

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 alcohol intensity and frequency questions in Wave 4 of the National Income Dynamics Study (NIDS) (n=28 401).

Measures: Alcohol, demographic, emotional, health and neighbourhood variables.

Findings: White and Mixed Heritage (referred to as 'Coloured' in South Africa) adults were more likely to consume alcohol, while Indian and White adults were less likely to binge drink relative to African adults. Males at greater risk of depression, and those who resided in neighbourhoods where frequent alcohol and drug abuse was common, were more likely to binge drink. Females who exercised more than three times a week were also more likely to drink and binge drink. Adults who smoked were more likely to drink and binge drink relative to non-smoking adults. Accounting for binge drinkers' household size, average monthly household spending for binge drinkers was low, which suggests that binge drinkers under-reported household alcohol spending. There was evidence of drinking and binge drinking among pregnant women.

Conclusions: Binge drinking trends related to race, gender, neighbourhood, pregnancy and household alcohol spending warrant further investigation and consideration for possible future alcohol interventions in South Africa.

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 patterns-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), 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 (Manthey et al., 2021; Matzopoulos et al., 2014).

This study adopted a biopsychosocial approach to analysing alcohol consumption, commonly used in the study of depression, risky behaviours, and addiction (Bolton & Gillett, 2019). The approach postulates that alcohol consumption results from a complex combination of biological, psychological and sociocultural characteristics, similar to addiction (Skewes & Gonzalez, 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 are associated with 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), and adults with religious affiliations as less likely to drink. Moreover, smoking is associated with an increased likelihood of drinking, and binge drinking is the highest among adults in the 25 to 34 year age group (Vellios & Van Walbeek, 2018). This study aimed to build on Vellios and Van Walbeek's (2018) research by exploring emotional, health and neighbourhood characteristics in comprehensively 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, 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 (unused by Statistics South Africa), 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 2015, comprising 49 532 household members, of which 28 401 were adult respondents (including proxy adults; Southern Africa Labour and Development Research Unit, 2015; Southern Africa Labour and Development Research Unit, 2018).

Variables

Table 1 outlines the variables used in this study. Alcohol consumption was measured using drinking ('How often do you drink alcohol?') and binge drinking status ('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'). The alcohol frequency variable in NIDS was recoded to capture drinking and non-drinking status (1 for drinkers, 0 otherwise). In this study, binge drinking refers to consuming five standard drinks on a drinking day for men and women (Vellios & Van Walbeek, 2018). A standard drink in South Africa comprises 12g absolute alcohol (Van Heerden & Parry, 2001). 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.

Table 1

Variables of Interest: National Income Dynamics Study (NIDS) Wave 4

Classification	Variable	Type	Transformation	Observations (response rate ¹)
Alcohol consumption	Drinker	Binary	Recoded to binary (drinker = 1) and non-logical values assigned to missing	22 723 (80%)
	Binge drinker	Binary	Recoded to binary (binge drinker=1) and non-logical values assigned to missing	6 417 (22.5%) ²
Individual demographic variables	Race ³	Categorical	Recoded and non-logical values assigned to missing	28 401 (100%)
	Gender	Binary	Recoded to binary (male=1) and non-logical values assigned to missing	28 399 (99.99%)
	Age	Categorical	Recoded into age categories and non-logical values assigned to missing	28 345 (99.80%)
	Marital status	Categorical	Unchanged	24 899 (87.66%)
	Province	Categorical	Recoded into provincial categories and non-logical values assigned to missing	28 289 (99.60%)
	Geographical region	Categorical	Recoded and non-logical values assigned to missing	28 198 (99.28%)
	Religion	Categorical	Recoded and non-logical values assigned to missing	22 662 (79.79%)
	Education	Categorical	Recoded to broader levels of education and non-logical values assigned to missing	25 949 (91.37%)
	Employment	Categorical	Non-logical values assigned to missing	24 234 (85.38%)
	Monthly household income per capita	Continuous	Monthly household income/household size and non-logical values assigned to missing	25 492 (89.75%)
Household characteristics	Household size	Continuous	Unchanged	25 492 (89.75%)
	Frequency of alcohol and drug abuse in neighbourhood	Categorical	Non-logical values assigned to missing	25 308 (89.10%)
	Biological children living in household	Binary	Unchanged	10 408 ⁴ (65.42%)
Health characteristics	Exercise	Categorical	Recoded to reflect exercise categories and non-logical values assigned to missing	22 701 (79.93%)
	Self-perceived health	Categorical	Non-logical values assigned to missing	24 304 (85.57%)
	Smoker	Binary	Recoded to binary (smoker=1) and non-logical values assigned to missing	22 709 (79.95%)
Emotional well-being	Depression	Binary	Depression composite indicator with binary cut-off points created using emotional well-being questions; non-logical values assigned to missing	22 721 (80%)
	Life satisfaction	Categorical	Life satisfaction cut-off points used to narrow satisfaction categories; non-logical values assigned to missing	22 690 (79.89%)

¹Cleaned observations as a percentage of 28 401 (adult and proxy respondents).

²The drinking intensity survey question used to quantify binge drinking was restricted to respondents who identified as drinkers, which explains the high rate of missingness for the binge-drinking variable. Therefore, analyses of binge drinkers are limited solely to the drinker group but represented here as a percentage of the total adult and proxy respondents.

³The terms 'White, African/Black, Asian/Indian, and Mixed Heritage (referred to as 'Coloured' in South Africa) refer to demographic markers and are not meant to signify inherent characteristics.

⁴Variable only available for female adults, i.e., response rate calculated as (10 408/15 909) * 100=65.42%

Poverty is reflected in low consumption and low wealth, making wealth a more comprehensive measure of poverty status than income (Headey, 2008). While individual wealth would have been a more comprehensive measure of poverty, wealth data were not always available in NIDS since some strata only had a single sampling unit. Household characteristics include household size and frequency of alcohol and drug abuse in the neighbourhood. The number of biological children living in the household was applied as a household control for women only as this variable is not

available for men (refer to Supplementary Table S.2). 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 Zulu, Xhosa and Afrikaans language groups in South Africa (Baron et al., 2017). 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.

Data Analysis Plan

Similar to the research by 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, ignoring endogeneity. Endogeneity occurs when a key regressor is correlated with the error term. This could occur when there are omitted variables, reverse causation, simultaneity, or a measurement error (Wooldridge, 2012). Because drinking itself does not capture intensity, the study used an odds estimator to establish the factors affecting the likelihood of binge drinking; an odds estimator is appropriate for predicting probabilities between 0 and 1. In the general specification below, Y_i represents a binary outcome variable (drinker or not/binge drinker or not); and $\pi(x_i)$ represents the conditional probability of experiencing an event given certain independent variables, x_i , or $\Pr(Y_i = 1|x_i)$. Table 1 lists the independent variables included in each of the six multivariable logistic regression models. Models 1 and 2 examine factors associated with drinking and binge drinking respectively, while Models 3, 4, 5 and 6 are gendered estimations.

$$\pi(x_i) = \Pr(Y_i = 1|x_i) = \frac{e^{x_i'\beta}}{1+e^{x_i'\beta}}$$

Results

Descriptive Statistics

Supplementary Table S.1 presents weighted descriptive statistics for all socio-economic factors of interest for the South African drinking and binge drinking population (Southern Africa Labour and Development Research Unit, 2013). The sample comprised mainly non-drinkers, with 28.74% of respondents identifying as a drinker. Similarly, the alcohol intensity variable was recoded to capture binge-drinking status (1 for binge drinkers, 0 otherwise). Binge drinkers and non-binge drinker respondents were close to equal in proportion (46.88% and 53.12% respectively). Most drinkers, binge drinkers and abstainers were from the African racial group, which is understandable since black Africans constitute the majority of the population. Drinkers and binge drinkers were mostly male. Most drinkers, binge drinkers and abstainers identified as Christian. A large proportion of drinkers, binge drinkers and abstainers were employed, with an average household size of approximately 4.3 members. A large proportion of drinkers and binge drinkers never exercised yet perceived themselves as

healthy. The monthly household income per capita was lower for binge drinkers relative to drinkers. The vast majority of the weighted sample was at a greater risk of depression. A large proportion of drinkers, binge drinkers and abstainers resided in neighbourhoods where frequent alcohol and drug abuse was common. Upon calculating the average household spending per day using the average household size, daily spending on alcohol was approximately R3 (equivalent to approximately US\$0.18 on 3 October 2021). Moreover, 2.4% and 2.3% of pregnant women in South Africa reportedly drank and engaged in binge drinking 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. According to Archer and Lemeshow's (2006) goodness of fit statistic, Models 2, 3, 4 and 5 were significant overall, which suggests that four of the six models presented in this study were a good fit. Supplementary Table S.2 presents Models 7 and 8, which account for biological children residing in households for females.

Model 1 suggests that drinkers are more likely to be 'Coloured' or White, between the ages of 25 and 54, 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 are less likely to drink compared to adults without schooling. Models 3 and 5 suggest that the results are similar when estimations are separated by gender. In addition, Model 3 suggests that Christian and Muslim men are less likely to drink than those with no religion. Model 5 suggests a similar trend for females who belong to the Christian, Jewish or traditional African religions.

Model 2 suggests binge drinkers are more likely to be African, male, affiliated to a Hindu or traditional African religion, have completed secondary school, smoke cigarettes, are at greater risk of depression, and reside in neighbourhoods where frequent alcohol and drug abuse is common. People over the age of 55 years have lower odds of binge drinking relative to people aged 15 to 24 years. When estimations are separated by gender, gender-specific factors are detected. In Model 4, depressed men and those residing in neighbourhoods where frequent alcohol and drug abuse is common are more likely to binge drink. Men who exercise one to two times a week are less likely to binge drink. Jewish and Muslim men are less likely to binge drink whereas men who identify as Hindu or of traditional African religion are more likely to binge drink. In Model 6, 'Coloured' and White women are less likely to binge drink while women who affiliate with Islam or a traditional African religion are more likely to binge drink than women with no religious affiliation. Moreover, women who exercise more than three days a week are more likely to drink (Model 5) or binge drink.

Table 2
Weighted logistic results (odds ratios, confidence intervals in parenthesis): National Income Dynamics Study (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)
Observations¹	22 340	6 302	9 273	4 148	13 071	2144
Race						
African	1	1	1	1	1	1
'Coloured'	1.45** (1.09-1.93)	0.82 (0.57-1.16)	1.18 (0.87-1.60)	0.85 (0.55 - 1.32)	1.83*** (1.30-2.57)	0.46*** (0.28-0.76)
Indian	1.22 (0.59-2.53)	0.15*** (0.04-0.58)	1.68 (0.65-4.36)	0.25*** (0.10 - 0.63)	0.43 (0.12-1.59)	—
White	3.25*** (2.00-5.31)	0.21*** (0.11-0.41)	3.24*** (1.86-5.62)	0.27*** (0.13 - 0.54)	3.49*** (1.92-6.34)	0.07*** (0.03-0.18)
Age						
15–24	1	1	1	1	1	1
25–34	1.72*** (1.40-2.11)	1.00 (0.77-1.28)	1.94*** (1.48- 2.53)	0.93 (0.68-1.26)	1.51*** (1.13-2.02)	1.08 (0.74-1.58)
35–44	1.28** (1.02-1.60)	0.91 (0.69-1.20)	1.48*** (1.12-1.98)	0.93 (0.67-1.31)	1.10 (0.80-1.51)	0.93 (0.56-1.55)
45–54	1.31* (1.00-1.73)	0.86 (0.60-1.23)	1.82*** (1.24-2.68)	1.02 (0.67-1.56)	0.84 (0.56-1.26)	0.42** (0.21- 0.85)
55–64	1.17 (0.81-1.68)	0.52*** (0.36-0.76)	1.66** (1.08-2.55)	0.63** (0.39- 0.99)	0.68 (0.42-1.10)	0.33*** (0.14-0.75)
65 and older	1.15 (0.73 - 1.81)	0.38*** (0.21-0.70)	1.65* (0.95-2.85)	0.41** (0.21-0.82)	0.70 (0.39-1.27)	0.37** (0.14-1.00)
Marital status						
Married	1	1	1	1	1	1
Living with partner	1.65*** (1.21-2.26)	1.14 (0.82-1.57)	1.79*** (1.32-2.42)	1.05 (0.69 - 1.61)	1.49* (0.93-2.40)	1.28 (0.76-2.13)
Widow/widower	0.88 (0.62 - 1.25)	0.99 (0.54-1.81)	1.06 (0.61-1.84)	1.35 (0.62 - 2.95)	0.93 (0.63-1.36)	0.43** (0.22-0.82)
Divorced or separated	1.85*** (1.25-2.72)	0.91 (0.53-1.55)	2.45*** (1.43-4.20)	0.93 (0.48 - 1.83)	1.47 (0.86-2.52)	1.00 (0.41-2.45)
Never married	1.58*** (1.28-1.95)	1.14 (0.84-1.54)	1.67*** (1.27-2.20)	1.26 (0.87 - 1.83)	1.62*** (1.22-2.14)	0.87 (0.57-1.31)
Gender						
Male	2.57*** (2.26-2.94)	1.60*** (1.33-1.93)	—	—	—	—
Geographical region						
Traditional	1	1	1	1	1	1
Urban	1.24*** (1.06-1.47)	1.17 (0.90-1.51)	1.20** (1.00-1.44)	1.11 (0.83-1.48)	1.32** (1.02-1.72)	1.10 (0.72-1.66)
Farming	1.16 (0.76-1.75)	0.95 (0.67-1.33)	1.12 (0.71-1.77)	0.88 (0.61-1.28)	1.07 (0.68-1.69)	1.11 (0.55-2.27)
Religion						
No religion	1	1	1	1	1	1
Christian	0.54*** (0.44-0.66)	1.04 (0.82-1.32)	0.59*** (0.46-0.74)	0.94 (0.73-1.23)	0.43*** (0.30 - 0.63)	1.56 (0.91-2.65)
Jewish	1.20 (0.51-2.82)	0.29 (0.06-1.29)	1.65 (0.52-5.26)	0.17** (0.03-0.84)	0.21* (0.04-1.25)	—
Muslim	0.32*** (0.15-0.66)	0.87 (0.47-1.63)	0.26*** (0.10-0.67)	0.42** (0.19-0.92)	0.44 (0.12-1.61)	4.94*** (1.74-14.01)
Hindu	0.97 (0.53-1.78)	8.29*** (2.29-30.01)	0.95 (0.48-1.87)	8.25*** (3.17-21.43)	1.43 (0.29-7.12)	—
African traditional	0.78* (0.60-1.04)	1.80*** (1.25-2.57)	0.85 (0.61-1.19)	1.70*** (1.14-2.54)	0.61** (0.38-0.98)	2.27** (1.09 - 4.73)
Other	0.51 (0.19-1.41)	0.65 (0.21-2.06)	0.34 (0.08-1.52)	0.57 (0.11-2.92)	0.84 (0.31-2.25)	1.27 (0.32-5.06)
Education						
No schooling	1	1	1	1	1	1
Some primary school (Gr R-7)	0.67*** (0.51-0.88)	1.41 (0.92-2.17)	0.72* (0.51-1.02)	1.44 (0.83-2.50)	0.59*** (0.41-0.85)	1.02 (0.49-2.11)
Some high school (Gr 8-11)	0.67** (0.50-0.92)	1.27 (0.83-1.93)	0.83 (0.56-1.22)	1.34 (0.78-2.30)	0.49*** (0.33-0.72)	0.89 (0.40-1.94)
Matric	1.01 (0.72-1.42)	1.59** (1.00-2.54)	1.33 (0.89-1.99)	1.71* (0.95-3.09)	0.67* (0.42-1.06)	1.06 (0.47-2.37)
Post-schooling	1.06 (0.74-1.51)	1.46 (0.91-2.33)	1.33 (0.85-2.08)	1.62 (0.90-2.92)	0.71 (0.46-1.11)	0.89 (0.40-1.97)

Observations ¹	Pooled Sample		Male		Female	
	Drinker (Model 1) 22 340	Binge Drinker (Model 2) 6 302	Drinker (Model 3) 9 273	Binge Drinker (Model 4) 4 148	Drinker (Model 5) 13 071	Binge Drinker (Model 6) 2144
Employment						
Not economically active	1	1	1	1	1	1
Unemployed_discouraged	1.97*** (1.21-3.21)	0.86 (0.44-1.66)	1.82 (0.81-4.09)	1.05 (0.43-2.53)	1.94** (1.11- 3.38)	0.71 (0.29-1.77)
Unemployed_strict	1.52*** (1.24-1.85)	0.95 (0.73-1.24)	1.31* (0.99-1.73)	1.10 (0.78-1.54)	1.67*** (1.30-2.14)	0.79 (0.52-1.20)
Employed	1.52*** (1.30-1.77)	1.14 (0.91-1.42)	1.44*** (1.17-1.77)	1.30* (0.98-1.73)	1.56*** (1.24-1.95)	0.93 (0.67-1.30)
Smoker						
Non-smoker	1	1	1	1	1	1
Smoker	4.69*** (3.97-5.54)	1.71*** (1.31-2.22)	4.71*** (3.87-5.73)	1.52*** (1.13-2.04)	4.31*** (2.96-6.27)	3.71*** (2.43-5.64)
Depression						
Less risk of depression	1	1	1	1	1	1
More risk of depression	1.10 (0.84-1.43)	1.87*** (1.31-2.68)	1.14 (0.82-1.59)	2.35*** (1.50-3.67)	1.19 (0.82-1.73)	1.09 (0.64-1.83)
Life satisfaction						
Unsatisfied	1	1	1	1	1	1
Intermediate satisfaction	0.96 (0.81-1.14)	0.88 (0.69-1.14)	1.02 (0.83-1.26)	0.93 (0.70-1.23)	0.91 (0.72-1.14)	0.84 (0.57-1.23)
Satisfied	1.06 (0.88-1.28)	1.06 (0.81-1.40)	0.97 (0.76- 1.25)	1.10 (0.80-1.51)	1.20 (0.93-1.55)	1.00 (0.68-1.47)
Very satisfied	0.97 (0.76-1.25)	0.95 (0.65-1.38)	0.87 (0.65-1.17)	1.03 (0.69-1.53)	1.06 (0.75-1.49)	0.94 (0.52-1.71)
Self-perceived health						
Excellent	1	1	1	1	1	1
Very good	1.00 (0.85-1.17)	0.92 (0.72-1.16)	1.06 (0.86-1.31)	0.85 (0.64-1.15)	0.89 (0.70-1.11)	1.02 (0.73-1.42)
Good	1.09 (0.91-1.30)	0.84 (0.65-1.07)	1.10 (0.87-1.39)	0.79 (0.59-1.05)	1.04 (0.81-1.32)	0.92 (0.66-1.30)
Fair	1.06 (0.83-1.37)	1.00 (0.66-1.53)	0.92 (0.66-1.28)	1.05 (0.61-1.80)	1.14 (0.84-1.53)	0.84 (0.50-1.43)
Poor	0.91 (0.64-1.30)	0.52* (0.25-1.07)	0.97 (0.61-1.55)	0.58 (0.24-1.40)	0.84 (0.45-1.54)	0.20*** (0.07-0.59)
Exercise						
Never	1	1	1	1	1	1
≤ 1–2 times a week	1.06 (0.90-1.24)	0.86 (0.69-1.08)	1.02 (0.83-1.26)	0.77* (0.59-1.01)	1.09 (0.87-1.38)	1.05 (0.71-1.56)
≥ 3 times a week	1.18 (0.97-1.44)	1.18 (0.94-1.47)	1.07 (0.86-1.33)	1.11 (0.86-1.43)	1.54*** (1.14-2.10)	1.66** (1.03-2.68)
Frequency of alcohol and drug abuse in neighbourhood						
Never	1	1	1	1	1	1
Very rare	0.86 (0.56-1.31)	1.20 (0.73-1.97)	0.97 (0.62-1.53)	1.36 (0.77-2.39)	0.71 (0.41-1.24)	0.80 (0.33-1.94)
Not common	0.84 (0.56-1.25)	1.13 (0.64-2.00)	1.09 (0.65-1.82)	1.23 (0.67-2.26)	0.60** (0.38-0.96)	0.90 (0.39-2.08)
Fairly common	0.95 (0.68-1.32)	1.53* (0.92-2.53)	1.01 (0.68-1.50)	1.83** (1.06-3.13)	0.93 (0.61-1.40)	0.94 (0.45-1.97)
Very common	1.01 (0.72-1.41)	1.80** (1.14-2.85)	1.07 (0.71-1.61)	2.06*** (1.28-3.31)	0.97 (0.64-1.46)	1.21 (0.62-2.37)
Monthly household income per capita	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)
Household size	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)
Control for province²	Yes	Yes	Yes	Yes	Yes	Yes
Goodness of fit³	0.00	0.07	0.24	0.61	0.47	0.00 ⁴

***p<0.01; **p<0.05; *p<0.1

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.

² 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.

³ Using Archer and Lemeshow (2006) to account for survey data design, as opposed to the standard Hosmer-Lemeshow goodness of fit statistic.

⁴ Accounting for biological children residing in households improves overall model fit – refer to Model 8 of Table S.2 in Supplementary Materials.

Discussion

Across all six models, race, age, gender, religion and smoking status are significant factors associated with alcohol consumption. In addition, gender-specific models reveal that depression, exercise and frequent alcohol and drug abuse in respondents' neighbourhoods are significant factors associated with men's binge-drinking behaviour. Moreover, frequent exercise is a significant factor associated with women's drinking and binge drinking.

The 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. Similarly, 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 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. Likewise, French and colleagues (2009) found that alcohol and physical activity positively correlate, for men and women, who may be sensation seeking and subsequently enjoy a risk-taking lifestyle. Similarly, the results for South African women suggest that physically active women may drink or binge drink due to a risk-taking lifestyle. Thus, alcohol policymakers in South Africa should not overlook physically active individuals. Analogous to Boden and Fergusson's (2011) findings, this study recommends further investigation into depression as a risk factor for binge drinking, particularly among men, for inclusion in targeted alcohol interventions. 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 unintuitive considering that Muslims are typically alcohol abstainers due to religiously imposed restrictions. This association either could relate to the under-sampling of Indians within NIDS (who account for a large proportion of Muslims in South Africa) or could signify an emerging alcohol consumption problem in the Muslim community.

A few interesting trends emerge from a descriptive analysis of the data. The first trend is that average household spending on alcohol was very low. Wave 4 of NIDS suggests that the average household alcohol spending for binge drinkers was R363.7 per month. This is equivalent to approximately R12.1 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 for off- and on-

licensed premises purchases respectively (Londani et al., 2021). In that study, on-license premises include shebeens, taverns, bars, pubs, hotels, planes, restaurants, sporting events, night clubs and off-license premises include motor vehicles, own home, someone else's home or other indoor/outdoor recreational locations (Londani et al., 2021). Binge drinking commercially brewed alcoholic beverages is hardly possible on R4 a day or R28 per week. This value is not surprising given the underreporting of drinking and lack of comprehensive alcohol pricing data for South Africa (Gibbs et al., 2021; Probst et al., 2017).

The second interesting trend relates to drinking and binge drinking among pregnant women. NIDS Wave 4 suggests that 2.4% and 2.3% of pregnant women in South Africa drink and binge drink respectively. This trend is not surprising but is likely an underestimation when compared to the 3.8% binge drinking prevalence among pregnant women in South Africa, calculated in Popova and colleagues (2016). This trend was also identified in Peltzer and Ramlagan's (2009) research. The continued drinking and binge-drinking trend among pregnant women suggests that South Africa's population-focused alcohol policy interventions need to include interventions targeting high-risk drinkers such as pregnant women. Brief interventions for pregnant women's alcohol consumption resulted in greater abstinence during pregnancy and improved infant health at birth (O'Connor & Whaley, 2007).

Study Limitations

This study had several limitations, related mainly to data. Firstly, while the researcher used the most recent NIDS dataset, a single cross-section does not permit an analysis of factors over time. Secondly, the researcher was unable to examine factors associated with different types of alcohol, such as wine, beer or spirits, as the data did not distinguish between different types of alcohol when measuring drinking and binge drinking. Different types of alcohol are known to have diverse consumer profiles and may have different correlates. Thirdly, smoking was included as a factor, which is subject to endogeneity bias. A joint estimation strategy could be used to reduce estimation bias and inform co-consumption policies, particularly in South Africa, where the emphasis is on separate alcohol and tobacco policies. Fourthly, depression was found to explain male binge-drinking behaviour, yet the researcher was unable to establish reverse causality between depression and drinking. A two-stage least-squares estimator may be the most efficient way to establish this in a future study. Fifthly, additional categorisations could have been created in the data to examine factors that distinguish people who moderately drink from those who binge drink. Lastly, it is unclear whether exercise was an intervention for alcohol use disorders among women in the sample, making it difficult to establish a clear link between the variables.

Conclusion

The study sought to account for demographic, emotional, health and neighbourhood dimensions in determining important covariates for alcohol consumption, which is

crucial in establishing a more 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, gender, religion and smoking status were significant factors associated with alcohol consumption. In addition, depression, exercise and frequent alcohol and drug abuse in the neighbourhood were significant factors associated with male binge-drinking behaviour, while frequent exercise was a significant factor associated with female drinking and binge-drinking behaviour. Low household spending on alcohol, particularly for binge drinkers, suggests that household alcohol spending was under-reported. Drinking and binge drinking among pregnant women was less than 3% of the population. Binge drinking trends related to race, gender, neighbourhood, pregnancy and household alcohol spending warrant further investigation and consideration for possible future alcohol interventions in South Africa.

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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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