinach SG. The prevalence of psychiatric disorders at a primary care clinic in Soweto, Johannesburg. *S Afr Med J* 1994;**83**:653-655.
- 10 45. South Africa Department of Health. White Paper for the Transformation of the Health System in South Africa, 1997.
46. South Africa Department of Health. Annual National Health Plan, 2007.
47. Hugo CJ, Boshoff DE, Traut A, et al. Community attitudes toward and knowledge of mental illness in South Africa. *Soc Psychiatry Psychiatr Epidemiol* 2003;**38**:715-9.

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