

# Socio-economic determinants of alcohol consumption for South Africa

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## Abstract

**Aims:** To examine the socio-economic factors associated with alcohol consumption in South Africa.

**Design:** Cross-sectional study exploring the various socio-economic factors associated with alcohol consumption in South Africa.

**Setting:** South Africans older than 15 years across the country's nine provinces.

**Participants:** Adult respondents of the drinking status and alcohol intensity questions in Wave 4 of the National Income Dynamics Study (NIDS;  $n = 28\,401$ ).

**Measures:** Alcohol, demographic, emotional well-being, health and neighbourhood variables.

**Findings:** White and Mixed Heritage (referred to as 'Coloured' in South Africa) adults were more likely to consume alcohol, while Asian/Indian and White adults were less likely to drink in a heavy episodic way, or 'binge drink' (five or more standard drinks in a day) relative to African/Black adults. Men with good self-perceived health were less likely to binge drink than those with excellent health while men who resided in neighbourhoods where alcohol and drug abuse were perceived to be either fairly common or very common, were more likely to binge drink. Women who exercised more than three times a week were also more likely to drink and binge drink. Women with a poor self-perceived health status were less likely to binge drink than those perceived to be in excellent health. Adults who smoked were more likely to drink and binge drink relative to non-smoking adults. Reported average monthly household spending on alcohol for binge drinkers was low. There was evidence of drinking and binge drinking among pregnant women.

**Conclusions:** In South Africa, race, age, gender, religion, education, and smoking were associated with drinking and binge drinking. Groups identified at greater risk of binge drinking warrant prioritisation when planning future national alcohol interventions.

## Introduction

South Africans who consume alcohol tend to display harmful drinking patterns. According to the World Health Organisation (WHO), average alcohol consumption per capita in South Africa is 9.5 litres annually, which is the highest in Africa (WHO, 2018). Moreover, one in seven South Africans binge drink (Vellios & Van Walbeek, 2018). Furthermore, South Africa is one of nine countries with a pattern-of-drinking score (PDS) of four out of five, suggesting highly risky individual-level drinking patterns (WHO, 2014).

Risky drinking, otherwise known as harmful use of alcohol, is problematic for a number of health reasons. Harmful use of alcohol adversely affects mental and emotional health by causing cognitive impairment, impulsivity, impaired

working memory, weakened emotional learning, interpersonal violence, and neuropsychiatric conditions (Lye & Hirschberg, 2010; Probst et al., 2018; Schneider et al., 2007; Stephens & Duka, 2008). Harmful use of alcohol also affects physical health and links to liver damage, cancers of the head and throat, heart disease, ulcers, and risky sexual behaviour known to increase exposure to sexually transmitted diseases (Lye & Hirschberg, 2010; Morojele et al., 2006). Moreover, studies on quality of life suggest that persons with alcohol use disorders (formerly termed alcoholics), defined as those engaging in 'periods of heavy drinking followed by abstinence' (Courtney & Polich, 2009, p. 142), experience a lower quality of life relative to persons without alcohol use disorders (formerly termed non-alcoholics) (Sharma et al., 2012; Welsh et al., 1993). In sum, risky drinking is an unhealthy behaviour that depreciates individual health capital (Cawley & Ruhm, 2012).

Harmful use of alcohol has several adverse economic consequences. There are various labour costs associated with harmful use of alcohol, such as decreased labour productivity, work-related injuries, high employee turnover, alcohol-attributable health problems, and workplace absenteeism (Matzopoulos et al., 2014). Individual economic costs, such as premature mortality and morbidity, unemployment, and early retirement are also associated with harmful use of alcohol (Matzopoulos et al., 2014). Harmful use of alcohol further increases the burden on the healthcare, criminal justice, social security, and social development systems (Matzopoulos et al., 2014; Manthey et al., 2021).

This study adopted a biopsychosocial approach to analysing alcohol consumption, commonly used in the study of depression and risky behaviours, such as addiction (Bolton and Gillet, 2019). The approach postulates that alcohol consumption results from a complex combination of biological, psychological, and socio-cultural characteristics, similar to addiction (Skewes & Gonzales, 2013). This view is an alternative to biomedical postulations, such as White's (2000) disease theory, which considers alcohol consumption, addiction in particular, as a primary disease that is progressive and incurable. It is through this lens that the researcher attempted to uncover a broad range of factors associated with drinking and binge drinking, to understand the complexity of alcohol consumption.

Many international studies have explored the factors associated with alcohol consumption. Dias and colleagues (2011) evaluated the social and behavioural factors associated with alcohol consumption and found that high-intake drinkers were older, male, smokers, less educated and lower consumers of fruit and vegetables. According to Yuan and Yen (2012), socio-economic variables determine alcohol consumption, and the authors argued that the probability of drinking decreases with age, income, and education. They also reported that men are more likely to drink than women and marriage decreases drinking. Cheah (2015) found that different factors affect the likelihood of light drinking versus heavy drinking for non-Malays in Malaysia. The likelihood of heavy alcohol drinking has a positive association with younger, poorer, less educated, non-single, employed rural dwellers, while the likelihood of light drinking has a positive association with high-income earners, single, well-educated urban dwellers. Moreover, Iparraguirre (2015) identified that several socio-economic factors, such as retirement, income, marital status, and other responsibilities were associated with high-risk alcohol consumption for people over 50 in England. In South Africa, Vellios and Van Walbeek (2018) identified African adults as less likely to report drinking (of any amount) than White adults, and adults with religious affiliations are less likely to drink relative to those without religious affiliations. Moreover, smoking is associated with an increased likelihood of drinking, and binge drinking is the highest among adults in the 25–34 age group (Vellios and Van Walbeek, 2018). This study aimed to build on Vellios and Van Walbeek's (2018) research by exploring emotional, health and neighbourhood characteristics comprehensively in understanding the factors associated with alcohol consumption. Thus, the study investigated a holistic set of

demographic, emotional, health, and neighbourhood explanatory variables associated with alcohol consumption (drinking and binge drinking), so as to understand the factors associated with alcohol consumption, especially binge drinking (heavy episodic drinking), in South Africa in order to inform possible interventions.

## Methods

### Sampling Procedures

The National Income Dynamics Study (NIDS) applied a stratified, two-stage cluster sampling design for the base Wave (Leibbrandt et al., 2009; Woolard et al., 2010). Four hundred primary sampling units (PSUs) from Statistics South Africa's master sample of 3000 PSUs (first stage) were proportionately selected within strata, constituting 53 district councils in the master sample (second stage). Thereafter, two clusters within each PSU were identified, providing 24 dwelling units for each PSU, totalling 9600 dwelling units (Woolard et al., 2010). Fieldworkers used a pre-designed and piloted questionnaire to interview every resident per dwelling unit, and various verification mechanisms were used to prevent and detect data falsification (Leibbrandt et al., 2009). Data from all NIDS waves are publicly available, and this study made use of Wave 4, gathered in 2014 and 2015, comprising 49 532 household members, of which 28 401 were adult respondents, including proxy adults: defined as an adult who completes an interview on behalf of a resident household member who cannot be located. Proxy interviews are also conducted for household members who reside elsewhere such as prison, residence, hospital, clinic or hospital (Southern Africa Labour and Development Research Unit and Development Research Africa, 2008; Southern Africa Labour and Development Research Unit, 2015; Southern Africa Labour and Development Research Unit, 2018).

### Variables

[Supplementary Table S1](#) outlines the variables used in this study and provides the number of responses received for each question, and these numbers as unweighted percentages of the total sample. Alcohol consumption was measured using drinking status ('How often do you drink alcohol?') and drinking intensity ('On a day that you have an alcoholic drink, how many standard drinks do you usually have? A standard drink is a small glass of wine; a 330ml can of regular beer, a tot of spirits or a mixed drink'). A standard drink in South Africa comprises 12g absolute alcohol (Van Heerden & Parry, 2001) and the drinking intensity variable was recoded to capture binge-drinking (five or more standard drinks in a day) status (1 for binge drinkers, 0 otherwise) (Vellios & Van Walbeek, 2018). Race, gender, age, marital status, province, geographical region, religious affiliation, education, employment, and individual income were included to control for individual demographic characteristics, in line with the research of Cheah (2015), Dias and colleagues (2011), Iparraguirre (2015), Peralta and Steele (2009), Vellios and Van Walbeek (2018) and Yuan and Yen (2012).

Regarding race, the terms ‘White’, ‘African/Black’, ‘Asian/Indian’, and Mixed Heritage (referred to as ‘Coloured’ in South Africa) refer to demographic markers. These markers were chosen for their historical significance given that the population of South Africa, according to the repealed Population Registration Act of 1950, was divided into four groups: African/Black; White; Mixed Heritage or ‘Coloured’ and Asian/Indian. The demographic characteristics of substance users are important to include in alcohol-related research as accurate user profiles can assist in identifying vulnerable sections of the population and in the planning and implementation of effective prevention and intervention programmes. Exercise, self-perceived health, and smoking status were included as representatives of overall health. Body Mass Index was originally included but later removed due to high levels of multicollinearity. Self-perceived health is highly correlated with physician assessments of health conditions (Bonner et al., 2017) and serves as a reasonable proxy for overall health. Life satisfaction and depression were used as indicators of emotional well-being. The researcher calculated depression using the 10-item Centre for Epidemiological Studies Depression Scale (CES-D-10) index and applied cut-off points to signal varying risk levels of depression – a value of 12 or above signals a greater risk of depression while a value less than 12 signals a lower risk of depression (Baron et al., 2017). An average cut-off value of 12 provides appropriate sensitivity and specificity across isiZulu, isiXhosa and Afrikaans language groups in South Africa (Baron et al., 2017:11). Similarly, the researcher applied cut-off points to life satisfaction based on the suggestions by Van Beuningen and colleagues (2014), where people with scores of 4 or less were classified as unsatisfied, 5–6 were classified as intermediately satisfied, 7–8 as satisfied, and 9–10 were classified as very satisfied.

Household characteristics included household size and the number of biological children living in the household, as determined for women with children as the variable was not available for men (refer to [Supplementary Table S2](#)). The frequency of alcohol and drug abuse in the neighbourhood refers to the reference individual’s perception, imputed by asking the oldest woman in the household, ‘How common is drug or alcohol abuse in your neighbourhood?’ The response options were never, very rare, not common, fairly common and very common.

### Data Analysis Plan

Similar to the research by a number of investigators (e.g. Cheah (2015), Dias and colleagues (2011), Iparraguirre (2015), Peralta and Steele (2009) and Yuan and Yen (2012)), this study began by applying an odds estimator to establish the factors affecting the likelihood of drinking and binge drinking. [Table S1](#) and Table 1 list the independent variables included in each of the six multivariable logistic regression models. In Table 1, Models 1 and 2 examine factors associated with drinking and binge drinking respectively, while Models 3, 4, 5 and 6 are stratified by gender to examine factors associated with drinking and binge drinking.

## Results

Table 1 presents weighted descriptive statistics for all socio-economic factors of interest for first the whole sample, then the pooled sample (of men and women) and then the stratified sample for men and women, with results presented separately to identify characteristics associated with the South African drinking and binge drinking populations (SALDRU, 2013). The total sample comprised mainly non-drinkers, with 28.7% of respondents identifying as a drinker. Among drinkers, binge drinkers and non-binge drinker respondents were close to equal in proportion (46.9% and 53.1% respectively). The majority of the sample (78.2 %) self-identified as African, 51.7% were female and 70.3% were younger than 45 years. More than half the sample (55.4%) were unmarried. A large proportion of respondents reside in the Gauteng (25%), KwaZulu-Natal (19.5%), Western Cape (12.1%) and Eastern Cape (21%) provinces while 63.3% of respondents resided in urban regions of South Africa. The percentage of the sample affiliated with the Christian religion was 82.5%. The majority of the sample had some high schooling (40.4%) or post-schooling (22.6%). Just under half of the sample comprised employed respondents (46.5%). The average household size, including children, was 4.7 and 63.8% of respondents never exercised. A minority of respondents reported poor (2.9%) or fair (8.4%) self-perceived health. Close to 80% of the sample were non-smokers, 90.7% were at lesser risk of depression and 66.6% of respondents were either unsatisfied or intermediately satisfied with life. More than 50% of the sample reside in neighbourhoods where drug and alcohol abuse is very common and 77.2% of respondents had a biological child residing in their household. Upon calculating the average household spending per day using the average household size, daily spending on alcohol was approximately R3 (equivalent to approximately \$0.24, based on the average 2015 annual ZAR/USD exchange rate). Moreover, 2.4% and 2.3% of pregnant women in South Africa reportedly drank and binge drank respectively.

### Socio-Economic Factors Affecting the Log Odds of Drinking and Binge Drinking

Table 2 displays weighted odds ratios, confidence intervals and variable significance for six models, estimated in Stata 15 (StataCorp, 2017). Models 1 and 2 present weighted results for drinking and binge drinking prior to gendered estimations. Models 3 and 4 present weighted drinking and binge drinking results for males while 5 and 6 present weighted results for females. According to Archer and Lemeshow’s (2006) goodness of fit statistic, Models 2, 3 and 5 were significant, which suggests that three of the six models presented in this study were a good fit. [Supplementary Table S2](#) presents Models 7 and 8, which account for biological children residing in households for females.

Table 1

*Weighted<sup>1</sup> Descriptive Statistics For Total, Drinking, and Binge Drinking Samples in South Africa (NIDS Wave 4)*

Variable	Pooled Sample					Male				Female			
	Total Sample: n (%)	Drinker: n (%)	Non- drinker: n (%)	Binger: n (%)	Non- binger: n (%)	Drinker: n (%)	Non- drinker: n (%)	Binger: n (%)	Non- binger: n (%)	Drinker: n (%)	Non- drinker: n (%)	Binger: n (%)	Non- binger: n (%)
Observations: n <sup>2</sup> (%)	28 401 (100%)	22 723 (100%)	6 417 (100%)	9 445 (41.6%)	4 215 (65.7%)	13 276 (58.4%)	2 201 (34.3%)						
Observations: n (%)	-	6 530 (28.7)	16 193 (71.3)	3 008 (46.9)	3 409 (53.1)	4 288 (45.4)	5 157 (54.6)	2 186 (51.9)	2 029 (48.1)	2 241 (16.9)	11 035 (83.1)	8 22 (37.3)	1 379 (62.7)
<b>Race</b>													
African	22 598 (78.2)	70.3	83.4	82.1	61.1	75.1	83.8	83.8	66.5	60.2	83.3	76.8	52.3
Mixed Heritage	4 087 (9.2)	12.2	7.4	12.4	12.0	9.7	8.3	9.9	9.5	17.3	6.8	20.1	15.9
Indian	403 (2.8)	2.3	2.9	1.3	3.2	3.0	2.7	1.7	4.3	1.0	2.9	-	1.4
White	1 313 (9.8)	15.2	6.3	4.2	23.7	12.2	5.2	4.6	19.7	21.5	7.0	3.1	30.4
<b>Gender</b>													
Female	15 909 (51.7)	32.2	63.7	24.1	38.1	-	-	-	-	-	-	-	-
Male	12 490 (48.3)	67.8	36.3	75.9	61.9	-	-	-	-	-	-	-	-
<b>Age</b>													
15–24	8 562 (27.2)	20.5	30.0	22.7	18.6	19.8	36.0	21.4	18.0	22.1	26.6	26.7	19.7
25–34	6 633 (24.9)	32.0	21.4	36.7	28.6	32.2	19.7	35.3	29.3	31.9	22.4	41.3	27.5
35–44	4 318 (18.2)	20.2	17.3	21.0	19.8	20.1	17.2	21.4	19.1	20.3	17.4	19.7	20.9
45–54	3 631 (13.1)	14.4	12.7	12.9	15.4	15.0	11.5	14.5	15.5	13.0	13.4	8.0	15.3
55–64	2 717 (9.1)	7.7	9.9	4.9	9.9	8.1	8.7	5.5	10.6	6.8	10.6	2.9	8.6
65 and older	2 484 (7.5)	5.2	8.7	1.8	7.7	4.8	6.9	1.9	7.5	5.9	9.6	1.4	8.0
Mean	37.0	36.9	37.2	34.2	38.9	37.0	35.0	35.0	39.1	36.5	38.4	31.8	38.7
<b>Marital status</b>													
Married	5 541 (27.5)	26.4	28.0	19.8	31.6	26.0	29.9	20.5	31.4	27.2	26.9	17.6	31.9
Living with partner	1 943 (6.6)	8.0	5.9	9.0	7.3	7.6	5.2	7.9	7.3	8.8	6.3	12.6	7.2
Widow/widower	2 242 (7.4)	4.6	9.3	3.0	5.8	3.6	3.0	3.1	4.1	6.7	12.8	2.9	8.5
Divorced or separated	540 (3.1)	4.7	2.4	3.3	5.9	4.6	1.7	3.3	5.8	5.0	2.8	3.3	6.0
Never married	14 633 (55.4)	56.3	54.4	64.9	49.4	58.2	60.2	65.2	51.4	52.3	51.2	63.6	46.4
<b>Province</b>													
Western Cape	3 564 (12.1)	16.0	9.8	14.3	17.3	13.1	10.4	13.1	13.1	22.3	9.5	18.0	24.2
Eastern Cape	3 193 (12.0)	10.8	13.1	10.1	11.1	11.2	12.4	10.0	12.1	9.6	13.5	10.5	9.3
Northern Cape	2 128 (2.3)	3.0	1.9	3.2	2.9	2.7	2.0	2.8	2.6	3.7	1.8	4.4	3.3
Free State	1 622 (5.2)	6.4	4.5	9.3	4.3	5.8	4.7	8.9	3.0	7.7	4.5	10.7	6.3
KwaZulu-Natal	7 927 (19.5)	13.7	22.2	12.6	14.5	15.9	20.7	13.2	18.3	9.1	23.1	10.6	8.5
North West	1 809 (6.8)	7.6	6.3	9.0	6.6	8.2	6.2	10.0	6.5	6.3	6.3	6.0	6.6
Gauteng	3 616 (25.0)	28.1	23.5	26.6	29.3	27.8	25.8	26.5	29.1	28.9	22.1	26.9	29.8
Mpumalanga	2 055 (7.6)	7.5	7.6	7.7	7.3	7.9	7.5	7.8	8.0	6.6	7.7	7.3	6.3
Limpopo	2 375 (9.5)	6.9	11.1	7.2	6.7	7.4	10.3	7.7	7.3	5.8	11.5	5.6	5.7
<b>Geographical region<sup>3</sup></b>													
Traditional	11 268 (32.2)	22.1	37.4	23.6	21.0	24.5	35.3	24.8	24.0	17.4	38.5	19.7	16.1
Urban	15 151 (63.3)	73.0	58.1	72.5	73.5	69.9	59.8	71.0	69.2	79.2	57.2	77.3	80.4
Farming	1 779 (4.5)	4.9	4.5	3.9	5.5	5.6	4.9	4.2	6.8	3.4	4.3	3.0	3.5

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<b>Religion</b>													
No religion	1 674 (7.3)	11.5	5.3	12.8	10.5	14.5	9.3	15.4	13.6	5.2	3.1	4.6	5.5
Christian	18 711 (82.5)	77.8	84.6	75.4	79.5	73.1	79.5	72.0	74.1	87.5	87.5	86.2	88.1
Jewish	49 (0.5)	0.9	0.3	0.2	1.5	1.4	0.3	0.2	2.4	0.1	0.2	0.4	-
Muslim	119 (1.3)	1.2	1.4	0.7	1.6	1.4	1.8	0.5	2.3	0.8	1.1	1.4	0.6
Hindu	98 (1.3)	1.2	1.3	1.0	1.4	1.5	1.1	1.3	1.7	0.7	1.5	0.1	0.9
African traditional	1 890 (6.7)	6.9	6.7	9.7	4.9	7.9	7.5	10.5	5.6	4.7	6.2	6.9	3.7
Other	121 (0.4)	0.5	0.4	0.2	0.6	0.2	0.5	0.1	0.3	1.0	0.4	0.4	1.2
<b>Education</b>													
No schooling	2 246 (5.4)	4.1	6.0	2.8	4.8	3.9	4.2	2.8	5.0	4.3	7.1	2.7	4.5
Some primary school (Gr R-7)	4 851 (15.0)	13.3	16.1	15.0	12.1	14.4	17.6	15.5	13.6	11.0	15.2	13.6	9.7
Some high school (Gr 8-11)	10 836 (40.4)	35.7	43.4	38.3	33.6	36.7	45.0	37.8	35.1	33.8	42.4	39.7	31.2
Matric	3 863 (16.6)	18.0	15.0	19.8	16.8	17.3	14.2	19.4	15.3	19.6	15.5	21.1	19.3
Post-schooling	4 153 (22.6)	28.9	19.5	24.1	32.7	27.7	19.0	24.5	31.0	31.3	19.8	22.9	35.3
<b>Employment</b>													
Not economically active	11 581 (40.5)	26.9	47.5	22.8	29.8	23.7	41.5	19.9	27.1	33.7	50.9	31.8	34.1
Discouraged work- seekers	460 (1.7)	1.3	1.1	1.1	1.4	1.2	0.9	1.1	1.3	1.4	1.2	1.3	1.6
Unemployed_strict	2 924 (11.3)	12.5	11.0	13.8	11.6	11.4	9.5	12.8	10.1	14.8	11.9	16.8	14.1
Employed	9 269 (46.5)	59.3	40.4	62.3	57.2	63.7	48.1	66.2	61.5	50.1	36.0	50.1	50.2
<b>Household size</b>													
Mean (including children)	4.7	4.1	4.9	4.2	4.0	3.8	4.4	3.9	3.7	4.7	5.2	5.2	4.4
<b>Exercise</b>													
Never	15 716 (63.8)	56.8	67.3	57.2	56.7	53.4	53.4	53.7	53.4	64.1	75.2	67.9	62.2
≤ 1-2 times a week	3 950 (21.3)	23.9	19.9	22.4	25.1	25.4	24.8	23.2	27.5	20.6	17.2	20.0	21.1
≥ 3 times a week	3 035 (14.9)	19.3	12.8	20.4	18.2	21.2	21.8	23.1	19.1	15.3	7.6	12.1	16.7
<b>Self-perceived health</b>													
Excellent	7 279 (32.7)	33.5	31.9	36.6	31.3	34.0	37.2	37.1	31.2	32.5	28.9	35.1	31.5
Very good	7 118 (28.9)	28.1	29.5	28.7	27.9	29.4	29.5	28.9	30.1	25.3	29.5	27.7	24.2
Good	6 928 (27.1)	28.6	27.2	26.3	30.2	27.7	24.7	25.4	29.7	30.4	28.7	29.0	31.0
Fair	2 127 (8.4)	7.6	8.6	6.8	8.1	6.6	6.5	6.6	6.5	9.8	9.7	7.3	10.7
Poor	852 (2.9)	2.2	2.8	1.7	2.5	2.3	2.1	2.0	2.5	2.0	3.2	0.9	2.6
<b>Smoker</b>													
Non-smoker	18 443 (79.6)	57.2	90.7	48.6	63.7	47.9	81.6	41.7	53.5	76.7	95.9	70.3	80.3
Smoker	4 266 (20.4)	42.8	9.3	51.4	36.3	52.1	18.4	58.3	46.5	23.3	4.1	29.7	19.7
<b>Monthly household income per capita</b>													
Mean	3750.5	4585.9	3091.3	3508.4	5433.9	4631.8	3373.9	3816.9	5419.8	4489.2	2929.9	2537.4	5456.7

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<b>Depression</b>													
Less risk of depression	20 520 (90.7)	89.2	89.5	88	90.2	89.6	89.5	89.6	89.8	89.2	89.5	89	89.4
More risk of depression	2 095 (9.3)	10.5	10.5	12	9.8	10.4	10.5	10.4	10.4	10.8	10.5	11	10.6
<b>Life satisfaction</b>													
Unsatisfied	7 795 (34.2)	33.0	34.8	35.9	31.1	35.2	34.6	36.1	34.6	28.5	34.9	35.5	25.3
Intermediate satisfaction	7 301 (32.4)	30.8	33.3	30.6	31.2	31.1	31.6	31.1	31.7	30.0	34.2	29.3	30.5
Satisfied	4 968 (22.5)	25.2	21.1	24.5	25.9	24.5	22.9	24.4	24.4	26.8	20.1	24.7	28.2
Very satisfied	2 626 (10.9)	11.0	10.8	9.0	11.8	9.2	10.9	8.4	9.3	14.7	10.8	10.5	16.0
<b>Frequency of alcohol and drug abuse in neighbourhood</b>													
Never	1 612 (8.7)	10.0	8.2	5.3	13.7	9.7	8.9	5.3	13.9	10.8	7.8	5.5	13.2
Very rare	2 347 (11.0)	10.3	11.0	7.4	12.6	10.4	10.6	7.7	13.0	10.0	11.1	6.5	11.9
Not common	2 453 (9.3)	9.0	9.3	7.1	10.4	9.5	8.7	7.3	11.4	7.8	9.7	6.3	8.7
Fairly common	4 839 (16.4)	15.6	17.1	16.1	15.1	15.7	17.4	16.5	15.0	15.2	17.0	14.7	15.4
Very common	14 057 (54.6)	55.1	54.4	64.1	48.2	54.7	54.4	63.2	46.7	56.2	54.4	67.0	50.8
<b>Biological children living with you?</b>													
No	2 296 (22.8)	-	-	-	-	-	-	-	-	21.6	23.1	18.5	22.6
Yes	8 112 (77.2)	-	-	-	-	-	-	-	-	78.4	76.9	81.5	77.4
<b>Household spending on beer, wine and spirits in the last 30 days</b>													
Mean	285.2	310.9	263.3	363.7	269.5	320.3	265.4	371.6	269.1	289.4	262.4	336.6	270.1
<b>Household daily<sup>4</sup> spending on beer, wine and spirits per capita in ZAR</b>													
Mean	3.1	3.3	2.8	3.9	2.9	3.4	2.8	3.9	2.9	3.1	2.8	3.6	2.9
<b>Pregnant (Female)<sup>5</sup></b>													
Yes	486 (5.1)	-	-	-	-	-	-	-	-	2.4	-	2.3	-
No	9 084 (94.9)												

**Notes:**

- Random sampling may not necessarily yield population representivity. Subsequently, survey weights can be adjusted to make data more representative of the population. In the case of NIDS, post-stratified weights were applied to account for overrepresentation of the elderly and under-representation of young adults (25–29-year-olds) and the Indian and White racial groups (Wittenberg, 2009). Post-stratified weights were calculated by applying a minimised cross-entropy estimation procedure to design weights, as outlined in Wittenberg (2009).
- Exact number of observations weighted to obtain population proportions.
- Traditional households refer to households situated in villages in tribal areas while farming households refer to households situated on land allocated or used for commercial farming (Brophy, Branson, Daniels, Leibbrandt, Mlatsheni and Woolard, 2018).
- Calculated as (Household spending on beer, wine and spirits in the last 30 days/30 (days))/3.1 (average household size, excluding children).
- Approximately 60% of females disclosed their current pregnancy status calculated as (9 570/15 909)\*100 = 60.1

**Table 2**

*Weighted Logistic Results (Odds Ratios, Confidence Intervals in Parentheses; NIDS Wave 4)*

	Pooled Sample		Male		Female	
	Drinker (Model 1)	Binge Drinker (Model 2)	Drinker (Model 3)	Binge Drinker (Model 4)	Drinker (Model 5)	Binge Drinker (Model 6)
Observations <sup>1</sup>	22 239	6 273	9 223	4 128	13 016	2 133
<b>Race</b>						
African	1	1	1	1	1	1
Mixed Heritage	1.42**(1.05-1.92)	0.76(0.54-1.07)	1.14(0.82-1.58)	0.77(0.51-1.16)	1.82*** (1.30-2.55)	0.48*** (0.30-0.77)
Indian	1.23 (0.59-2.53)	0.15*** (0.04-0.56)	1.68(0.65-4.36)	0.24*** (0.09-0.61)	0.43(0.11-1.61)	-
White	3.29*** (2.02-5.37)	0.21*** (0.11-0.41)	3.36*** (1.93-5.86)	0.27*** (0.13 - 0.55)	3.47*** (1.92-6.27)	0.07*** (0.03-0.18)
<b>Age</b>						
15–24	1	1	1	1	1	1
25–34	1.71*** (1.39-2.10)	0.99(0.78-1.27)	1.90*** (1.44-2.50)	0.92(0.68-1.25)	1.52*** (1.14-2.03)	1.09(0.75-1.59)
35–44	1.28** (1.02-1.60)	0.91(0.68-1.20)	1.47** (1.09-1.96)	0.93(0.66-1.30)	1.11(0.81-1.53)	0.93(0.56-1.55)
45–54	1.30* (0.99-1.71)	0.81(0.56-1.17)	1.79*** (1.21-2.65)	0.94(0.62-1.43)	0.85(0.56-1.28)	0.41** (0.20-0.83)
55–64	1.17 (0.81-1.68)	0.50*** (0.34-0.74)	1.65** (1.07-2.54)	0.59** (0.37- 0.94)	0.69(0.43-1.12)	0.32*** (0.14-0.75)
65 and older	1.16 (0.73 - 1.83)	0.39*** (0.22-0.71)	1.68*(0.97-2.91)	0.42** (0.21-0.84)	0.71(0.39-1.28)	0.37** (0.13-1.00)
<b>Marital status</b>						
Married	1	1	1	1	1	1
Living with partner	1.62*** (1.17-2.23)	1.13(0.81-1.57)	1.74*** (1.28-2.37)	1.07(0.68-1.67)	1.48(0.92-2.37)	1.22(0.72-2.05)
Widow/widower	0.88 (0.62 - 1.25)	0.98(0.53-1.83)	1.05(0.60-1.82)	1.34(0.60-2.98)	0.93(0.63-1.37)	0.43** (0.22-0.82)
Divorced or separated						
Never married	1.86*** (1.26-2.74)	0.94(0.56-1.57)	2.51*** (1.45-4.36)	0.98(0.51-1.87)	1.47(0.86-2.52)	0.99(0.41-2.40)
	1.58*** (1.28-1.95)	1.13(0.83-1.54)	1.67*** (1.27-2.21)	1.26(0.86-1.84)	1.62*** (1.22-2.15)	0.84(0.56-1.28)
<b>Gender</b>						
Male	2.56*** (2.24-2.91)	1.58*** (1.32-1.91)	-	-	-	-
<b>Geographical region</b>						
Traditional	1	1	1	1	1	1
Urban	1.23*** (1.05-1.45)	1.16(0.89-1.51)	1.18** (0.99-1.42)	1.11(0.83-1.49)	1.32** (1.01-1.71)	1.07(0.71-1.62)
Farming	1.15 (0.76-1.75)	0.91(0.65-1.28)	1.11(0.70-1.76)	0.84(0.57-1.22)	1.06(0.67-1.67)	1.10(0.55-2.23)
<b>Religion</b>						
No religion	1	1	1	1	1	1
Christian	0.53*** (0.44-.66)	1.04(0.81-1.32)	0.58*** (0.46-0.73)	0.94(0.72-1.23)	0.43*** (0.30-0.63)	1.54(0.91-2.62)
Jewish	1.20(0.52-2.78)	0.32(0.07-1.36)	1.65(0.53-5.18)	0.19** (0.04-0.91)	0.21* (0.04-1.25)	-
Muslim	0.32*** (0.15-.65)	0.90(0.47-1.72)	0.25*** (0.10-0.66)	0.44** (0.20-0.97)	0.45(0.12-1.68)	4.78*** (1.74-13.10)
Hindu	0.97(0.53-1.77)	7.83*** (2.16-28.45)	0.94(0.48-1.85)	7.23*** (2.78-18.78)	1.45(0.29-7.30)	-
African traditional	0.77* (0.58-1.02)	1.77*** (1.22-2.57)	0.84(0.60-1.17)	1.70** (1.12-2.57)	0.60** (0.38-0.96)	2.15** (1.01-4.57)
Other	0.49(0.18-1.37)	0.57(0.17-1.88)	0.32(0.07-1.45)	0.40(0.07-2.12)	0.83(0.31-2.21)	1.30(0.33-5.22)
<b>Education</b>						
No schooling	1	1	1	1	1	1
Some primary school (Gr R–7)	0.67*** (0.51-0.88)	1.48* (0.96-2.30)	0.72* (0.51-1.02)	1.54(0.88-2.68)	0.59*** (0.41-0.85)	1.00(0.48-2.08)
Some high school (Gr 8–11)	0.68** (0.50-0.92)	1.27(0.83-1.96)	0.83(0.56-1.23)	1.34(0.78-2.32)	0.49*** (0.33-0.72)	0.88(0.41-1.93)
Matric	1.02(0.73-1.44)	1.63** (1.01-2.61)	1.36(0.91-2.02)	1.74* (0.96-3.16)	0.67* (0.42-1.07)	1.05(0.47-2.36)
Post-schooling	1.06 (0.74-1.52)	1.43(0.89-2.30)	1.33(0.85-2.09)	1.56(0.86-2.83)	0.71(0.46-1.11)	0.88(0.40-1.95)

	Pooled Sample		Male		Female	
	Drinker (Model 1)	Binge Drinker (Model 2)	Drinker (Model 3)	Binge Drinker (Model 4)	Drinker (Model 5)	Binge Drinker (Model 6)
<b>Employment</b>						
Not economically active	1	1	1	1	1	1
Unemployed_ discouraged <sup>2</sup>	1.97***(1.21-3.21)	0.90(0.46-1.74)	1.79(0.79-4.06)	1.08(0.45-2.56)	1.95**(1.12-3.40)	0.74(0.30-1.84)
Unemployed_strict	1.53***(1.26-1.88)	0.98(0.75-1.28)	1.32*(1.00-1.75)	1.12(0.80-1.57)	1.69***(1.31-2.18)	0.80(0.53-1.21)
Employed	1.53***(1.31-1.78)	1.15(0.93-1.43)	1.47***(1.19-1.80)	1.31**(1.00-1.72)	1.55***(1.24-1.94)	0.94(0.67-1.32)
<b>Smoker</b>						
Non-smoker	1	1	1	1	1	1
Smoker	4.72***(4.00-5.57)	1.71***(1.32-2.22)	4.75***(3.91-5.79)	1.52***(1.14-2.04)	4.31***(2.96-6.28)	3.60***(2.36-5.49)
<b>Depression</b>						
Less risk of depression	1	1	1	1	1	1
More risk of depression	0.95(0.78-1.15)	1.19(0.86-1.65)	0.97(0.77-1.22)	1.19(0.83-1.72)	0.92(0.67-1.25)	1.32(0.79-2.21)
<b>Life satisfaction</b>						
Unsatisfied	1	1	1	1	1	1
Intermediate satisfaction	0.96(0.81-1.13)	0.91(0.71-1.17)	1.03(0.84-1.27)	0.96(0.72-1.27)	0.89(0.71-1.12)	0.85(0.57-1.27)
Satisfied	1.06(0.88-1.28)	1.13(0.86-1.48)	0.99(0.76-1.27)	1.19(0.87-1.63)	1.19(0.92-1.53)	1.03(0.70-1.51)
Very satisfied	0.97(0.76-1.25)	1.02(0.70-1.48)	0.88(0.65-1.19)	1.13(0.77-1.66)	1.05(0.76-1.47)	0.97(0.54-1.75)
<b>Self-perceived health</b>						
Excellent	1	1	1	1	1	1
Very good	0.99(0.85-1.16)	0.92(0.72-1.17)	1.05(0.85-1.30)	0.86(0.64-1.17)	0.88(0.70-1.10)	1.01(0.73-1.41)
Good	1.08(0.90-1.29)	0.83(0.65-1.05)	1.08(0.86-1.36)	0.78*(0.59-1.04)	1.03(0.81-1.31)	0.91(0.64-1.28)
Fair	1.06(0.83-1.36)	1.01(0.66-1.55)	0.92(0.66-1.28)	1.10(0.63-1.91)	1.13(0.84-1.52)	0.80(0.47-1.36)
Poor	0.93(0.65-1.33)	0.52*(0.25-1.08)	1.00(0.62-1.60)	0.61(0.25-1.46)	0.84(0.46-1.55)	0.19*** (0.07-0.55)
<b>Exercise</b>						
Never	1	1	1	1	1	1
≤ 1–2 times a week	1.06(0.90-1.25)	0.90(0.72-1.14)	1.03(0.84-1.27)	0.83(0.63-1.08)	1.10(0.87-1.39)	1.07(0.72-1.58)
≥ 3 times a week	1.18(0.96-1.44)	1.21(0.96-1.52)	1.07(0.86-1.34)	1.16(0.88-1.51)	1.54***(1.14-2.10)	1.69**(1.05-2.72)
<b>Frequency of alcohol and drug abuse in neighbourhood</b>						
Never	1	1	1	1	1	1
Very rare	0.87(0.56-1.34)	1.33(0.84-2.10)	1.00(0.63-1.58)	1.55(0.90-2.67)	0.72(0.41-1.26)	0.80(0.32-1.95)
Not common	0.84(0.56-1.27)	1.17(0.68-2.01)	1.11(0.66-1.86)	1.31(0.73-2.35)	0.60**(0.37-0.97)	0.86(0.37-2.03)
Fairly common	0.97(0.69-1.35)	1.68**(1.05-2.68)	1.04(0.70-1.54)	2.07*** (1.23-3.47)	0.94(0.62-1.42)	0.95(0.45-1.99)
Very common	1.02(0.73-1.43)	1.98**(1.30-2.99)	1.09(0.73-1.64)	2.32*** (1.49-3.62)	0.99(0.65-1.49)	1.21(0.61-2.39)
<b>Monthly household income per capita</b>						
	1.00(1.00-1.00)	1.00(1.00-1.00)	1.00(1.00-1.00)	1.00(1.00-1.00)	1.00(1.00-1.00)	1.00(1.00-1.00)



	Pooled Sample		Male		Female	
	Drinker (Model 1)	Binge Drinker (Model 2)	Drinker (Model 3)	Binge Drinker (Model 4)	Drinker (Model 5)	Binge Drinker (Model 6)
<b>Household size</b>	1.01(0.99-1.03)	1.01 (0.98-1.05)	1.01(0.99-1.04)	1.02(0.98-1.05)	1.01(0.97-1.04)	1.01(0.96-1.06)
<b>Control for province<sup>3</sup></b>	Yes	Yes	Yes	Yes	Yes	Yes
<b>Goodness of fit<sup>4</sup></b>	0.00	0.00	0.16	0.02	0.79	0.00 <sup>5</sup>

**Notes:**

1. Observations in Table 2 are slightly lower when compared to [Table S1](#) as (weighted) complete case analysis is applied for each model. Refer to Little and Rubin (2020:47) for a detailed rationale for complete case analysis. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$
2. Unemployment is separated into two categories namely strictly unemployed and discouraged work seekers. The former refers to people who do not have work and who are not looking for work or unavailable to work while the latter represents ‘employees who have left the labour force because they have not been able to find employment’ (McConnell, Brue and Flynn, 2023). These categories distinguish those unemployed who do not want to work from those who want to work, but cannot find work.
3. Leibbrandt et al. (2009) do not recommend analysing results at provincial level as the sample is not representative. Despite weighting the data for representivity, Vellios and Van Walbeek (2018) also did not analyse the results at provincial level.
4. Using Archer and Lemeshow (2006) to account for survey data design, as opposed to the standard Hosmer-Lemeshow goodness of fit statistic.
5. Accounting for biological children residing in households improves overall model fit – refer to Model 8 of [Table S2](#) in Supplementary Materials.

Model 1 suggests that drinkers (compared to non-drinkers) are more likely to be 'Coloured' or White, between the ages of 25 and 54, unmarried (living with partner, divorced or separated, or never married), male, smokers, economically active, and urban dwellers compared to the various reference groups. People with some schooling and who affiliate with the Christian, Muslim or traditional African religions, are less likely to drink compared to adults without schooling and adults who do not affiliate with a religion. Models 3 (outcome: men drinking versus not-drinking) and 5 (outcome: women drinking versus not drinking) suggest that drinking results are somewhat different by gender. Specifically among men (Model 3), being of White racial heritage, over the age of 25, unmarried (never married, divorced, separated or living with a partner), residing in an urban geographical region, holding employment or being strictly unemployed, and smoking, all increased the probability of drinking; while males with some primary school education and who affiliate with the Christian or Muslim faith were less likely to drink. Among women (Model 5) being of 'Coloured' or White racial heritage, between 25 and 34 years of age, never married, residing in an urban area, being economically active, smoking and exercising three or more times a week increased the probability of drinking among women; while affiliating with Christianity, Judaism or a traditional African religion and having some level of primary or secondary education (includes completing Grade 12) and residing in a neighbourhood where drug and alcohol abuse are not common decreased the probability of drinking among women.

Model 2 suggests that binge drinkers (compared to non-binge drinkers) are more likely to be male, affiliated to the Hindu or traditional African religions, have completed some primary schooling or Grade 12, smoke, and reside in neighbourhoods where drug and alcohol abuse is either fairly common or very common. Binge drinkers were less likely to be Indian or White, over the age of 55 and have a poor self-perceived health. Models 4 (outcome: men binge drinking versus non-binge drinking) and 6 (women binge drinking versus non-binge drinking) suggest that binge drinking differs by gender. Model 4 suggests that being Indian or 'Coloured', 55 years or older, of Jewish or Muslim faith, and having a good self-perceived health status reduced the probability of binge drinking; while affiliating with Hinduism or a traditional African religion, completing high school, holding employment, smoking, and living in a neighbourhood where drug and alcohol abuse is either fairly common or very common, increased the probability of binge drinking among men. In Model 6, religious affiliation with Islam or a traditional African religion, smoking, and exercising three or more times a week, increased a woman's probability of binge drinking; while being of 'Coloured' or White racial heritage, aged 45 and over, widowed, and with poor self-perceived health, decreased the probability of female drinking.

## Discussion

Across all six models, race, age, religion, education and smoking status are significant factors associated with

drinking and binge drinking. In addition, gender-specific models reveal that perceived ubiquity of alcohol and drug abuse in respondents' neighbourhoods is associated positively with men's binge-drinking and negatively with women's drinking. Moreover, frequent exercise has a significant association with women's drinking and binge drinking. Males are more likely to drink and binge drink relative to females. Urban residence is significantly associated with male and female drinking. Compared to those with excellent perceived health, men with good self-perceived health are less likely to binge drink, while women with poor self-perceived health are less likely to binge drink.

Many findings in this study are congruent with the literature. Trangenstein and colleagues (2018) found that a larger proportion of men drink heavily, relative to women. In addition, Yuan and Yen (2012) found that men were more likely to drink than women, while Cheah (2015) and Parry and colleagues (2005) reported urban dwellers were more likely to drink. According to Vellios and Van Walbeek (2018), smoking was a significant factor associated with drinking at differing intensities. This suggests co-consumption should be investigated further, particularly for future policy consideration. In contrast, Elliot and colleagues (2017) found poorer self-perceived health to be associated with risky drinking in a specific sub-sample of persons with HIV and Hepatitis C. This study found that males with good self-perceived health are less likely to binge drink than those with excellent perceived health. As this study is cross-sectional, the association may be operating in reverse; for instance, men of slightly poorer health status may have reduced their risky drinking (relative to those in excellent health). Either way, binge drinking should be addressed to limit associated health consequences, as argued by Fairlie and colleagues (2019) and Hingson and colleagues (2017).

Turning to measures of neighbourhood risk, Leslie and colleagues (2015) determined that alcohol outlet density is associated with problem drinking among men. While this study does not include alcohol outlet density as a factor, the findings in this study on neighbourhood drinking complement Leslie and colleagues' (2015) findings and suggest that alcohol policymakers consider interventions in neighbourhoods where alcohol and drug use is common, particularly among men.

French and colleagues (2009) found that alcohol consumption and physical activity are positively correlated among women, who may be sensation-seeking and enjoy a risk-taking lifestyle. Similarly, the results for South African women may suggest that physically active women may drink or binge drink as part of a more independent, risk-taking lifestyle. There is widespread evidence from lower income countries that more educated women may be more likely to drink (Wilsnack & Wilsnack, 2013), and as economies develop, women with higher incomes are targeted as independent earners via marketing strategies, as argued by Atkinson and colleagues (2022). Thus, alcohol policymakers in South Africa should not overlook educated and physically active women. The only finding that was unintuitive pertained to women who affiliate with Islam or a traditional African religion. They were found to be more likely to binge drink relative to women with no religious affiliation. This

finding is counter-intuitive considering that Muslims are typically alcohol abstainers due to religiously imposed restrictions. Since Indians, who account for a large proportion of Muslims in South Africa, are under-sampled in NIDS, and given that drinking and binge drinking Muslim women comprise 0.4% of the drinking sample and 0.37% of the binge drinking sample respectively, this result should be treated with caution.

Two additional and important descriptive findings emerged in our analysis. Average household spending on alcohol was very low. Wave 4 of NIDS suggests that the average household alcohol spending for binge drinkers was R363.70 per month. This is equivalent to approximately R12.10 per day. After accounting for the average household size for binge drinkers of 3.1 (excluding children), per capita household spending on alcohol equated to approximately R4 a day or R28 per week. The average price of commercially brewed regulated alcohol ranges between R12 and R24 per standard drink (Londani et al., 2021). The binge drinking described in Wave 4 would not have been possible (spending only R4 a day or R28 per week) via consumption of only commercially brewed alcoholic beverages. This may underline that drinking is under-reported and that there is a lack of comprehensive alcohol spending and pricing data for South Africa (Gibbs et al., 2021; Probst et al., 2017). Secondly, drinking and binge drinking among pregnant women continued to be reported in the NIDS Wave 4. An estimated 2.4% and 2.3% of pregnant women in South Africa reported drinking and binge drinking respectively, which is low compared to the 13.2% and 3.8–4.2% drinking and binge drinking prevalence among pregnant women in South Africa, calculated in Popova and colleagues (2016). Brief interventions to reduce pregnant women's alcohol consumption (O'Conner & Whaley, 2007) or other national education campaigns/interventions may have resulted in greater abstinence during pregnancy, warranting further examination in future studies. The continued drinking and binge-drinking among some pregnant women suggests South Africa's population-focused alcohol policy interventions need to include interventions targeting high-risk drinkers such as pregnant women.

### Study Limitations

This study had several limitations, related mainly to data. Additional categorisations could have been created in the data to examine factors that distinguish people who moderately drink from those who binge drink. Different types of alcohol are known to have diverse consumer profiles and may have different correlates. The survey did not include data on drinking and binge drinking of different types of alcohol, such as wine, beer, or spirits. Smoking was included as a predictor of drinking and binge drinking, even though there may be a bidirectional relationship between smoking and drinking or binge drinking. All potential covariates were entered simultaneously, and additional analyses of interactions may have identified links between pairs of factors, e.g., exercise and education. Multi-level analyses were not undertaken, and most of the variables were self-reported, based on key participants' perceptions. While the researcher used the most recent NIDS dataset, a single

cross-section does not permit an analysis of factors over time and neither causality nor direction can be attributed.

### Conclusion

The study sought to identify demographic, emotional well-being, health, and neighbourhood dimensions that are important covariates of alcohol consumption in South Africa. Such studies are crucial in establishing a holistic understanding of the factors associated with the harmful use of alcohol. While many factors may not be easy to ameliorate, they are certainly able to inform targeted alcohol interventions. The study found that race, age, education, religion, and smoking status were significant factors associated with alcohol consumption. In addition, good relative to excellent self-perceived health status and less frequent alcohol and drug abuse in the neighbourhood were significant factors associated with decreased male binge-drinking behaviour; while poor relative to excellent self-perceived health was associated with decreased female binge drinking. Frequent exercise was a significant factor associated with female drinking and binge-drinking behaviour. Low household spending on alcohol, particularly for binge drinkers, may suggest that household alcohol spending was under-reported. Drinking and binge drinking among pregnant women was reported by less than 3% of the population. Drinking and heavy episodic drinking among pregnant women warrants further investigation, as does household alcohol spending. Groups identified at greater risk of binge drinking warrant prioritisation when planning future national alcohol interventions.

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### Ethical Consideration Statement

The NIDS survey used in this study received ethical clearance from the University of Cape Town Ethics in Research Committee on 12 December 2017.

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