Demographic Factors and Depression as Predictors of Substance Use Among Students at a
South African University

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Abstract

Substance abuse among university students is associated with adverse consequences for health, mental health and future job opportunities. In addition, depression has been associated with an increased risk for substance abuse. Although there is research on the risk factors for substance use disorders (SUDs) among university students internationally, no study to date has examined risk factors for SUDs among university students in Cape Town. The current study examined the association of demographic factors and depression with the severity of alcohol and marijuana use among students ($N = 1063$) at a Cape Town university, and the role of depression as a mediator of these outcomes. Findings suggest that 40.83% of participants have clinically at risk levels of alcohol use and 29.92% have clinically at risk levels of marijuana use. Participants who identify as white and male, have secure funding, and live outside of university residence or the family home are at higher risk of alcohol use, while male gender, living outside of university residence or the family home, and studying for a degree outside of the Humanities faculty are associated with an increased risk for marijuana use. The need for preventative substance abuse interventions and recommendations for future research are discussed.

Keywords: substance abuse, risk factors, alcohol, marijuana, depression, university students

Excessive alcohol or drug use may lead to substance use disorders or SUDs (American Psychiatric Association [APA], 2013). SUDs are characterised by frequent and increasing consumption of a substance, reporting cravings, spending a considerable amount of time acquiring a substance or recovering from use, developing tolerance and withdrawal responses to a substance, and impairments in functioning as a result of substance abuse (APA, 2013). University students are a population at risk for SUDs, and the resulting consequences not only affect academic work and future job prospects, but also the health and well-being of students (Skidmore, Kaufman, & Crowell, 2016).

Alcohol and cannabis are the most prevalent and financially attainable substances among university students (Pengpid, Peltzer, & Van Der Heever, 2013a; Wicki, Kuntsche, & Gmel, 2010). In a study conducted by Wechsler and Nelson (2008) which surveyed a nationally representative sample of United States university students between 1993 and 2001, 40% of students were found to engage in frequent excessive drinking. Another study in the United States found that among first year students who used alcohol frequently, 24.7% also engaged in cannabis abuse (Caldeira, Arria, O'Grady, Vincent, & Wish, 2008). In the United Kingdom, 30% of university students were found to engage in heavy episodic or binge drinking (El Ansari, Vallentin-Holbech, & Stock, 2015). In Kuwait, 14.4% of male university students engaged in excessive illicit drug use, with the most used substance being cannabis at 11% (Bajwa et al., 2013). In Brazil, 84.7% of university students were found to excessively use alcohol, while cannabis was the most used illicit drug, with a prevalence of 19.7% (Silva, Malbergier, Stempliuk, & de Andrade, 2006).

Substance abuse among university students is associated with disrupted study and sleep patterns, difficulty in concentration and in effectively handling stress which negatively affects academic performance, academic failure, difficulty in maintaining a social life and inadequate coping mechanisms to manage these compounding consequences (Bajwa et al., 2013; Wicki et al., 2010). Substance abuse also increases the risk of engaging in high-risk sexual behaviour and excessive alcohol consumption increases the risk of dating violence perpetration and victimization between couples at university, although there is a less clear association with cannabis use (Cho et al., 2014; Shorey, Stuart, & Cornelius, 2011). In addition, university students who excessively use alcohol, cannabis or both are more likely to be involved in unlawful situations which may hinder future job opportunities after university (Karam, Kypri, & Salamoun, 2007; Wicki et al., 2010). Further, short-term cannabis use affects motor coordination which impairs driving ability, leading to an increased risk for vehicular injuries (Volkow, Baler, Compton, & Weiss, 2014; Wicki et al.,

2010). Long-term cannabis use results in reduced satisfaction, determination and motivation, as well as addiction and dependence (Cho et al., 2014; Volkow et al., 2014). Previous research shows that university students exposed to the use of cannabis during adolescence are more likely to develop dependence and engage in substance abuse in young adulthood (Bajwa et al., 2013; Volkow et al., 2014).

Given the many adverse consequences associated with student substance abuse, early identification and intervention are necessary in order to prevent substance abuse disorders among university students. Identifying which students are most at risk of developing substance use disorders can enable targeted early identification and support.

Sociodemographic factors allow for closer inspection of the distribution of students who may be at risk for substance abuse (Young & de Klerk, 2008). Studies have shown that male students are more likely to engage in substance abuse than females (Bajwa et al., 2013; Cho et al., 2014; Wicki et al., 2010). In terms of race, students of colour at various European universities have been found to engage less frequently in cannabis use and consume a smaller amount of alcohol in contrast to white students (Wicki et al., 2010). Race frequently intersects with class, and in international studies, university students with a high socioeconomic status are more likely to engage excessively and frequently in alcohol consumption and cannabis use (Bajwa et al., 2013; Cho et al., 2014). Students with a low socioeconomic status do not have the same financial stability and resources as those with a high socioeconomic status; this may restrict, yet indirectly protect, students with a low socioeconomic status from engaging in potentially harmful and excessive substance use (Bajwa et al., 2013).

The accommodation circumstances of university students are an important risk factor as social freedom and less adult supervision may provide a gateway for substance abuse (Wicki et al., 2010). Students living with their parents do not have the same social freedom and unsupervised space as students living in a UCT residence or alone in an apartment, which in turn acts as a protection factor against the risk of harmful substance use (Wicki et al., 2010).

Academic factors provide further insight into the distribution of university students who may be at risk for substance abuse (Bajwa et al., 2013). Although previous research suggests that older students are more likely to resort to the excessive use of substances to cope or find an escape from dealing with stress, academic deadlines or part-time job responsibilities (Redonnet, Chollet, Fombonne, Bowes, & Melchior, 2012), a more recent study by Cho et al. (2014) reports that first and second year students in the United States are

more likely to consume excessive amounts of alcohol and frequently use cannabis after observing the habits of other students (Cho et al., 2014).

A significant association between depression and substance abuse has been found among university students (Cho et al., 2014; Geisner, Mallett, & Kilmer, 2012), however, the nature of this relationship is unclear. While depression can develop as a consequence of excessive substance use, the presence of depression among university students also significantly influences the likelihood of developing SUDs (Cho et al., 2014; Wicki et al., 2010). A systematic review of 61 studies including both general and clinical American, European and Australian adolescent samples found more evidence for a prospective association between depression and substance use than for a prospective association between alcohol or marijuana use and depression, indicating that depression is more likely to be a risk factor for SUDs than vice versa (Hussong, Ennett, Cox, & Haroon, 2017). However, the few South African studies which have examined depression as a risk factor for SUDs among university students found no significant associations between depression and SUDs (Jager, 2014; Peltzer & Pengpid, 2016).

Although a substantial amount of empirical research concerning substance abuse among university students has been conducted in high-income countries, there is a lack of research from the African continent (Young & Mayson, 2010). Similarly, while research indicates that substance abuse is prevalent among South African adolescents (Carney, Myers, Louw, Lombard, & Flisher, 2013; Reddy, Resnicow, Omardien, & Kambaran, 2007; Saban, Flisher, & Distiller, 2010), there is a scarcity of studies pertaining to substance use and abuse among university students in South Africa. The South African university population is quite different demographically, academically and socially in comparison to high school students, as university students tend to have more social freedom, greater academic demands, financial stressors and more responsibilities than young adults (Young & de Klerk, 2008). While SUDs are highly prevalent (13%) and tend to have an early age of onset (a mean of 21 years) among the general South African adult population (Stein et al., 2008), it is unclear whether South African university students are particularly at risk for SUDs as few studies have been conducted and the findings have not been consistent.

A cross-sectional study by Peltzer and Pengpid (2016) found that only 3.4% of a sample of undergraduate students in South Africa engaged in illicit drug use more than ten times during 2015. It was also found that students who resided away from home, either on or off-campus, engaged in binge drinking, used tobacco or were involved in a physical fight in the previous twelve months were more likely to engage in frequent illicit drug use, negatively

affecting academic work (Peltzer & Pengpid, 2016). Young and de Klerk (2008) found that students at Rhodes University living away from their parents, in a campus residence or off-campus apartment, are more likely to engage in substance abuse (16%) than students living with their parents (0%). In addition, students with poor academic performance were found to be more likely to engage in substance use although the directionality of this relationship is unclear (Young & de Klerk, 2008).

The role of race and class as risk factors for substance use among South African university students is not yet well understood. Race is associated with contrasting economic positions and social experiences which may influence substance use patterns for different groups (Young & de Klerk, 2008; Young & Mayson, 2010). Poverty, inequality and social exclusion within the South African context are highly 'raced' (Gradin, 2012). Further, black students attending previously white-only universities continue to be socially excluded as a result of perpetual racism and stigma (Seekings, 2008). Taken together, these experiences may impact on patterns of substance abuse. In a study at Rhodes University, students of colour were less likely to abuse alcohol and cannabis than white students (Young & de Klerk, 2008). However, in a nationally representative sample of South African adults, participants who identified themselves as Coloured had the highest prevalence of SUDs, possibly resulting from the particular experiences of this group under, and since, apartheid (Stein et al., 2008).

While international studies have indicated that higher socioeconomic status predicts higher substance use among university students, it is also possible that cumulative socioeconomic stressors may increase the risk of substance use as a coping mechanism (Redonnet et al., 2012). Economic factors have not yet been assessed as a risk factor for SUDs in South African university student samples (Reddy et al., 2007). One measure of the socio-economic and financial stressors faced by students is whether or not they are receiving financial aid towards their university tuition fees, since university students with a lower socio-economic status are more likely to depend on financial aid than students with a higher socio-economic status (Akoojee & Nkomo, 2008; Wangenge-Ouma & Cloete, 2008). Therefore, it would be valuable to explore whether type of university funding, for example if students are funded by NSFAS or by a parent/guardian, is associated with level of alcohol and marijuana use on South African university campuses.

Although international literature reports high rates of excessive substance use amongst university students, this research predominantly pertains to high income contexts while there is a lack of research in the South African or African context. Only two South

African studies have been published to date, each with different prevalence rates and examining different risk factors. No study to date has examined risk factors for SUDs among university students in Cape Town. Identifying students at high-risk for SUDs is essential for preventative programmes and interventions for enhancing the health, well-being and futures of university students (Cho et al., 2014; Peltzer & Pengpid, 2016; Wicki et al., 2010).

Study Aim and Research Questions

The aim of this study is to examine the association of demographic factors and depression with the severity of alcohol and marijuana use among students at the University of Cape Town in South Africa.

The following research questions will be explored: What is the proportion of respondents that report use of alcohol and the proportion that report use of marijuana? What is the proportion that are at risk for alcohol and marijuana misuse? Is there an association between the independent variables of gender, race, accommodation circumstances, type of university funding, type of degree, year of study and depression with severity of alcohol and marijuana use? When considered simultaneously, which of the above variables contribute independently to alcohol use and to marijuana use?

Method

Research design

The study made use of a cross-sectional survey design, which is useful in identifying prevalence and associations between risk factors within a population at a specific point in time (Levin, 2006; Mann, 2003). Cross-sectional survey designs are cost-efficient and time-saving in collecting data, as all measurements are taken at once for each person (Knottnerus & Muris, 2003).

Participants

The sample comprised of undergraduate Psychology students ($N = 1063$) from the University of Cape Town recruited via convenience sampling, which was best suited to the time-frames and budget available for this study. All undergraduate Psychology students were notified via email about the study through the UCT Psychology Department's SRPP programme. On completion of the study, participants received one SRPP point which formed part of the criteria for completion of their Psychology courses. This study had no exclusion criteria.

Measures

Demographic Questionnaire. The demographic questionnaire (see Appendix A) assessed participants' age (in years), gender (female/ male/other), race (black/white/indian/coloured/other/I prefer not to respond), type of university funding (National Student Financial Aid Scheme/student loan from bank/private bursary/parent or guardian/other), accommodation circumstances (UCT residence/living alone/sharing with non-family members/living at home with parents/other), choice of degree (Bachelor of Arts/Bachelor of Social Science/other degree in Humanities/other degree not within Humanities), and year of study (first year/ second year/ third year/fourth year/other).

Alcohol Use Disorders Identification Test (AUDIT). Alcohol consumption was assessed using the 10-item Alcohol Use Disorders Identification Test (AUDIT) (see Appendix B) (Bohn, Babor, & Kranzler, 1995; Pengpid et al., 2013a). This test was constructed by the World Health Organization as a screening tool for current alcohol-related problems which pose serious health implications (Bohn et al., 1995). The scale comprises of three items which access alcohol use levels, three items assessing symptoms of alcohol reliance, and four items assessing problems associated with alcohol use (Bohn et al., 1995). The responses to items are rated on a 5 point Likert scale ranging from 0 to 4. The maximum score for this test is 40, and summative scores of 8 or more (for males), and 6 or more (for females) indicates problematic or hazardous drinking behaviour; therefore, higher AUDIT scores represent increased health risks associated with harmful drinking (Bohn et al., 1995).

Pengpid et al. (2013a) found that the Cronbach alpha for the AUDIT scale for their sample of 722 undergraduate students in Limpopo was 0.91, which indicates a high level of reliability. Furthermore, Saunders, Aasland, Babor, De la Fuente and Grant (1993) and Bohn et al. (1995) report that the AUDIT scale is highly correlated with other measures for identifying alcohol-problems and is successful in distinguishing light drinkers from harmful drinkers, which indicates good validity. The Cronbach alpha for the ten items on the AUDIT scale in this sample was .82, which indicates good internal reliability.

Drug Use Disorders Identification Test (DUDIT). Marijuana use was assessed using the 11-item Drug Use Disorders Identification Test (DUDIT) (see Appendix C) (Berman, Bergman, Palmstierna, & Schlyter, 2004; Jager, 2014). This test was constructed by a Swedish group of researchers and is a self-report tool for identifying current drug-related problems which poses serious health risks (Berman et al., 2004). For the purposes of this study, the items on the DUDIT scale were adapted to specifically assess the frequency of marijuana use, physical and psychological problems associated with marijuana use, and the

presence of symptoms of dependency for marijuana (Matuszka et al., 2013). The responses to items are rated on a 5 point Likert scale ranging from 0 to 4. The maximum score for this test is 44, and summative scores for the whole scale of 6 (for males) and 2 (for females) in general populations indicate marijuana use problems (Berman et al., 2004).

The DUDIT scale was used to identify South African undergraduate students in Limpopo with drug-related problems and the scale was found to have good internal reliability with a Cronbach alpha of .80, in addition to a 90% sensitivity towards predicting drug dependence (Jager, 2014). The Cronbach alpha for the eleven items on the DUDIT scale in this study was .88, which indicates good internal reliability.

Centre for Epidemiologic Studies Depression Scale Revised (CES-D-R-10). This is a 10-item, 4 point Likert-type, self-report scale which measures the severity of current symptoms of depression (see Appendix D) (Radloff, 1977; Vilagut, Forero, Barbaglia, & Alonso, 2016). The responses to items range from 0 to 3, "Rarely or none of the time (less than 1 day)" to "All of the time (5-7 days)." A summative score equal to or above 10 indicates that an individual is at high risk for having a clinical diagnosis of depression. According to the systematic review and meta-analysis conducted by Vilagut et al. (2016), twenty-eight studies show that the CES-D illustrates appropriate screening accuracy to identify and measure depression symptomatology. There were no significant differences found regarding its use across populations ranging from adolescents to elderly adults, and in primary care settings (Vilagut et al., 2016).

Radloff (1977) found that Cronbach's alpha for internal reliability is .85 in a general population, and .90 in a psychiatric population. In addition, the scale was found to be correlated with various other self-report measures of depression, such as the Bradburn Balance scale (.61) and the Langer scale (.54) (Radloff, 1977). Furthermore, Miller, Anton and Townson (2007) found that the internal consistency is .86, test-retest reliability is .85, convergent validity is .91, and the divergent validity is .89. However, whilst the CES-D-10 has shown a high reliability and validity towards measuring the symptomatology of depression, these statistics are dependent on the population being used for each study and thus are changeable properties of the instrument (Vilagut et al., 2016). A randomised control trial, which included the CES-D 10 scale, carried out by Pengpid, Peltzer, van der Heever and Skaal (2013b) among 722 university students in Gauteng, found that the Cronbach alpha at time 1 and time 2 were .70 and .78 respectively, indicating good reliability among a South African student population. In the current study, the Cronbach alpha for the CES-D-R-10

scale was .68, which indicates that the revised CES-D-R scale has a lower but acceptable internal reliability.

Procedure

An online survey was hosted on SurveyMonkey. An SRPP advertisement with the invitation link to participate in the study was sent to all undergraduate psychology students via email as part of the SRPP programme at UCT. Participants were informed in the email that the survey will take 10-15 minutes to complete on a phone, laptop or tablet, and only on completion of the survey participants will be awarded one SRPP point for their participation in the study. Prior to administration of the study, twenty participants were recruited for a pilot of the online survey in order to evaluate its functionality and reliability. The data obtained from the pilot study was not used as part of the main data collection, instead it was used to inform the operationality of the online survey for the main data collection. The register used in the survey, coding accuracy of survey responses, and the generation of the recorded data into a Microsoft Excel file format were analysed for any errors or irregularities. After the recorded data had been reviewed, the study was re-opened for the main data collection.

Prior to beginning the survey, participants were presented on-screen with a consent form (see Appendix E), which they were required to complete in order to provide their consent to participate in the study. Only participants who provided their consent were able to continue with the study by selecting the 'next' option. Thereafter, participants were required to complete the demographic items, the AUDIT, the DUDIT and the CES-D-R-10. These measures required participants to answer each item by selecting the option which best fits their response. In total, there were 38 items which participants were required to complete. Lastly, participants were thanked for their participation in the study, presented with a debriefing form (see Appendix F) and were required to provide their student number and psychology course code for the allocation of their SRPP points.

Data Analysis

An a priori multiple regression analysis using the statistical programme G*Power showed that the estimated sample size to power the study was 200 participants (Faul, Erdfelder, Buchner, & Lang, 2009). In addition, categories for the independent variables were collapsed for the purposes of analysis. The indian and other race categories were collapsed into the category of other, the accommodation types of living alone and sharing with non-family members were collapsed into the other accommodation category, and the type of funding categories of National Student Financial Aid Scheme and student loan from bank were collapsed into non-secure funding, and private bursary, parent or guardian or other

categories were collapsed into non-secure funding. Further, the type of degree categories of Bachelor of Arts, Bachelor of Social Science, and other degree in Humanities were collapsed into the inside Humanities category, and the fourth year of study category was collapsed into the category other. Descriptive statistics were generated for the demographic factors, while scale statistics were analysed for the AUDIT, DUDIT and CES-D-R-10. Bivariate associations between demographic factors and depression (independent variables) with severity of alcohol and marijuana use (dependent variables) were determined through t-tests and ANOVA (Field, Miles, & Field, 2013). Thereafter, all the IVs were examined simultaneously as predictors of alcohol and marijuana use in two multiple regression models, one for each DV, to determine which independent variables significantly predict the DVs when considered together. Analyses were executed using SPSS and R statistical software packages.

Treatment of Missing Data

The original sample consisted of $N = 1170$ participants, as three cases did not provide consent to participate in the study. There were 105 cases which had a large number of missing responses throughout the survey. There were missing item responses on each of the four outcome measures: 40 cases (3.76%) had incomplete data on the Demographics questionnaire, 83 cases (7.79%) on the AUDIT scale, 82 cases (7.70%) on the DUDIT scale and 104 cases (9.77%) on the CES-D-R-10 scale. Therefore, listwise deletion of 105 cases resulted in a decrease in the sample size from 1170 to 1065. In addition, the two participants who indicated "Other" under the variable Gender were excluded from the sample due to being a small category in relation to the categories of "Male" and "Female". The final sample consists of $N = 1063$ participants. Furthermore, there were no patterns in the missing data, which indicated that incomplete survey responses were made at random.

Ethical Considerations

An ethical application for this study was submitted to the Research Ethics Committee in the Department of Psychology at the University of Cape Town and was approved. Before beginning the survey, participants were presented with a consent form (see Appendix E) which they were required to complete in order to proceed with participating in the study. Following completion, a debriefing form was presented (see Appendix F). Participants were guaranteed confidentiality, as only the researcher had access to their recorded responses which were kept separately and located in a password protected folder a USB device, and their student number was not associated with their provided survey responses.

Results

Descriptive statistics

The following section reports the frequencies for the demographic factors and scale statistics for the AUDIT, DUDIT and CES-D-R-10.

Table 1

Sample characteristics

	Frequency	%	*N*
Gender			
Female	868	81.50	1063
Male	195	18.31	1063
Race			
White	423	39.72	1063
Black	271	25.45	1063
Coloured	261	24.51	1063
Other	109	10.23	1063
Accommodation Circumstances			
Living at home with parents/guardians	409	38.40	1063
UCT residence	326	30.61	1063
Other	328	30.80	1063
Type of Funding			
Secure funding	680	63.85	1063
Non-secure funding	383	35.96	1063
Type of Degree			
Inside Humanities	738	69.30	1063
Outside of Humanities	325	30.52	1063
Year of Study			
First year	436	40.94	1063
Second year	352	33.05	1063
Third year	207	19.44	1063
Other	68	6.38	1063

The mean age of the participants was 20.3 years (SD = 2.81). The minimum reported age was 17 years and the maximum age 48 years. As reported in Table 1, of the 1063 participants there were considerably more females (81.5%, n = 868) than males (18.3%, n = 195). These proportions reflect the predominance of females in UCT Psychology courses more generally. Of the sample, almost 40% of participants identified as white (39.8%, n = 423), there were a similar percentage of participants who identified as either black (25.4%, n = 270) or coloured (24.6%, n = 261), and a minority identified as other (10.3%, n = 109). Almost 40% of participants (38.5%, n = 409) indicated that they lived at home with parents/guardians, 30.9% (n = 328) indicated other, while the remaining participants, 30.7% (n = 326) lived in UCT residences. The majority of participants (64%, n = 680) indicated that they had secure funding and the remainder of participants (36%, n = 383) had non-secure funding. Of the sample, 69.4% (n = 738) are studying towards a degree in the Humanities faculty, while the remainder are studying towards a degree within a different faculty. First year students made up the largest group of respondents (41%, n = 436), followed by second years, third years, and other students.

Scale statistics for the AUDIT, DUDIT and CES-D-R-10. For the three outcome scales used in the study, the maximum scores that could be obtained were: 40 for AUDIT (M = 5.63, SD = 5.14), 44 for DUDIT (M = 2.36, SD = 4.86) and 30 for CES-D-R-10 (M = 10.39, SD = 4.49). The means and standard deviations are reported in Table 2. Of the sample, 32.92% (n = 350) of students reported having a drink containing alcohol two to four times a week, 30.95% (n = 329) indicated monthly and 1.41% (n = 15) indicated four or more times a week, whereas only 19.66% (n = 209) of students reported never having a drink containing alcohol. Almost 41% of students in the sample (40.83%, n = 434) had AUDIT scores equal to or above the cut-off score for clinically significant levels of alcohol abuse, which indicates increased health risks associated with problematic or hazardous drinking (Bohn et al., 1995). In addition, 17.69% (n = 188) of students in the sample reported having six or more drinks on one occasion monthly. While the majority of students in the sample (68.67%, n = 730) reported never using marijuana, 17.78% (n = 189) reported using marijuana once a month, 6.77% (n = 72) indicated marijuana use as often as two to four times a month, 3.10% (n = 33) indicated two to three times a month, and 3.67% (n = 39) reported use four times a week or more. Of the sample, 29.92% (n = 318) of students had DUDIT scores equal to or above the cut-off score for clinically significant levels of marijuana abuse, which suggests the presence of marijuana-related problems (Berman et al., 2004). About half of the students in the sample (50.52%, n = 537) reported CES-D scores greater than the cut-off score of 10, which

indicates a high risk for having a clinical diagnosis of depression. 13.92% ($n = 148$) of students in the sample indicated that they felt depressed occasionally or a moderate amount of time (3-4 days), while 5.74% ($n = 61$) reported all the time (5-7 days), and 15.62% ($n = 166$) indicated that they could not get going occasionally or a moderate amount of the time (3-4 days).

Table 2

Scale statistics for AUDIT, DUDIT, and CES-D-R-10

	N	Min	Max	*M*	*SD*	Std.Error
DUDIT	1063	0	42	2.36	4.86	.08
AUDIT	1063	0	36	5.63	5.14	.08
CES-D-R-10	1063	2	27	10.39	4.49	.08

Bivariate Analyses

This section reports the association between the demographic factors, alcohol use (AUDIT), marijuana use (DUDIT), and the severity of depression (CES-D-R-10).

Association between age and alcohol use, marijuana use and depression. Pearson Product-Moment correlations indicate that there is no association between age and alcohol use ($r = -.02, p = .47$), marijuana use ($r = .01, p = .75$), or depression ($r = .00, p = .96$).

Gender differences in alcohol use, marijuana use and depression. As indicated in Table 3, the average scores for males were higher than for females' on both the AUDIT and DUDIT scales. Independent sample t-tests indicated that both these differences in mean scores were statistically significant with *p*-values $< .05$, although the effect sizes as measured by Cohen's d were small (see Table 4). On the depression scale, the average score for females ($M = 10.47$) was slightly higher than males ($M = 10.07$), however an independent sample t-test found that this difference was not significant.

Table 3

Descriptive statistics by gender for alcohol use, marijuana use, and depression

		M	SD	Std. Error
Alcohol Use	Female	5.45	4.91	.17
	Male	6.44	6.02	.43
Marijuana Use	Female	1.89	4.07	.14
	Male	4.48	7.04	.50
Depression	Male	10.07	4.63	.33
	Female	10.47	4.45	.15

Note. Male (*n* = 195); Female (*n* = 868).

Table 4

Independent sample t-tests investigating gender differences for alcohol use, marijuana use and depression

	t	df	p	d
Marijuana Use	4.96	223.86	.000***	.21
Alcohol Use	2.15	255.01	.033*	.08
Depression	-1.08	280.25	.281	.03

*p < .05. ***p < .001.

Association of race with alcohol use, marijuana use and depression. Descriptive statistics indicate that students who identified as white reported higher scores, on average, for alcohol use (*M* = 7.48) and marijuana use (*M* = 2.78) than students who identified as black, coloured, and other (see Table 5). However, students who identified as other reported higher scores for depression (*M* = 11.45) than students who identified as white (*M* = 9.88), black (*M* = 10.81), and coloured (*M* = 10.36). Furthermore, students who identified as white reported the lowest mean scores for depression.

Table 5

Descriptive statistics for alcohol use, marijuana use and depression by race

		N	*M*	*SD*	Min	Max
Alcohol Use	White	423	7.48	5.08	0	25
	Black	270	4.95	4.88	0	26
	Other	109	4.02	4.24	0	22
	Coloured	261	4.00	4.93	0	36
	Total	1063	5.63	5.14	0	36
Marijuana Use	White	423	2.78	5.33	0	32
	Other	109	2.28	4.45	0	22
	Black	270	2.21	4.91	0	42
	Coloured	261	1.89	4.05	0	27
	Total	1063	2.36	4.86	0	42
Depression	Other	109	11.45	4.52	3	25
	Black	270	10.81	4.60	2	25
	Coloured	261	10.36	4.30	3	25
	White	423	9.88	4.46	2	27
	Total	1063	10.39	4.49	2	27

One-way analyses of variance (ANOVAs) were conducted to evaluate the mean differences between different race categories for alcohol use, marijuana use and depression. The results indicate that race categories did not have statistically significantly differences for marijuana use ($F(3, 1059) = 1.97$, $p = .12$, $\eta2 = .00$). However, there were statistically significant differences reported between the different race categories for alcohol use ($F(3, 1059) = 35.32$, $p < .001$, $\eta2 = .09$) and depression ($F(3, 1059) = 4.70$, $p < .001$, $\eta2 = .01$). Race explains 9.1% and 1.3% of the variance in alcohol use and depression respectively. Tukey's HSD and Games-Howell post-hoc tests were conducted in order to determine where the significant differences lie across the different race categories (see Appendix G). The assumption of homogeneity was upheld for alcohol use and depression.

There were significant mean differences for alcohol use between the white race category ($M = 7.48$) and the coloured ($M = 4.00$), other ($M = 4.02$), and black ($M = 4.95$) race categories at $p < .001$. This suggests that white students are significantly more likely to engage in problematic or hazardous drinking behavior than students who identify as black, coloured or other. Similarly, there were significant mean differences for depression, as participants in the other ($M = 11.45$) and black ($M = 10.81$) race categories reported significantly higher mean scores than the white ($M = 9.88$) race categories at $p < .05$. This indicates that students who identify as other or black show a significantly greater average

level of depression. In addition, the lower bound of the confidence intervals for these categories are greater than the CES-D-R cut-off score of 10. However, the confidence intervals for the remaining categories of students who identify as white or coloured contain the cut-off score, which suggests that there is a greater amount of variability within these race categories and at this level of confidence there is no significant evidence to conclude these students are at high risk for a clinical diagnosis of depression.

Association of accommodation circumstances with alcohol use, marijuana use and depression. The descriptive statistics in Table 6 indicate that, on average, students living in the type of accommodation referred to as other reported higher levels of alcohol use ($M =$ 6.76) and marijuana use ($M = 3.29$) than students living in UCT residences or living at home with parents/guardians. However, students living at home with parents/guardians on average reported higher levels of depression ($M = 10.64$) than students living in UCT residences or the type of accommodation referred to as other.

Table 6

Means, standard deviations (SD) and 95% confidence intervals (CI) for alcohol use, marijuana use and depression by type of accommodation circumstance

	AUDIT			DUDIT			Depression		
	M	*SD*	*CI*	*M*	*SD*	*CI*	*M*	*SD*	*CI*
Other	6.76	5.09	6.21, 7.31	3.29	5.70	2.68, 3.91	9.85	4.24	9.38, 10.33
UCT residence	5.38	5.38	4.80, 5.97	1.89	4.57	1.40, 2.39	10.63	4.36	10.14, 11.12
Living at home with parents/guardians	4.92	4.84	4.45, 5.39	1.99	4.24	1.58, 2.40	10.64	4.57	10.19, 11.08

One-way analysis of variance (ANOVA) tests indicated that there are significant differences between the different types of accommodation circumstances for alcohol use ($F(2, 1060) = 12.43$, $p < .001$, η2 = .02), marijuana use ($F(2, 1060) = 8.88$, $p < .001$, η2 = .01) and depression ($F(2, 1060) = 3.45$, $p < .05$, η2 = .01). The different type of accommodation circumstances explained 2.3%, 1.6% and .6% of the variance in levels of alcohol use, marijuana use and severity of depression respectively. Tukey's HSD and Games-Howell post-hoc tests were conducted in order to determine where the significant differences lie across the different types of accommodation circumstances (see Appendix H). Whilst the assumption of homogeneity was upheld for the alcohol use and depression, Levene's Homogeneity of Variance Test indicated that the variances were not homogenous for marijuana use as a result of statistically significant differences in the group variances, $p <$

.001. Therefore, the assumption of homogeneity was violated and the post-hoc results for Games-Howell instead of Tukey's HSD were analysed for marijuana use.

Statistically significant mean differences were found for alcohol use between the type of accommodation referred to as other ($M = 6.76$), and UCT residence ($M = 5.38$) and living at home with parents/guardians ($M = 4.92$) at $p < .05$. Similarly, significant mean differences for marijuana use were found between the type of accommodation referred to as other ($M = 3.29$) and living at home with parents/guardians ($M = 1.99$) and UCT residence ($M = 1.89$) at $p < .05$. This suggests that students who stay in the other accommodation circumstance are significantly more likely to engage in problematic or hazardous drinking behavior and harmful marijuana use than students who are living at home with parents/guardians or who stay in a UCT residence. Furthermore, participants living at home with parents/guardians ($M = 10.64$) have significantly higher depression scores than those living in the type of accommodation type referred to as other ($M = 9.85$) at $p = .048$. In addition, the mean score and lower bound confidence interval for the accommodation type of living at home with parents/guardians is above the CES-D-R cut-off score of 10, which indicates that students within this category are on average at high risk for a clinical diagnosis of depression.

Association of type of funding with alcohol use, marijuana use and depression. On average, students with secure funding reported higher scores for alcohol use ($M = 6.28$) and marijuana use ($M = 2.61$) than students with non-secure funding (see Table 7). Independent sample t-tests indicated that these differences were both statistically significant with p-values $< .05$, although the effect sizes as measured by Cohen's d were small (see Table 8). On the depression scale, students with non-secure funding reported higher mean scores for depression ($M = 10.84$) than students with secure funding ($M = 10.14$), and an independent sample t-test found that this difference was significant with a p-value $< .05$, however the effect size was again small (Cohen, 1988; Tredoux & Durrheim, 2002).

Table 7

Mean levels of alcohol use, marijuana use and depression for students with non-secure funding and secure funding

		M	*SD*
Alcohol Use	Non-secure funding	4.48	4.73
	Secure funding	6.28	5.25
Marijuana Use	Non-secure funding	1.91	4.18
	Secure funding	2.61	5.18
Depression	Secure funding	10.14	4.31
	Non-secure funding	10.84	4.76

Note. Non-secure funding (*n* = 383); Secure funding (*n* = 680).

Table 8

Independent sample t-tests investigating differences in type of funding for alcohol use, marijuana use and depression

	t	*df*	*p*	*d*
Alcohol Use	-5.70	863.23	.000***	.17
Marijuana Use	-2.40	935.79	.016**	.07
Depression	2.37	729.86	.018**	.07

**p* < .01. ****p* < .001.

Association of type of degree with alcohol use, marijuana use and depression. On inspection of the mean scores in Table 9, students studying towards a degree in the Humanities Faculty reported higher mean scores for alcohol use (*M* = 5.80), marijuana use (*M* = 2.59) and depression (*M* = 10.61) than students studying towards a degree outside the Humanities Faculty. Independent sample t-tests indicated that the differences for marijuana use and depression were statistically significant with *p*-values < .05, but the effect sizes as measured by Cohen's d were small (see Table 10). In contrast, the difference between the two type of degree groups was not significantly associated with alcohol use.

Table 9

Mean levels of alcohol use, marijuana use and depression for students studying towards a degree inside or outside the Humanities Faculty

		M	SD
Alcohol Use	Outside Humanities	5.24	5.00
	Inside Humanities	5.80	5.20
Marijuana Use	Outside Humanities	1.85	3.90
	Inside Humanities	2.59	5.21
Depression	Outside Humanities	9.90	3.98
	Inside Humanities	10.61	4.68

Note. Outside Humanities ($n = 325$); Inside Humanities ($n = 738$).

Table 10

Independent sample t-tests investigating differences in type of degree for alcohol use, marijuana use and depression

	t	df	p	d
Marijuana Use	-2.54	812.80	.011**	.07
Depression	-2.51	720.68	.012**	.07
Alcohol Use	-1.68	642.35	.093	.05

**$p < .01$.

Association of year of study with alcohol use, marijuana use and depression.
Descriptive statistics show that, on average, students in their third year of study reported higher levels of alcohol use ($M = 6.13$) and marijuana use ($M = 3.11$) than students in their first, second or other year of study (see Table 11). However, students in their year of study referred to as other on average reported higher scores for depression ($M = 10.82$) than students in their first, second or third year of study.

One-way analysis of variance (ANOVA) tests indicate that there are no significant differences between the different years of study for alcohol use ($F(3, 1059) = 1.04$, $p = .37$, η2 = .00), marijuana use ($F(3, 1059) = 2.43$, $p = .06$, η2 = .00) and depression ($F(3, 1059) = 1.11$, $p = .34$, η2 = .00). However, the mean scores for depression for all the year of study categories are above the CES-D-R cut-off score of 10, which indicates that on average the students in the sample are at high risk for a clinical diagnosis of depression.

Table 11

Means, standard deviations (SD) and 95% confidence intervals (CI) alcohol use, marijuana use and

depression by different years of study

	Alcohol Use			Marijuana Use			Depression		
	M	*SD*	*CI*	*M*	*SD*	*CI*	*M*	*SD*	*CI*
First Year	5.51	5.27	5.02, 6.01	2.00	4.23	1.60, 2.40	10.10	4.43	9.68, 10.52
Second Year	5.60	4.89	5.08, 6.11	2.37	4.70	1.87, 2.86	10.58	4.49	10.11, 11.05
Third Year	6.13	5.57	5.37, 6.89	3.11	6.07	2.27, 3.94	10.56	4.46	9.94, 11.17
Other	5.03	4.09	4.04, 6.02	2.38	5.09	1.15, 3.61	10.82	4.88	9.64, 12.00

Association between alcohol use, marijuana use and depression. Pearson Product-

Moment correlations indicate that there are significant correlations between all three

variables at the level of $p < .01$. The highest correlation is between the AUDIT and DUDIT

scores ($r = .35$) and suggests that there is a moderate association between problematic or

hazardous drinking behavior and harmful marijuana use. The lowest correlation is between

the DUDIT and CES-D-R-10 scores ($r = .14$), suggesting that there is a weak association

between harmful marijuana use and severity of depression symptoms. Further, there is a weak

association between the AUDIT and CES-D-R-10 ($r = .16$).

Multiple Linear Regression Analyses

Multiple linear regression was used to identify significant demographic predictors of

alcohol and marijuana use when all the independent variables were considered

simultaneously, as some may act as proxies for others. The aim was to identify parsimonious

models that do not over-fit the data, but instead contain a set of predictors that are statistically

significant. As a secondary step, the mediating role of depression was examined using the

strongest alcohol and marijuana use models.

For each response variable, simultaneous linear regression models were run using all

predictor variables at once. Thereafter, predictors that became insignificant were removed

and considered whether they could be added back based on logical or theoretical reasoning.

In addition, the interactions between the remaining predictors were considered. Following

this, the underlying model assumptions were checked and the predictive power of the final

models were assessed through 10-fold cross-validation.

Predictors of alcohol use. A simultaneous regression model was fitted with all

predictor variables: age, gender, race, type of funding, type of degree, accommodation

circumstances and year of study. The results from this first regression model indicated that

age, type of degree and year of study were not significant at the 5% level. Following this,

these predictor variables were removed from the model. The model was refit with the remaining predictor variables: gender, race, type of funding and accommodation circumstances. Each remaining predictor had at least one category with a significant p-value (see Table 12). The final model was statistically significant $F(7, 789) = 15.72$, $p < .05$, indicating that R was significantly different from 0 ($R = .35$). The predictor variables explained 12.24% of the variance in alcohol use (Adjusted $R^2 = 11.46\%$). This was accepted as the final model for predicting alcohol use.

Table 12

Model coefficients for the prediction of alcohol use by gender, type of funding, race and accommodation circumstances

Predictors		AUDIT						
	R	R^2	Adjusted R^2	b	Std. Error	Beta	t	p
Intercept	.35	.12	.11	4.63	.77		6.00	.000***
Race_White				3.63	.61	.57	6.00	.000***
Gender_Female				-1.41	.46	-.10	-3.07	.002**
Type of Funding_Secure				1.16	.40	.11	2.92	.004**
Accommodation_Living at home with parents/guardians				-1.09	.46	-.20	-2.37	.018*
Race_Black				1.00	.69	.17	1.43	.154
Race_Coloured				.65	.68	.05	.97	.334
Accommodation_UCT residence				.17	.50	.02	.34	.737

*$p < .05$. **$p < .01$. ***$p < .001$.

The regression equation for this model is:

Alcohol use = 4.63 – 1.41*Gender_Female + 1.16*Type of Funding_Secure + 1.00 *Race_Black + 3.63*Race_White + .65*Race_Coloured + .17*Accommodation_UCT residence – 1.09*Accommodation_Home with Parents or Guardians

On inspection of the final model, the predictors of alcohol use in descending order of impact (based on b-values) are race, gender, type of funding, accommodation circumstance referred to as other, and living at home with parents/guardians. The intercept/baseline of 4.63 for this model represents the average AUDIT score for a student who identifies as a male,

with the race category of other, has non-secure funding and lives in the type of accommodation referred to as other. On average, students who identify as white significantly increase the AUDIT score from the baseline by 3.63. This results in a predicted AUDIT score for white students that is more than double the baseline score. Further significant additions to the baseline score occur for students who have secure funding. However, a significant decrease to the baseline score occurs for students who identify as female or are living at home with parents/guardians.

Predictors of marijuana use. A simultaneous linear regression model was fitted with all predictor variables: age, gender, race, type of funding, type of degree, accommodation circumstances and year of study. The results from this first regression model indicated that age, race, type of funding and type of degree were not significant at the 5% level. Following this, these predictor variables were removed from the model. The model was refit with the remaining predictor variables: gender, year of study and accommodation circumstances. Each remaining predictor had at least one category with a significant p-value (see Table 13). The final model was statistically significant ($F(6, 790) = 11.99$, $p < .05$), indicating that R was significantly different from 0 ($R = .29$). The predictor variables explained 8.34% of the variance in marijuana use (Adjusted $R^2 = 7.65\%$). This was accepted as the final model for predicting marijuana use.

The regression equation for this model is:

Marijuana use = 5.71 – 3.12*Gender_Female + .35*Year of Study_Second + 1.18*Year of Study_Third + .31*Year of Study_Other – 1.25*Accommodation_UCT residence - 1.11*Accommodation_Home with Parents or Guardians

Table 13

Model coefficients for the prediction of marijuana misuse by gender, year of study and accommodation circumstances

Predictors	R	R^2	Adjusted R^2	b	Std. Error	Beta	t	p
			DUDIT					
Intercept	.29	.08	.08	5.71	.54		10.64	.000***
Gender_Female				-3.12	.44	-.24	-7.03	.000***
Accommodation_Living at home with parents/guardians				-1.11	.41	-.26	-3.81	.000**
Accommodation_UCT residence				-1.25	.44	-.25	-3.12	.002**
Year of Study_Third				1.18	.48	.17	2.15	.032*
Year of Study_Second				.35	.40	.06	.87	.386
Year of Study_Other				.31	.71	-.01	-.12	.907

*$p < .05$. **$p < .01$. ***$p < .001$.

On inspection of the final model, the predictors of marijuana use in descending order of impact (based on *b*-values) are gender, the accommodation circumstance referred to as other, living at home with parents/guardians, staying in a UCT residence, and the first and third years of study. The intercept/baseline of 5.71 for this model represents the average DUDIT score for a student who identifies as male, is in their first year of study and lives in the type of accommodation referred to as other. On average, students who identify as male, live in the other accommodation circumstance, and are in their first or third year of study significantly increase the baseline, while students identifying as female, and live at home with parents/guardians or in a UCT residence significantly decrease the baseline.

Assumptions and validation of final models. The final models for predicting alcohol misuse and marijuana misuse, established above, were assessed to determine if the underlying assumptions of multiple linear regression were upheld. Normal Q-Q and residual plots for both models indicated that the assumption of homoscedasticity of residuals was violated (see Appendix I). Although it may have been best to change the functional forms of the final AUDIT and DUDIT models to improve their validity, given the large sample ($N = 1063$) the final models and associated statistical tests were robust to underlying assumptions. In addition, various outliers were identified and each case's questionnaire response was checked and no evidence was found regarding patterned selection errors. On the basis that the questionnaire responses were likely to be correct and errors made at random, these cases were

all kept in the study. Finally, the predictive power of the models and therefore the efficacy of the remaining predictor variables in predicting alcohol and marijuana misuse were assessed. This involved performing a 10-fold cross validation (see Appendix J).

        Depression as a mediator of alcohol and marijuana use. The final aim of the study is to examine whether depression mediates the severity of alcohol or marijuana usage. The following mediation analyses were conducted using path analysis which is a form Structural Equation Modeling (SEM) in R. This allowed for the investigation of correlations between variables (Kline, 2015). To investigate depression as a mediator of alcohol use, the final regression model for alcohol use was taken as a starting point. The categorical variables representing insignificant predictor categories were removed, leaving the following variables in the model as significant predictors of alcohol use: gender, race, accommodation circumstances and type of funding. Thereafter, the potential mediator variable of depression was regressed on these four remaining predictor variables. Table 14 shows that none of the predictor variables were significant predictors of depression. Furthermore, confidence intervals generated by bootstrapping tests showed the same predictor variables to be insignificant. This suggests that the data does not provide sufficient evidence in support of the hypothesis that depression mediates alcohol use (see Figure 1).

Table 14

Model coefficients for the mediation of alcohol use by depression

|	b	z-value	p	CI
AUDIT Score				
Gender_Female	-1.44	-3.24	.001**	-2.32, -.57
Race_White	3.40	8.37	.000***	2.37, 3.82
Accommodation_Living at home with parents/guardians	-1.42	-4.02	.000***	-2.11, -.73
Type of Funding_Secure	1.08	2.89	.004**	.35, 1.81
Depression	.23	6.10	.000***	.16, .31
Depression Score				
Gender_Female	.04	.11	.916	-.77, .86
Race_White	-.60	-1.74	.082	-1.27, .08
Accommodation_Living at home with parents/guardians	.59	1.79	.073	-.06, 1.23
Type of Funding_Secure	-.30	-.87	.383	-.98, .38

**p < .01. ***p < .001.
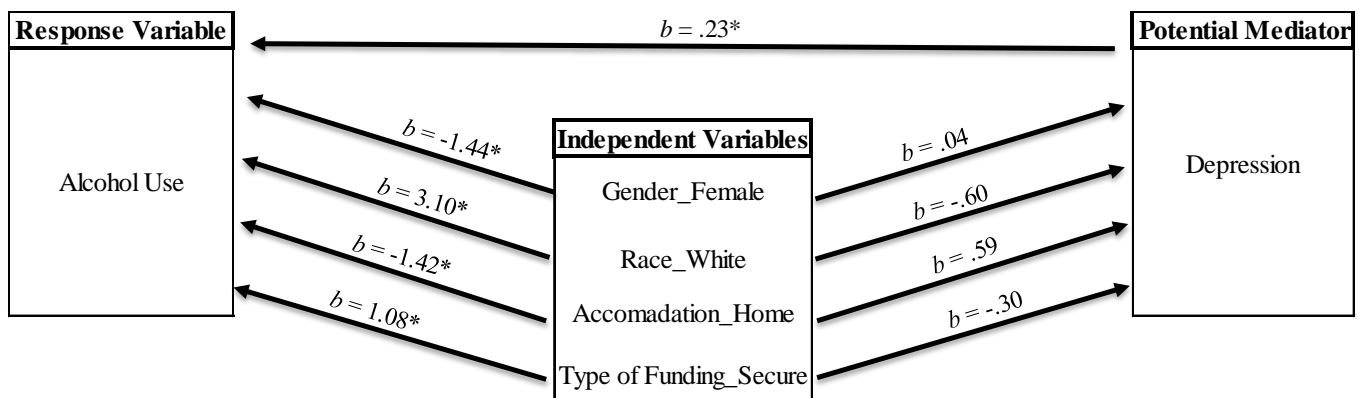
Figure 1. Path diagram showing depression as a potential mediating variable towards alcohol usage. *p < .05.

The final regression model for marijuana use reported above was taken as a starting point to determine whether depression mediates marijuana usage. The categorical variables representing insignificant predictor categories were removed, leaving the following variables in the model: gender, accommodation circumstances and year of study. Again, the first step of the mediation process was to acknowledge that the predictors remaining in the model are significant predictors of marijuana use. Thereafter, the potential mediator variable of depression was regressed on these four remaining predictor variables. Results indicate that only one predictor variable, accommodation category of living at home with parents/guardians, is a significant predictor of depression (see Table 15). This was not sufficient to move onto the final step of the mediation process. In addition, confidence intervals generated by bootstrapping tests showed the same predictor variables to be insignificant. Therefore, the process was again terminated at this step as the data does not provide sufficient evidence in support of the hypothesis that depression mediates marijuana use (see Figure 2).

Table 15

Model coefficients for the mediation of marijuana use by depression

	b	z-value	p	CI
DUDIT Score				
Gender_Female	-3.11	-7.09	.000***	-3.97, -2.25
Accommodation_Living at home with parents/guardians	-1.71	-4.20	.000***	-2.51, -.91
Accommodation_UCT residence	-1.47	-3.44	.001**	2.31, -.64
Year of Study_Third	.86	2.01	.044*	.02, 1.70
Depression	.14	3.79	.000***	.07, .22
Depression Score				
Gender_Female	-.01	-.12	.987	-.82, .81
Accommodation_Living at home with parents/guardians	.86	2.24	.025*	.11, 1.61
Accommodation_UCT residence	.60	1.48	.140	-.20, 1.39
Year of Study_Third	.15	.38	.703	-.64, .95

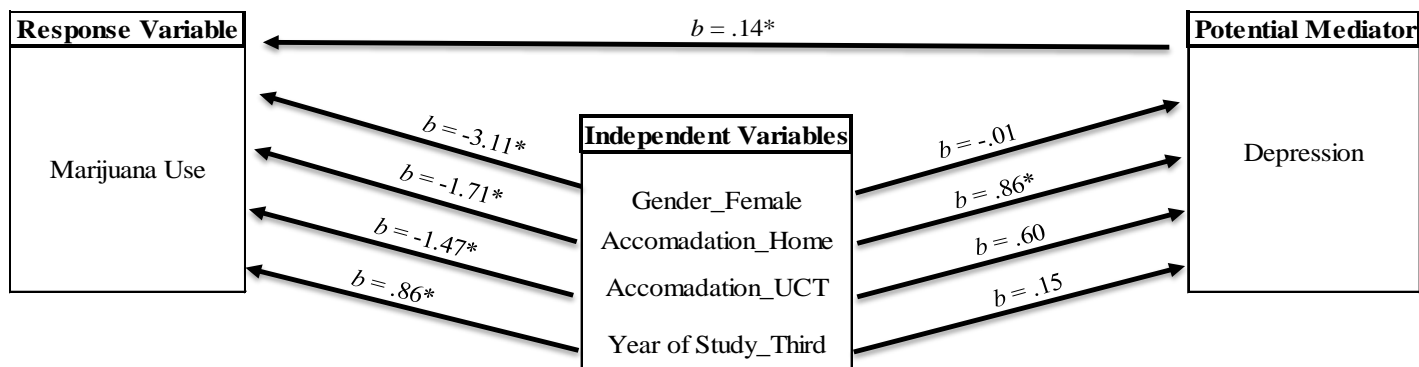*p < .05. **p < .01. ***p < .001.

Figure 2. Path diagram showing depression as a potential mediating variable towards marijuana usage. *p < .05.

Discussion

The current study found a high prevalence of alcohol and marijuana use among students at the University of Cape Town, which is consistent with the findings of the few studies at other South African universities (Peltzer & Pengpid, 2016; Pengpid et al., 2013a; Young & de Klerk, 2008). Almost one third (32.92%) of participants reported having a drink containing alcohol as often as two to four times a week, whereas only 19.66% reported never using alcohol. Almost 18% of participants reported having six or more drinks on one occasion monthly. Nearly two thirds (68.67%) of participants reported never using marijuana, while 17.78% indicated marijuana use once a month, 9.87% as often as two to four times a month, and 3.67% reported use four times a week or more.

Although less than half of the sample were found to have clinically at risk levels of alcohol use (40.83%), the overall prevalence of at risk alcohol use in the study was markedly higher than previous South African and international studies (Cho et al., 2014; Jager, 2014; Pengpid et al., 2013a). Similarly, the overall prevalence of any marijuana use among students in the sample (29.92%) was found to be higher than previous studies (Bajwa et al., 2013; Caldeira et al., 2008; Cho et al., 2014; Peltzer & Pengpid, 2016; Silva et al., 2006). However, it should be noted that the AUDIT and DUDIT scales do not indicate caseness of SUDs, but rather participants who may be at risk of having a SUD. Thereafter, further diagnostic assessment would be needed (Bohn et al., 1995; Matuszka et al., 2013). In concordance with the findings of numerous other studies (Geisner et al., 2012; Jager, 2014; Pengpid et al., 2013a; Wicki et al., 2010; Young & de Klerk, 2008; Young & Mayson, 2010), the study found that men reported significantly higher levels of alcohol and marijuana misuse than women, suggesting that male participants engage more frequently in problematic or hazardous drinking behaviour and harmful marijuana use than female participants.

Whilst previous studies have shown that demographic factors, namely age, gender, race, accommodation, parental income or financial support, academic field, year of study and depression, are significant predictors of alcohol and/or marijuana use (Cho et al., 2014; El Ansari et al., 2015; Jager, 2014; Peltzer & Pengpid, 2016; Pengpid et al., 2013a; Young & de Klerk, 2008), there is no comparative published study among university students in Cape Town. Consistent with previous findings, when the association between alcohol use and demographic factors were considered individually, gender, race, accommodation circumstances and type of funding were found to be significant predictors of alcohol use. In addition, when all demographic factors were considered simultaneously, it was found that race, gender, type of funding and accommodation circumstances remained significant

predictors of alcohol use. Specifically, students in the sample who identify as male, with the other or white race category, have secure funding and live in the type of accommodation referred to as other engage in significantly more alcohol use, whereas students who identify as female, have non-secure funding and live at home with parents/guardians engage in significantly less alcohol use. This may reflect the cumulative risk for alcohol use posed by masculinity norms for white males combined with having secure funding and living in unsupervised accommodation.

Similar to the findings of previous studies (Pengpid et al., 2013a; Young & Mayson, 2010), this study found that students who identified with the race categories of white indicated significantly higher levels of alcohol use than students identifying as black, coloured or other. In accordance with the studies by El Ansari et al. (2015) and Wicki et al. (2010), age and year of study were not found to be significant predictors of alcohol use. Interestingly, the predictor of the accommodation circumstance of living at home with parents/guardians that was found to significantly predict alcohol use in this study, is not a significant predictor of alcohol use in the findings of previous studies (El Ansari et al., 2015; Peltzer & Pengpid, 2016; Pengpid et al., 2013a; Wicki et al., 2010).

When the association between marijuana use and demographic factors were considered individually, only gender, year of study and accommodation circumstances were significant predictors of marijuana use. Again, when all demographic factors were considered simultaneously, the above factors remained significant towards predicting marijuana use. This indicates that students who identify as male, are in their first or third year of study and live in the other accommodation circumstance are significantly more likely to use marijuana, whereas students who identify as female, live at home with parents/guardians or in a UCT residence have significantly lower levels of marijuana use. These predictors of marijuana use are also confirmed by other studies (El Ansari et al., 2015; Jager, 2014; Pengpid et al., 2013a). However, unlike in other studies (Bajwa et al., 2013; Peltzer & Pengpid, 2016), the demographic factors of age, race, type of funding and type of degree were not found to be significant predictors of marijuana use.

Consistent with previous research (Geisner et al., 2012; Jager, 2014; Peltzer & Pengpid, 2016), this study found that depression does not mediate the severity of alcohol or marijuana usage, but has a significant direct association with alcohol and marijuana use among participants in the study. While this study found that half of the sample are at risk for a clinical diagnosis of depression, the absence of mediation could be explained by the fact that students experiencing high levels of depression are less likely to engage in social

activities on and off-campus centered around alcohol and/or marijuana use (Geisner et al., 2012). However, it may be that the severity of depression is intensified by harmful alcohol and marijuana use. Further investigation is needed by conducting longitudinal studies in future to examine this relationship (Cho et al., 2014; Geisner et al., 2012).

Limitations

This study contains a few limitations which influence the generalizability of findings and the validity of the inferences that can be made. Firstly, the study made use of a non-representative sample of South African university students, as only undergraduate UCT Psychology students participated in this study which does not accurately reflect the diverse student population at UCT. Therefore, the generalization and interpretation of findings should be done with caution. This study involved the use of four online self-report questionnaires which are likely to been influenced by retrospective report bias (Jager, 2014). In addition, there are no South African clinical cut-off scores for the AUDIT and DUDIT measures to date, which suggests that the current universal cut-off scores may be less sensitive towards alcohol and marijuana use when applied within the South African context (Pengpid et al., 2013a). Lastly, the study made use of a cross sectional survey design which prohibits the making of causal inferences regarding the association between demographic factors and depression and substance abuse. Therefore, future research should consider using longitudinal studies to investigate this relationship more precisely. The relatively low variance explained by each regression model suggests that factors not explored in this study also contribute to alcohol and marijuana use in this population, thus other possible predictors should also be identified.

Recommendations

Given the high prevalence of alcohol and marijuana use found among students in the study, the implementation of preventative substance abuse programmes and interventions are crucial to ensuring that the health, mental health and futures of university students in Cape Town are safeguarded. Substance abuse prevention programmes should be incorporated into the undergraduate psychology curriculum at UCT, for example in the health or clinical psychology modules, as research indicates that mental health promotion for students is best delivered through their curriculum (Fernandez & Howse, 2016). This would ensure that every student has access to preventative substance abuse resources and will encourage the promotion of mental wellbeing among students. Further, these programmes should be

embedded within UCT's policies and practices to ensure the promotion and incorporation of mental health into the university environment. Future studies conducted at South African universities should make use of longitudinal survey designs with representative student samples, in order to create generalizable and comparable findings regarding predictors of SUDs among university students in South Africa.

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Appendix A

Demographic Questionnaire

<u>Substance Abuse Among University Students</u>

Demographic Questionnaire

Please complete the following questionnaire by selecting one option for each item which best relates to you:

Age: (17-Above 65)

Gender: (Male/Female/Other)

Race: (Black/White/Indian/Coloured/Other/I prefer not to respond)

Accommodation Circumstances: (UCT residence/Living alone/Sharing with non-family Members/Living at home with parents/Other)

Type of University Funding: (National Student Financial Aid Scheme/Student Loan from Bank/Private Bursary/Parent or Guardian/Other)

Choice of Degree: (Bachelor of Arts/Bachelor of Social Science/Other degree in Humanities/Other degree not within Humanities)

Year of Study: (First year/Second year/Third year/Fourth year/Other)

Appendix B

Alcohol Use Disorders Identification Test (AUDIT)

Please answer the following questions about your alcohol use as honestly as possible, and your answers will remain strictly confidential.

Select an option for each question that best describes your response.

	Questions	0	1	2	3	4
1.	How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week
2.	How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more
3.	How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
4.	How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	4 or more times a week
5.	How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	4 or more times a week
6.	How often during the last year have you needed a drink first thing in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	4 or more times a week
7.	How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	4 or more times a week
8.	How often during the last year have you been unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	4 or more times a week
9.	Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year
10.	Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year

Appendix C

Drug Use Disorders Identification Test (DUDIT)

Please answer the following questions about your marijuana (also known as dagga) use as honestly as possible, and your answers will remain strictly confidential.
Select an option for each question that best describes your response.

	Questions	0	1	2	3	4
1.	How often do you use dagga?	Never	Once a month of less often	2-4 times a month	2-3 times a week	4 times a week or more
2.	Do you use dagga and another type of drug on the same occasion?	Never	Once a month of less often	2-4 times a month	2-3 times a week	4 times a week or more
3.	How many times do you use dagga on a typical day?	0	1-2	3-4	5-6	7 or more
4.	How often are you heavily under the influence of dagga?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
5.	Over the past year, have you felt that your longing for dagga was so strong that you could not resist it?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
6.	Has it happened, over the past year that you have not been able to stop using dagga once you started?	Never	Less often than once a month	Every month	Weekly	Daily or almost daily
7.	How often over the past year have you used dagga and then not done something you should have done?	Never	Less often than once a month	Every month	Weekly	Daily or almost daily
8.	How often over the past year have you needed to use dagga the morning after heavy dagga use the day before?	Never	Less often than once a month	Every month	Every week	Daily or almost daily
9.	How often over the past year have you had guilt feelings or a bad conscience because you used dagga?	No	Less often than once a month	Every month	Every week	Daily or almost daily
10.	Have you or anyone else been mentally/physically hurt because you used dagga?	No	Yes, but not over the last year	Yes, over the last year		
11.	Has a relative or a friend, a doctor or a nurse, or anyone else, been worried about your dagga use or said to you that you should stop using dagga?	No	Yes, but not over the last year	Yes, over the last year		

Appendix D

Centre for Epidemiologic Studies Short Depression Scale (CES-D-R-10)

Below is a list of some of the ways you may have felt or behaved.

Please indicate how often you may have felt this way during the past week by selecting the appropriate option for each item.

	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2days)	Occasionally or a moderate amount of time (3-4 days)	All of the time (5-7 days)
1. I was bothered by things that usually don't bother me.				
2. I had trouble keeping my mind on what I was doing.				
3. I felt depressed.				
4. I felt that everything I did was an effort.				
5. I felt hopeful about the future.				
6. I felt fearful.				
7. My sleep was restless.				
8. I was happy.				
9. I felt lonely.				
10. I could not "get going."				

Appendix E

Consent Form

Consent to participate in research study

Dear student,

Purpose of Study

You are invited to take part in a study conducted by a Psychology Honours student at the University of Cape Town. The purpose of the study is to explore patterns of alcohol and marijuana (also known as dagga) use among UCT students.

Study Procedures

If you consent to participating in this study, you will be required to respond to various questions and statements. The information you provide in the survey will be kept strictly confidential and only the researcher will have access to the recorded responses. You will need to provide your name, surname and student number if you wish to receive 1 SRPP point for participation. This is strictly for the purposes of SRPP point allocation and there will be no way for the researcher to link the survey responses back to your identification.

Possible Risks

There is a risk that you may experience some distress or concern while completing the survey, as personal and sensitive questions regarding symptoms of depression, marijuana and alcohol use will be asked. There are no consequences if you choose not to answer a question(s) in the survey, or if you choose to withdraw from the study at any point.

Possible Benefits

In return for your participation, you will be awarded 1 SRPP point for an undergraduate psychology course. You may also find this topic of study interesting and relevant within a university environment.

Voluntary Participation

Your participation in this study is solely voluntary. You may choose to not take part in this research study, and there will be no consequences for you in making this choice. You may also choose to not answer a question(s) or withdraw from the study at any point, and there will also be no consequences for you in making these decisions.

Questions

Any questions or problems related to the study should be directed to the researcher or her supervisor, Debbie Kaminer:

Serita Ramdhani   RMDSER001@myuct.ac.za
Debbie Kaminer   Debbie.Kaminer@uct.ac.za

If you have any questions about your rights as a research participant, feedback or issues related to the study, these may be sent to the Research Ethics Committee, Department of Psychology, University of Cape Town by contacting Rosalind Adams at Rosalind.adams@uct.ac.za or at 021-6503427.

CONFIRMATION OF PARTICIPANT CONSENT:

I have read and understood the above information regarding the study, the possible benefits and risks. Any questions I have about the study have been answered.

[Participants will be required to select an option indicating that they agree to voluntarily participate in the research study and thereafter will be allowed to proceed with the survey. If participants indicate that they do not agree to participate in the study, they will instantly be directed out of the survey]

Appendix F

Participant Debriefing Form

Demographic factors and Depression as Predictors of Substance Use Among University Students

Thank you for your participation in this study! You are encouraged to take a screenshot of this page as proof of your participation in this study.

Aim of the study

The aim of this study is to examine patterns of alcohol and dagga (marijuana) use among students at the University of Cape Town in South Africa, specifically looking at how demographic factors and feelings of depression may be linked to use of these substances.

Some students use alcohol or dagga (marijuana) recreationally without experiencing any negative impacts, while for others their use of alcohol or marijuana can cause difficulties in their academic and/or social functioning. Similarly, some students feel a bit sad or down some days without it having any long-lasting negative impact, while others feel sad and down for many weeks and are not able to keep up their academic or social functioning as a result of this.

If taking part in this study has left you with any worries about your level of alcohol or marijuana use, or about your mood, and how these are impacting on how you are coping, please contact:

The UCT Student Careline
Toll free: **0800 24 25 26** from a Telkom line
SMS: **31393** for a call-me-back

UCT Student Wellness
Phone: **021 650 1020**
Email: counselling@uct.ac.za

Cape Town Drug Counselling Centre
Phone: **021 447 8026**

Lifeline Western Cape
Phone: **021 461 1113**

If you have any further questions regarding this study, please contact the researcher via email. If you would like to be informed about the results for this study, please notify the researcher via email and she will be in contact with you once the study is completed.

Contact details of the researcher:

Serita Ramdhani   RMDSER001@myuct.ac.za

Appendix G

Table 6

Post-hoc comparisons for alcohol use and depression by race

				Mean Difference (I-J)	SE	Sig.	95% *CI* Lower Bound	Upper Bound
Alcohol Use	Tukey HSD	Other	Black	-.93	.56	.341	-2.36	.50
			White	-3.47	.53	.000*	-4.82	-2.11
			Coloured	.01	.56	1.000	-1.43	1.46
		Black	Other	.93	.56	.341	-.50	2.36
			White	-2.54	.38	.000*	-3.52	-1.55
			Coloured	.94	.43	.120	-.15	2.04
		White	Other	3.47	.53	.000*	2.11	4.82
			Black	2.54	.38	.000*	1.55	3.52
			Coloured	3.48	.39	.000*	2.49	4.48
		Coloured	Other	-.01	.56	1.000	-1.46	1.43
			Black	-.94	.43	.120	-2.04	.15
			White	-3.48	.39	.000*	-4.48	-2.49
Depression	Tukey HSD	Other	Black	.64	.51	.584	-.66	1.95
			White	1.57	.48	.006*	.34	2.81
			Coloured	1.09	.51	.141	-.22	2.40
		Black	Other	-.64	.51	.584	-1.95	.66
			White	.93	.35	.038*	.04	1.83
			Coloured	.45	.39	.656	-.55	1.44
		White	Other	-1.57	.48	.006*	-2.81	-.34
			Black	-.93	.35	.038*	-1.83	-.04
			Coloured	-.48	.35	.516	-1.39	.42
		Coloured	Other	-1.09	.51	.141	-2.40	.22
			Black	-.45	.39	.656	-1.44	.55
			White	.48	.35	.516	-.42	1.39

*p < .05.

Appendix H

Table 8

Post-hoc comparisons for alcohol use, marijuana use and depression by accommodation circumstance

				Mean Difference (I-J)	SE	Sig.	95% *CI* Lower Bound	Upper Bound
Alcohol Use	Tukey HSD	Other	UCT residence	1.38	.40	.002*	.44	2.31
			Living at home	1.84	.38	.000*	.95	2.72
		UCT residence	Other	-1.38	.40	.002*	-2.31	-.44
			Living at home	.46	.38	.440	-.42	1.35
		Living at home with parents/guardians	Other	-1.84	.38	.000*	-2.72	-.95
			UCT residence	-.46	.38	.440	-1.35	.42
Marijuana Use	Games-Howell	Other	UCT residence	1.40	.40	.002*	.45	2.35
			Living at home	1.30	.38	.002*	.42	2.19
		UCT residence	Other	-1.40	.40	.002*	-2.35	-.45
			Living at home	-.10	.33	.953	-.87	.67
		Living at home with parents/guardians	Other	-1.30	.38	.002*	-2.19	-.42
			UCT residence	.10	.33	.953	-.67	.87
Depression	Tukey HSD	Other	UCT residence	-.78	.35	.069	-1.60	.05
			Living at home	-.78	.33	.048*	-1.56	-.01
		UCT residence	Other	.78	.35	.069	-.05	1.60
			Living at home	-.01	.33	1.000	-.79	.77
		Living at home with parents/guardians	Other	.78	.33	.048*	.01	1.56
			UCT residence	.01	.33	1.000	-.77	.79

*$p < .05$.

Appendix I

Model Validation Plots for final AUDIT and DUDIT models
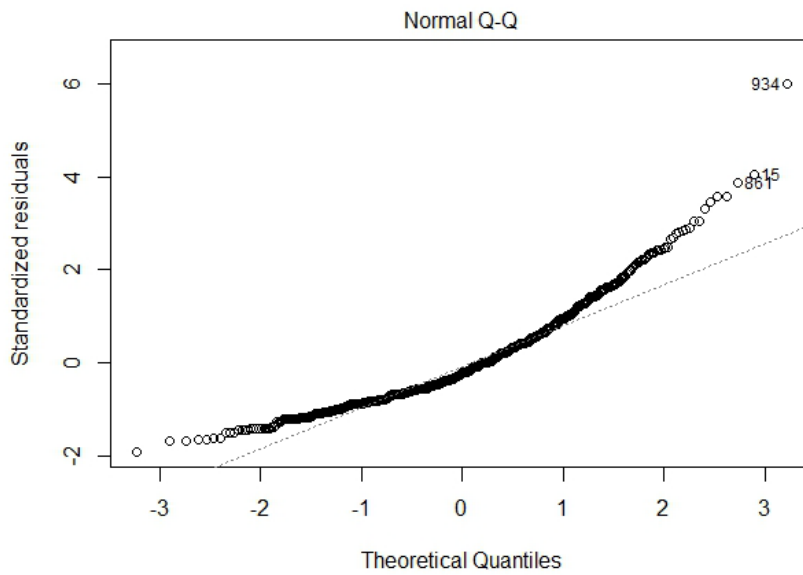

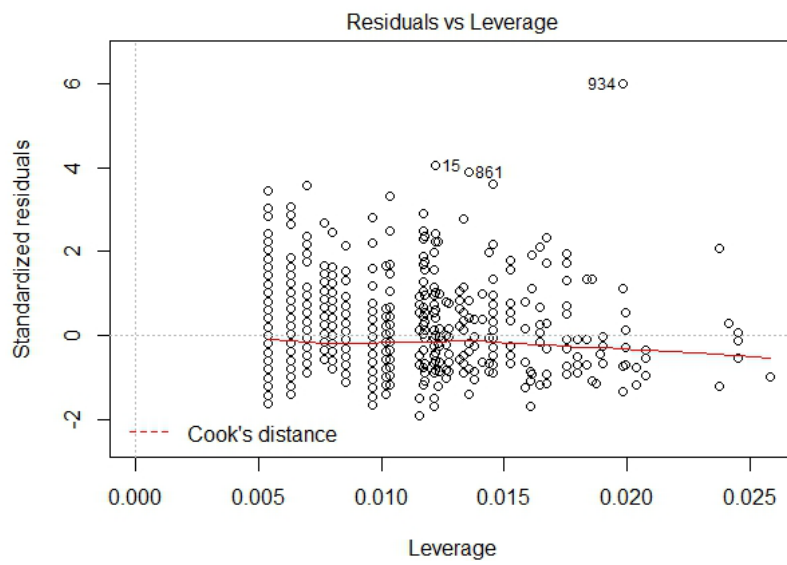*Figure 3.* Normal Q-Q plot for AUDIT model.

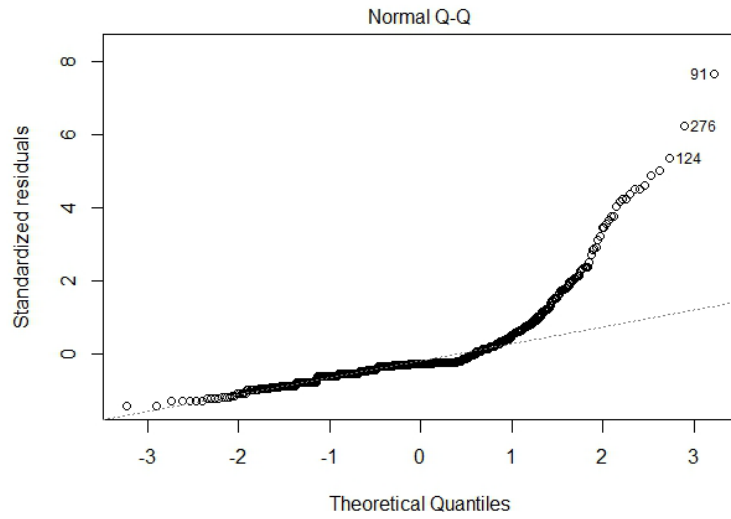*Figure 4.* Residual vs Leverage plot for AUDIT model.

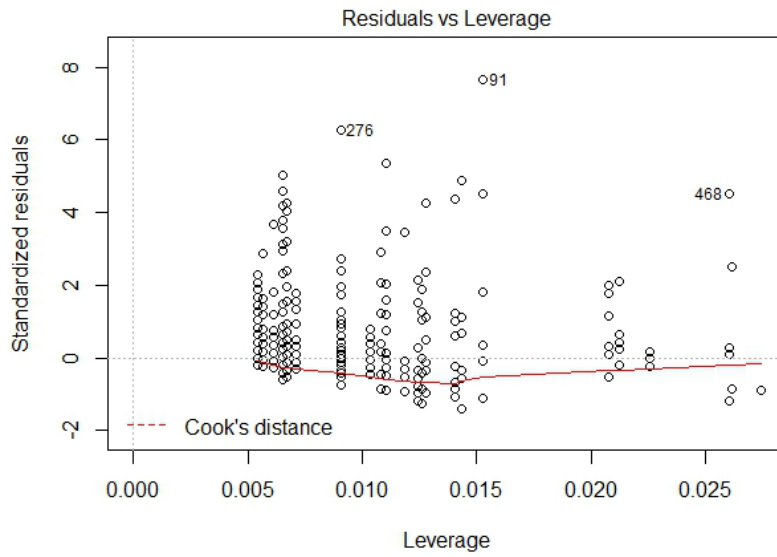*Figure 5.* Normal Q-Q plot for DUDIT model.

Figure 6. Residuals vs Leverage plot for DUDIT model.

Appendix J

10-fold Model Cross Validation

As a control for this analysis, each of the final models were compared to their respective null models. The null model is simply the model comprising of just the mean response, which is the intercept. The mean of the squared error (predicted response – actual response) for the final AUDIT model across the 10 folds remained fairly stable and was consistently lower than the null model (see Figure 7). The final DUDIT model is slightly more sensitive to the data used to train it, as we see more variability in the mean squared error across the folds (see Figure 8). However, the final DUDIT model was consistently lower than the null model. The results of the cross validation confirm that the models have predictive power. Based on the sample, the final models are worth using for the prediction of AUDIT and DUDIT scores, in comparison to simply taking the mean score to be the predicted outcome.
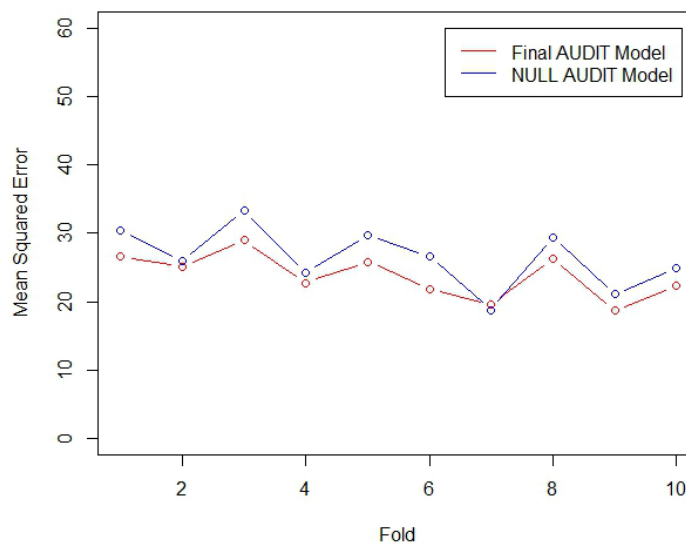

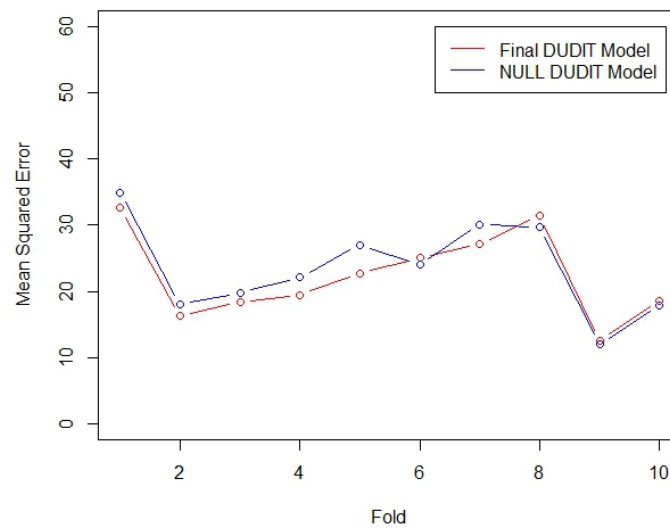*Figure 7*. 10-fold cross validation of Final AUDIT Model and Null AUDIT Model.

Figure 8. 10-fold cross validation of Final DUDIT Model and Null DUDIT Model.