GENDER DIFFERENCES IN DEPRESSION AND SMOKING AMONG YOUTH IN CAPE TOWN, SOUTH AFRICA

Objective: Gender differences in the association between depression and smoking has received inconsistent support among youth in national samples in the United States and other countries. However, the examination of depression and smoking among South African male and female youth has not been sufficiently studied. This paper examines gender differences in the association between depression, racially classified social group (RCSG) status, social amenities, and grade level with smoking among South African youth in Cape Town.

Design: Six-hundred twenty students completed a questionnaire on socio-demographic characteristics, smoking, and depression. Separate logistic regression procedures were conducted by gender to assess significant variations in correlates of ever smoker versus never smoker status and current smoker versus nonsmoker status. Variables included in the models were Beck Depression Inventory scores, RCSG, social amenities, and grade level.

Results: Primary analyses revealed that among girls, mild and severe depression were significant predictors of ever smoking status. In addition, girls who suffered from mild, moderate, and severe forms of depression were more likely to be current smokers than nonsmokers. Among boys, depression was not a significant predictor of smoking status.

Conclusions: The results support the need to incorporate mental health education strategies into smoking intervention programs, especially among school girls in Cape Town, South Africa. (Ethn Dis. 2006;16:41–50)

Key Words: Depression, Gender, Racially Classified Social Group Differences, Smoking, South African Youth

INTRODUCTION

Cigarette smoking is commonly referred to as a pediatric disease because it is a problem that originates in youth, with 90% of all smokers initiating use by the age of 18 years.1 Recently, Flisher, Parry, Evans, Muller and Lombard2 found that 27% of South African youth in Cape Town were current smokers. Upon closer investigation, King et al3 found that among Cape Town youth, White students were more likely to be current smokers (defined as a history of having smoked in the past 31 days; 36.3%) when compared to Colored (29.7%) and Black (9.7%) students. Flisher et al2 found a gender effect in that Black males had higher prevalence rates (lifetime, previous year, and previous month) of smoking than Black females who smoked less than their Colored and White counterparts. It is expected that smoking rates among youth in South Africa will likely increase as the tobacco industry targets marketing toward youth in developing countries.4,5

The current rates of smoking among South African youth and the estimated increase in prevalence rates are disturbing because smoking is a major yet preventable cause of morbidity and mortality. Most chronic diseases associated with tobacco use are not manifested until adulthood and it is estimated that smoking-related illness will contribute to more than 10 million deaths annually over the next 30 years.6,7 Approximately 95,000 of these smoking-related deaths will occur in sub-Saharan Africa.7 Delineating and understanding risk factors associated with smoking among South African youth is a critical public health issue.

Documented risk factors for smoking among adolescents in the United States and other countries include individual factors as well as community and social influences, such as low self esteem,8–9 ethnic/racial status,10–21 religious culture/attendance,22,23 peer influences,24–29 poor school performance,22,30 socioeconomic status,31–32 weight control for girls,33–35 other drug use,34,35 and familial influences.9,32 Previous studies have also identified associations with depressive disorders such as depression and anxiety and smoking among youth.12,26,36–52

The prevalence of depressive symptoms among non-clinical samples of adolescents have ranged between 8.6% and 54%49,57–59 and there is a two- to three-fold increased risk of depressive symptomatology for adolescent girls compared with boys.60–62 Epidemiologic studies applying clinical diagnostic criteria yield prevalence rates for current major depression among US adolescents ranging from 0.4%–7.0%.57,63–65 One published study examined a community sample of 500 Khayelitsha youth in an informal settlement area in Cape Town, South Africa and found the prevalence of dysthymic disorder was 4% and major depression was 3.4%.66 Although revealing, the lack of representativeness of this sample points to the need to examine more fully rates of mental...
disorders among South African youth in Cape Town.

Investigators have postulated that individuals who are depressed may use nicotine as a form of self-medication in an attempt to treat their symptoms or improve their psychological well-being. In a psychiatric population of South African adolescents Bérard and colleagues, found that 48.4% of the sample reported smoking. Smokers were significantly younger and scored higher on the Hamilton depression rating scale than nonsmokers.

Studies examining smoking among South African youth have explored familial influences, academic performance and attendance, socioeconomic status, urbanization status, comorbid substance use, and participation in risk behaviors. However, we are not aware of any studies that have documented gender differences in the relationship between affective disorders, such as depression, and smoking among a non-clinical sample of South African adolescents. The early premise of cigarette smoking as a “gateway drug” along the progression of stages of illegal drug use among youth is an important factor to consider. Identifying key variables that may influence smoking status and smoking initiation among South African male and female youth would be helpful in developing smoking prevention and intervention programs for this population. Thus, the aim of this analysis is to examine the association between depression and smoking among South African male and female youth in Cape Town.

**METHODS**

**Sample**

Data for this study were derived from the 1997 South African Community Epidemiology Network on Drug Use (SACENDU) School survey. A stratified sampling procedure utilizing postal zip codes was used to select students at non-private high schools in Cape Town. The number of schools selected was proportional to the total number of students in all the schools in the geographic stratum. The probability of selection of a school was proportional to the number of students in the school. Within each selected school, two classes in each of two grades (8 and 11) were randomly chosen and 40 students were randomly selected. A maximum of five additional students per grade were selected as replacements for absentees, drop-outs, and transferees.

A total of 2,946 students completed Part I of the survey, which included sociodemographic and cigarette smoking questions. From these 2,946 students, a subsample of 946 was randomly selected to complete Part III of the survey, which included the Beck Depression Inventory (BDI). The results presented in this paper are from Part III respondents (all of whom also completed Part I). Formatting differences in the BDI portion of Part III of the survey were different from other scales on the questionnaire and led to a large number of missing items. Students with missing data on the BDI were subsequently excluded from the analyses. The resultant sample consisted of 623 students. (There were no significant differences regarding the demographic variables between students with complete vs incomplete data on the BDI. However, students with complete BDI data were more likely to have ever smoked a whole cigarette in his/her lifetime – i.e., ever smoker).

Racially classified social groups (RCSG) were used in the analyses. In this study, the use of RCSG refers explicitly to the social conception of race. The race groups of Black, White, Colored (i.e., derived from Asian, European, and African ancestry) and Asian are as defined by the repealed population Registration Act of 1950. (As there were only three Asians in the sample, they were excluded from the analyses). There are dangers of analyzing the data by RCSG since these groups do not have anthropological or genetic validity. However, RCSG as classified above is used here for descriptive purposes and as a control variable because differences between these groups have been found, for many indicators of health, to be mediated by political and economic factors.

Human subject approval was provided by the Research Ethics Committee of the University of Cape Town, Faculty of Health Sciences. Students were informed that they could choose not to participate in the study or to omit answering certain questions without any negative repercussions.

**Instrument**

The instrument was translated from English into the other main languages spoken in Cape Town (Afrikaans and Xhosa) and then back translated into English by individuals whose home languages were either Afrikaans or Xhosa. Very similar versions of the instrument have been used in previous studies and it has been subjected to extensive pilot studies in small groups and classrooms of youth in Cape Town, South Africa. The test-retest reliability of the items Cohen’s kappa was 0.85 (0.80–0.91 [95% confidence interval]) for cigarettes. The instrument included all 21 items from the Beck Depression Inventory. Cronbach’s alpha reliability coefficient for the BDI was .91. Using Landis and Koch’s criteria, test-retest reliability for the BDI among Cape Town youth have reportedly ranged from fair to almost perfect. Students were also asked if they had used a fictitious substance (Derbisol). None of the students included in the current analyses responded positively to this item.

**Procedure**

Members of the research team distributed a self-administered questionnaire during regular school periods in the absence of teachers or other school personnel. The seating was arranged such that confidentiality was preserved. After completing the questionnaire, the
students placed it in an envelope, which they sealed before handing in. The level of student participation was satisfactory and no student refused to participate.

Data Analyses

The primary smoking variable was a two-level cigarette smoking indicator about whether an adolescent had ever smoked a whole cigarette in his/her lifetime (ie, ever smoker) or was a lifetime abstainer (ie, never smoker). Ever smokers were re-categorized into current smokers and former smokers based on whether they had smoked in the past 31 days. Those who had consumed cigarettes within this time period were categorized as current smokers and former smokers if they had not. The nonsmokers category consisted of both never and former smokers.

The depression variable consisted of the total score from the BDI. For analytical purposes the following categories were developed according to scale guidelines: minimal level of depression (scores ranging from 0–13); mildly depressed (scores ranging from 14–19); moderately depressed (scores ranging from 20 to 28); and severely depressed: (scores ranging from 29 to the maximum score of 63). For the primary hypothesis test of the association between smoking status and depression, scores on the BDI were analyzed as continuous data.

Traditional measures of socioeconomic status (SES), such as family income and parental education were not collected from respondents. Alternatively, students were asked about their number of household amenities (ie, television, electricity, telephones, and automobiles). An index of the number of household amenities was created by summing each participant’s total number of amenities. Participants could have less than two amenities, two, three, or all four amenities. The number of amenities served as a proxy variable for SES.

For the primary analyses the STATA computer program was used to conduct logistic regression on the two binary smoking status responses (never smoker vs ever smoker; current smoker vs nonsmoker). STATA produced accurate estimates for the standard errors of the regression coefficients, as it takes the complex sample design into account. As existing research has suggested the etiology and prevalence of depression may differ by gender, and our preliminary logistic regression analyses revealed a significant gender main effect, logistic regressions were conducted on separate gender models to assess statistically significant variations in correlates of smoking status. Variables included in the multivariate analyses were RCSG, depression, social amenities, and grade level.

RESULTS

Preliminary Results

Socio-Demographics

Colored students (54%) comprised the majority of the 620 subjects (54%), followed by Whites (28%) and Blacks (18%; see Table 1). Overall, 58% of the students were female and significant gender differences were found by RCSG ($P=.05$). Grade level representativeness was fairly equitable across RCSG groups ($P=.53$), with 43% of the students in grade 8 and 57% in grade 11. However, scores revealed that on average Blacks were significantly older (17.0 years, ± 3.1) than either Colored (15.4 years, ± 1.8) or White (15.4 years, ± 1.6) students ($P<.01$). Significant differences by RCSG were found with respect to SES ($P<.01$). The percentages of Black, Colored, and White students whose families possessed all four household amenities (ie, television, electricity, telephones, and an automobile) were 27%, 58%, and 82%, respectively.

Depressive Characteristics

Over half of all respondents (64%) reported minimal levels of depression, according to the BDI, compared to those reporting mild, moderate, and severe levels of depression (13%, 12%, and 10%, respectively; see Table 2). Mean scores on the BDI were higher among Blacks (14.4 ± 1.0) than any other group with their scores significantly higher than Whites (9.9 ± 0.8) but not Coloreds (12.7 ± 0.6; $P<.01$). Significant gender differences were found on the BDI with adjusted mean scores for males lower than those for females (8.5 ± 8.5 and 14.6 ± 11.7, respectively; $t<.01$). There were no significant differences in BDI scores by SES ($P=.07$). Mean scores on the BDI...
were higher for 11th grade students (14.1 (6.4) than for 8th grade students (9.6 (2.9; <0.01). Age was significantly correlated with BDI scores.

Table 2. Depression among Cape Town students

<table>
<thead>
<tr>
<th>Depression Category</th>
<th>Gender</th>
<th>% Black</th>
<th>% Colored</th>
<th>% White</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (n=256)</td>
<td>70.6 5.9 17.6 5.9</td>
<td>77.9 14.7 5.2 2.2</td>
<td>87.2 3.8 1.3 7.7</td>
<td>80.1 9.8 5.9 4.3</td>
</tr>
<tr>
<td></td>
<td>Female (n=354)</td>
<td>50.7 9.6 23.3 16.4</td>
<td>48.3 16.5 17.6 17.6</td>
<td>63.7 17.6 12.1 6.6</td>
<td>53.4 15.5 17.0 14.1</td>
</tr>
<tr>
<td>Number of amenities*</td>
<td>&lt;2 (n=28)</td>
<td>38.9 27.8 22.2 11.1</td>
<td>12.5 50.0 25.0 12.5</td>
<td>50.0 50.0 0.0 0.0</td>
<td>32.1 35.7 21.4 10.7</td>
</tr>
<tr>
<td></td>
<td>2 (n=55)</td>
<td>63.2 5.3 26.3 5.2</td>
<td>61.3 9.7 16.1 12.9</td>
<td>60.0 0.0 0.0 40.0</td>
<td>63.8 6.9 17.2 12.1</td>
</tr>
<tr>
<td></td>
<td>3 (n=159)</td>
<td>62.5 5.0 20.0 12.5</td>
<td>59.4 11.5 15.1 13.5</td>
<td>78.3 8.7 8.7 4.3</td>
<td>64.2 9.1 15.2 11.5</td>
</tr>
<tr>
<td></td>
<td>4 (n=351)</td>
<td>60.7 3.6 21.4 14.3</td>
<td>63.8 17.3 9.2 9.7</td>
<td>74.6 11.6 7.3 6.5</td>
<td>67.3 14.1 9.4 9.1</td>
</tr>
<tr>
<td>Grade</td>
<td>8th (n=264)</td>
<td>65.8 7.3 17.1 9.8</td>
<td>70.7 17.9 7.1 4.3</td>
<td>75.7 12.2 4.0 8.1</td>
<td>71.6 14.0 7.6 6.8</td>
</tr>
<tr>
<td></td>
<td>11th (n=356)</td>
<td>53.0 8.8 23.5 14.7</td>
<td>53.6 14.2 15.8 16.4</td>
<td>73.7 10.5 9.5 6.3</td>
<td>59.3 12.4 15.4 12.9</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>57.8 8.3 21.1 12.8</td>
<td>61.0 15.8 12.1 11.1</td>
<td>74.6 11.3 7.1 7.1</td>
<td>64.2 13.1 12.3 10.3</td>
</tr>
</tbody>
</table>

*N<0.05 due to missing values.
*2 probability P<0.05.
*3 probability P<0.01.

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Smoking Characteristics
The proportion of students who had never smoked a whole cigarette was significantly lower for 11th grade students (0.6 (9.2; <0.01). Among current smokers, a higher percentage of Black students (30%) compared to Colored students (11%) and White students (5%) reported lifetime smoking status as a current smoker. Significant RCSG differences were found on smoking status (P<0.01) with Colored students having the highest proportion (64%) of current smokers compared to Black (30%) and White (11%) students. Males and females current smoking status was comparable (30% and 27%; P=0.44).

On average, Black students who were current smokers were significantly more likely to delay the onset of smoking by approximately two years with mean age of onset of smoking at 15.4 (±2.9) years for Blacks compared to 13.7 (±3.1) years for Colored students and 14.3 (±3.8) years for White students (P<0.01). A higher percentage of 11th graders (36%) were current smokers than were 8th graders (19%; P<0.01). No significant gender difference on age of smoking initiation was found (t=3.38), with average onset for females 13.1 (±1.9) years and 12.7 (±1.5) years for males. A higher percentage of students whose families possessed less than two household amenities (33%) were smokers compared to those who reported four, three, and two household amenities (24%, 26%, and 7%; P<0.01).

Primary Results
Table 4 details the multiple logistic regression model for ever smokers compared to never smokers by gender.
Logistic regression analysis revealed that, among girls, Blacks were significantly less likely (OR .08, 95% CI .03–.27) than Whites to be ever smokers. Mild and severe depression (OR 2.14, 95% CI .95–4.81; OR 1.94, 95% CI .95–3.97, respectively) were marginally significant predictors of smoking status as girls who suffered from either form of depression were more likely to be ever smokers than girls who experience minimal depression. Grade and SES were not statistically significant predictors of depression among girls.

Among boys, those in grade 11 were more likely (OR 2.23, 95% CI 1.26–3.93) than those in grade 8 to be ever smokers. Racially classified social groups (RCSG), depression, and SES were not statistically significant predictors of smoking status among boys.

Table 3. Smoking among Cape Town students

<table>
<thead>
<tr>
<th>Smoking Status</th>
<th>% Black</th>
<th>% Colored</th>
<th>% White</th>
<th>% Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (n=256)</td>
<td>22.6</td>
<td>85.7</td>
<td>50.0</td>
<td>45.0</td>
</tr>
<tr>
<td>Female (n=354)</td>
<td>77.4</td>
<td>14.3</td>
<td>50.0</td>
<td>55.0</td>
</tr>
<tr>
<td>Number of amenities* †</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2 (n=27)</td>
<td>19.5</td>
<td>0.0</td>
<td>8.3</td>
<td>2.8</td>
</tr>
<tr>
<td>2 (n=57)</td>
<td>20.7</td>
<td>0.0</td>
<td>16.7</td>
<td>9.9</td>
</tr>
<tr>
<td>3 (n=161)</td>
<td>35.4</td>
<td>42.9</td>
<td>50.0</td>
<td>30.3</td>
</tr>
<tr>
<td>4 (n=358)</td>
<td>24.4</td>
<td>57.1</td>
<td>25.0</td>
<td>53.9</td>
</tr>
<tr>
<td>Grade level†</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8th (n=259)</td>
<td>38.8</td>
<td>28.6</td>
<td>25.0</td>
<td>51.8</td>
</tr>
<tr>
<td>11th (n=351)</td>
<td>61.2</td>
<td>71.4</td>
<td>75.0</td>
<td>48.2</td>
</tr>
<tr>
<td>Total</td>
<td>81.7</td>
<td>6.7</td>
<td>11.5</td>
<td>43.9</td>
</tr>
</tbody>
</table>

* N<620 due to missing values.
† χ² probability P<.01.

Logistic regression analysis revealed that, among girls, Blacks were significantly less likely (OR .08, 95% CI .03–.27) than Whites to be ever smokers. Mild and severe depression (OR 2.14, 95% CI .95–4.81; OR 1.94, 95% CI .95–3.97, respectively) were marginally significant predictors of smoking status as girls who suffered from either form of depression were more likely to be ever smokers than girls who experience minimal depression. Grade and SES were not statistically significant predictors of depression among girls.

Among boys, those in grade 11 were more likely (OR 2.23, 95% CI 1.26–3.93) than those in grade 8 to be ever smokers. Racially classified social groups (RCSG), depression, and SES were not statistically significant predictors of smoking status among boys.

Table 4. Multiple logistic regression for ever smokers vs never smokers stratified by gender*

<table>
<thead>
<tr>
<th>Variables in Model</th>
<th>Females Odds Ratio (95% CIs)</th>
<th>Males Odds Ratio (95% CIs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimal</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Mild</td>
<td>2.14 (.95–4.81)</td>
<td>1.41 (.52–3.85)</td>
</tr>
<tr>
<td>Moderate</td>
<td>1.35 (.70–2.62)</td>
<td>0.60 (.20–1.83)</td>
</tr>
<tr>
<td>Severe</td>
<td>1.94 (.95–3.97)</td>
<td>2.81 (.66–11.88)</td>
</tr>
<tr>
<td>RCSG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Colored</td>
<td>1.08 (.53–2.19)</td>
<td>1.37 (.64–2.94)</td>
</tr>
<tr>
<td>Black</td>
<td>0.08 (.03–.27)</td>
<td>0.72 (.26–1.97)</td>
</tr>
<tr>
<td>Grade level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9th</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>11th</td>
<td>1.22 (.66–2.27)</td>
<td>2.23 (1.26–3.93)</td>
</tr>
<tr>
<td>SES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (&lt;2 amenities)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Low (≥2 amenities)</td>
<td>0.81 (.39–1.67)</td>
<td>0.49 (.18–1.38)</td>
</tr>
</tbody>
</table>

* Probability modeled is that of being an ever smoker.

DISCUSSION

Symptoms of depression are associated with ever and current smoking status among adolescent females, but compared to nonsmokers by gender. Mild, moderate, and severe depression (OR 2.33, 95% CI 1.02–5.33; OR 2.42, 95% CI 1.25–4.70; OR 2.47, 95% CI 1.21–5.03, respectively) were significant predictors of smoking status as girls who suffered from these forms of depression were more likely to be current smokers than those who experienced no depression. Black girls were significantly less likely (OR .15, 95% CI .05–.51) than White girls to be current smokers. Colored girls did not differ significantly from White girls in the adjusted probability of being a current smoker. Grade and SES were not statistically significant predictors of smoking status among boys.

Among boys, those in grade 11 were more likely (OR 3.30, 95% CI 1.64–6.63) than those in grade 8 to be current smokers. Racially classified social groups (RCSG), depression, and SES were not statistically significant predictors of smoking status among boys.
not among males in this study of South African students in Cape Town. Average BDI scores for males were significantly lower than those of females and it is possible that this finding may have accounted, in part, for the failure to find an association of this variable with smoking among males. However, our findings are similar to other studies conducted in the United States. For example Acierno et al, examining a national sample of adolescents, found that a diagnosis of depression was significantly associated with the likelihood of smoking among adolescent girls, but not among adolescent boys. However, the findings are in contrast to the findings of Killen et al who reported depression predicted smoking initiation for boys, but not girls. Acierno and colleagues posited that conflicting results across studies reflect differences in statistical strategies and variable operationalization. For example, in the present study and Acierno and colleagues’ study, the effect of multiple risk factors, such as RCSG/ race and SES, were controlled. In addition, both our study and Acierno et al’s work used a more conservative assessment of smoking status than that employed by Killen et al. In Killen and colleagues study, an affirmative response to a single item was sufficient to classify an individual as a smoker. Acierno and colleagues point out that the smoker classification strategy created by Killen et al is likely to be heterogeneous, with infrequent or experimental smokers included along with active smokers.

The present finding of an association between depression and smoking is suggestive rather than causal. Mediating and/or moderating factors that may account for the association between depression and smoking found among girls and not boys may also be related to psychosocial influences (such as coping and/or mood regulation) as well as biological influences (such as a weight control and a possible genetic predisposition). While smoking, as a form of coping with psychosocial pressure, among adolescents is well-documented, studies examining gender differences in coping among adolescents are mixed. It is possible, that as depression leads to low self-esteem among girls they exhibit fewer coping resources (ie, social skills) to withstand social pressure to smoke. Furthermore, the association between depression and low self-esteem among adolescents has been demonstrated and low self-esteem has been linked to adolescent risk behaviors such as smoking. Studies differentially examining associations between self-esteem, social skills, and the role of coping on smoking among adolescent male and female youth may need to be investigated.

As Breslau, Kilbey, and Andreski and Acierno et al have noted, a mediating factor, such as a desire for weight control, may be responsible for the association found between smoking and depression among girls but not boys. Due to societal pressures for thinness among women, female youth may be depressed due to dissatisfaction with their body image, and thus, may use smoking as a form of weight control. Alternatively, biological factors are suspected as explanations for gender differences in levels of depression. Although possible, it is not known whether nicotine from tobacco provides gender specific neurochemical effects among youth.

Another explanation for the gender differences found in the smoking and depression association may pertain to related issues underlying the diffusion of innovations. In the current study the prevalence of smoking is lower among girls, which implies that the girls who smoke are innovators of smoking. It is possible that the innovators of smoking in this population are motivated primarily by personal factors (such as depression). Social influence may be less important since smoking is not common in this population. Conversely, once smoking is more common, social influence becomes more important at the expense of personal factors. There may be other ways in which the innovators differ from those that commence smoking later, for example the existence of family problems (which are, in turn, associated with depression).

Twenty-eight percent of the students in this study met the criteria for current smoker status and just over half the students had never smoked a cigarette. Colored students were found to have

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**Table 5. Multiple logistic regression for current smokers vs nonsmokers separated by gender**

<table>
<thead>
<tr>
<th>Variables in Model</th>
<th>Females Odds Ratio (95% CIs)</th>
<th>Males Odds Ratio (95% CIs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depression category</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimal</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Mild</td>
<td>2.33 (.102–5.33)</td>
<td>1.60 (.53–4.85)</td>
</tr>
<tr>
<td>Moderate</td>
<td>2.42 (.125–4.70)</td>
<td>0.74 (.18–3.15)</td>
</tr>
<tr>
<td>Severe</td>
<td>2.47 (.121–5.03)</td>
<td>2.77 (.50–15.42)</td>
</tr>
<tr>
<td><strong>RCSG</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Colored</td>
<td>0.81 (.44–1.52)</td>
<td>2.16 (.84–5.53)</td>
</tr>
<tr>
<td>Black</td>
<td>0.15 (.05–.51)</td>
<td>0.81 (.23–2.80)</td>
</tr>
<tr>
<td><strong>Grade level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9th</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>11th</td>
<td>1.87 (.86–4.10)</td>
<td>3.30 (1.64–6.63)</td>
</tr>
<tr>
<td><strong>SES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High (&gt;2 amenities)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Low (&lt;2 amenities)</td>
<td>0.87 (.43–1.75)</td>
<td>0.65 (.16–2.65)</td>
</tr>
</tbody>
</table>

* Probability modeled is that of being a current smoker.
the highest proportion of current smokers while Blacks had the lowest proportion. In addition, Black students had a significantly longer delay of smoking initiation than other students. Furthermore, Black girls were less likely to be ever smokers or current smokers than White girls. Studies among US adolescents have also noted racial differences in smoking where Black students are least likely to be smokers.12,13,16,35 Possible explanations for the lower rates of smoking found among Blacks in the current study may be do to access to less disposable income, other socio-cultural factors, and/or less exposure to media.

A higher percentage of 11th graders were ever or current smokers than were 8th graders, particularly among boys. Coogan et al40 and Gritz et al12 also found a higher history and incidence of smoking and history of smoking among students in upper grade levels compared to students in lower grade levels. However, these findings are in contrast to Bérand and colleagues68 study of an outpatient psychiatric population of adolescents who found that smokers were significantly younger than non-smokers among the South African youth. It is possible that compared to clinically-treated samples, quitting rates are lower among community-based sample and this may account for differences in smoking rates found in Bérand and colleagues study. Socio-economic status (SES) was also found to differentiate smokers from non-smokers. A higher percentage of students with less than two amenities were smokers compared to those with two or more amenities. Studies conducted in the United States, using educational status as a proxy variable for SES, have found an inverse relationship between smoking and SES.90–91

Of note also are the differential findings on BDI scores. The finding that females had significantly higher BDI scores than males is similar to other studies conducted on depressive symptomatology among adolescents in the United States and Spain.12,36,42,45,56,60,61,81,90,91,92 The vast majority of adolescents reported minimal levels of depressive symptomatology.

Age was also significantly positively related with BDI scores. Goodman and Capitman45 and Brooks and colleagues41 found associations of age with depressive symptoms in that adolescents with high depressive symptoms were significantly older. Explanations for this age effect that have been provided include alteration of societal experiences, changes in self perception, rises in hormone levels, and alterations in the size or function of brain structures, or combinations of these.23 In addition, students with higher scores on the proxy variable of SES were also more likely to report higher levels of depression. This finding is similar to those of Hanna and colleagues91 who operationalized SES as family income below or above poverty threshold, but unlike the findings documented by Goodman and Capitman45 where lower household income and lower parental education were associated with depression. Different methods of assessing SES across studies may be responsible for the lack of consistency found across studies.

It is noteworthy that significant racial differences were found on the BDI with Blacks reporting higher scores and Whites reporting the lowest scores. To date, there have been inconsistent findings regarding depression in racial subgroups. The current study’s findings are in contrast to Brooks and colleagues41 and Garrison and colleagues94 who found Black youth in the United States had decreased odds of feeling depressed when compared to White students. Other studies in the United States have documented that adolescents who identify themselves racially as Black, Hispanic, or Other are more likely to report higher levels of depression than Whites.12,95,96,97 Lack of confirmatory results across studies may be related to the inconsistent methods of assessing depression among youth. While some studies have utilized psychometrically valid and standardized scales other studies have used single or multiple items (with demonstrated or lacking reliability) to assess depressive symptomatology. Mental health disorders among Blacks in South Africa may be related to the social legacy of apartheid and disadvantages in the post-apartheid era. This topic warrants additional investigation, using standardized scales like the BDI.

Limitations and Strengths

The limitations of this study include the restriction of study subjects to students who were in attendance at school on the day the survey was administered. Dropouts and absentees were not included. There is evidence from previous studies in Cape Town69,99 that rates of substance use are higher for these sub-groups. Second, the study relied on self-report data. Although great lengths were taken to ensure confidentiality, there was no way of assessing underreporting of tobacco use. Furthermore, a large number of subjects from the larger sample were excluded due to formatting differences in the BDI section of the questionnaire. However, no significant differences were found on the demographic variables among those students with complete vs incomplete data on the BDI. The decision to exclude subjects with missing data, rather than develop a total BDI score for subjects with missing data based upon an imputation, was made to protect the integrity of the scale. It appears unlikely that the decision was due to missing data on the BDI, who were found more likely to be “never” smokers compared to students with complete data on the BDI (P=.04), would have skewed the study results because more smokers were present in the data that was analyzed and a higher prevalence may not have
changed the risk estimates found. In addition, the study did not include biochemical verification of smoking. Finally, the study was cross-sectional, which limits the extent to which conclusions can be drawn about the causal nature of the associations between depression and smoking.

Despite these limitations, the current study has several important strengths. Whereas other studies examining the depression and smoking relationship in other populations have used single item or non-standardized measures of depression, a standardized measure was utilized in this study. Furthermore, whereas other population-based studies conducted among non-South African youth have used various assessments of smoking status, we used a commonly accepted definition of current smoking status (defined as smoking within the past 31 days). No published studies examining the relationship of depression and smoking status of adolescents in South Africa exist.

These results provide useful insights for smoking prevention and cessation interventions and support the need to screen for and incorporate mental and emotional health education strategies that aggressively prevent and treat symptoms of depression among female adolescents in Cape Town, South Africa.

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Manuscript draft: Flisher, Lombard, Price, and Chalton
Statistical expertise: Flisher, King, Noubary, Lombard, and Chalton
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