



# Social Determinants of Alcohol and Other Drug Misuse Among Women Living with HIV in Economically Underserved Communities in Cape Town, South Africa: A Cross-Sectional Study

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## Abstract

This study aimed to understand how social determinants—the economic and social factors that affect health and well-being—are associated with self-reported and biological alcohol and other drug misuse in South Africa among women living with HIV. Logistic regression analyses were performed using baseline data from an implementation science trial conducted from 2015 to 2018 with 480 Black and Coloured women who were living with HIV and reported recent alcohol or other drug misuse. Educational attainment, type of housing, access to running water, food insecurity, and housing instability were examined. Women with higher education had reduced odds of any drug misuse—both biological (aOR: 0.53; 95% CI: 0.33–0.84) and self-reported (aOR: 0.37; 95% CI: 0.22–0.64). Women living in formal housing had increased odds of a positive alcohol screening test (aOR: 1.92; 95% CI: 1.16–3.18) and women with housing instability had increased odds of self-reported alcohol misuse—daily (aOR: 1.99; 95% CI: 1.18–3.35) and weekly (aOR: 1.91; 95% CI: 1.19–3.07). Food insecurity was associated with reduced odds of self-reported alcohol misuse (aOR: 0.40; 95% CI: 0.25–0.64) and increased odds of self-reported drug misuse (aOR: 2.05; 95% CI: 1.16–3.61). These findings indicate the complexity of the relationship between social determinants and alcohol and other drug misuse, and may have implications for addressing social and structural determinants as part of multilevel interventions focused on reducing alcohol and other drug misuse among key populations of women in South Africa.

**Keywords** Substance use · socioeconomic status · educational attainment · food insecurity · housing instability · health disparities · people living with HIV

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## Introduction

Substance use is a critical public health concern in South Africa, which has one of the highest levels of alcohol consumption per capita in the world [1]. Although overall rates of substance use are lower among women compared with men, among women who report alcohol or other drug (AOD) use, hazardous use is common [2–4]. In previous studies conducted with women who use AODs in South Africa, approximately a third reported clinical levels of alcohol dependence [5, 6]. Nationally, 7% of women in South Africa report hazardous levels of drinking, which is defined as alcohol consumption that increases the likelihood of adverse outcomes [1]. Additionally, women account for a quarter of admissions into substance use treatment services with alcohol, cannabis, and methamphetamine as the primary drugs of misuse [7].

AOD misuse is associated with morbidity and mortality, particularly among women living with HIV [8]. AOD misuse also is associated with lower levels of antiretroviral therapy (ART) adherence, retention in care, and viral suppression [9–11]. When people use alcohol, they may intentionally adjust their medication regimen—such as intentionally skipping a dose or taking it earlier due to misconceptions about taking ART if using alcohol, such as toxicity [12, 13]. It is estimated that up to 10% of HIV-related deaths among women in South Africa are attributed to alcohol use, based on the risk of engaging in condomless sex due to alcohol use [14].

Consequently, it is critical that strategies to reduce AOD misuse among women in South Africa are cognizant of the social and structural factors that drive this behavior. The World Health Organization defines the social determinants of health as “the conditions in which people are born, grow, live, work and age” [15]. Examples include education, housing, and food insecurity. These social determinants are influenced by access to power, resources, and policies. In South Africa, approximately 40% of the population is living in poverty, a majority of whom are Black or Coloured (multiracial)—racial categories created during the apartheid era, a system of institutionalized racial segregation in South Africa from 1948 to 1991 [16]. These racial categories are widely used and accepted in South Africa—and have been important for the South African government in monitoring and addressing disparities in social and health indicators; thus, these racial categories are used in this article.

In South Africa, several social determinants have emerged as important predictors of alcohol [17] and other drug use [18]. High levels of alcohol use have been observed in Black and Coloured communities [19–21], which may be attributed to the apartheid era “Dop” system in which low-wage farm workers in vineyards—mostly Black and

Coloured—were partially paid with alcohol [22]. This system also persisted post-apartheid and has been associated with alcohol use [23]. Additionally, apartheid-era policies promoting alcohol use and limiting access to the retail sale of alcohol and access to treatment for alcohol use disorder have contributed to heavy alcohol use in Black and Coloured communities [24]. These policies also led to the establishment of underground or illicit alcohol-serving venues in Black communities [25, 26].

In 2014–2015, a population-level survey conducted in South Africa found higher odds of any alcohol use among Coloured and White female participants as compared with Black female participants [19]. However, this survey found that among current drinkers, hazardous use was higher among Black participants compared with other racial groups. Gender inequities within South Africa have resulted in high levels of gender-based violence [27] and limited economic opportunities for women [28]. Collectively, gender inequality, poverty, and violence have contributed to Black and Coloured women having the highest prevalence of HIV (16.6% and 5.3%, respectively) in South Africa [29].

The association between socioeconomic status (SES) and substance use varies based on the dimension of SES and type of substance used. Higher levels of educational attainment—such as having some tertiary education—in addition to employment and income are associated with lower odds of alcohol use [17, 19, 30]; however, having household assets, such as having access to running water, is associated with higher odds of alcohol use [18]. For methamphetamine employment and educational attainment are associated with lower odds of use [21, 31].

Although some studies have explored the social determinants of substance use among people living with HIV in Sub-Saharan Africa [32], few have used biological measures of substance use or have focused solely on women. Some studies have shown that women may underreport or not disclose substance use—with comparable findings for women who are pregnant or not [33–35], which may exclude them from receiving substance use treatment services. Additionally, sometimes people are not aware of all of the substances they are using or which drugs may be mixed or added. To address these gaps, the present study aimed to examine the social determinants of heavy alcohol and other drug use among a cohort of Black and Coloured women who were living with HIV and were enrolled in a trial focused on substance use and sexual risk reduction in Cape Town, South Africa.

## Methods

### Parent Study

This study used baseline data from an implementation science trial [36] that recruited 480 adult women living with HIV who reported the use of alcohol or another drug at least once a week during the past 3 months. Participants were recruited from communities surrounding 4 health clinics and 4 substance use treatment clinics in Cape Town from 2015 to 2018. This article uses self-reported data from the study eligibility screener and the validated baseline risk behavior assessment [37] administered via computer-assisted personal interviewing. Biological assessments included an alcohol screening test via a breathalyzer, which was conducted after consenting, and urine drug screening tests for 7 drugs. Benzodiazepines, cocaine, methamphetamine, ecstasy, opiates, and marijuana were tested for using the Homemed Multi-Drug 6 Panel Test (BZO/COC/M-AMP/MDMA/OPI/THC) and methaqualone was tested for via the Stelmed for methaqualone strip. Detection of AODs can vary by individual and their type of use. Alcohol is estimated to be detected up to 24 h after consumption and the drugs vary depending on the metabolites, from up to 2 days for methamphetamine, ecstasy and cocaine metabolites to more than 3 weeks for marijuana. Additional information about the study procedures of the parent study are detailed in the study protocol [36].

### Measures

#### Outcome

The outcome of interest was AOD misuse, which was assessed via biological testing and self-report using several measures. For alcohol use, breathalyzer test results over 0.0 were classified as positive. For self-reported alcohol misuse, the median values for daily and weekly drinks were used as cutoff points to distinguish between lower and higher levels of consumption among participants. Although the Alcohol Use Disorders Identification Test of Consumption (AUDIT-C, with scores ranging from 1 to 12) [38] was initially considered for analyses, almost all of the participants had scores that were indicative of hazardous drinking. Using the two commonly recommended women-specific AUDIT-C thresholds for hazardous drinking [39], 462 participants (96%) had an AUDIT-C score of 3 or above and 454 (95%) had an AUDIT-C score of 4 or above. These high scores support the findings from the study team's previous research in South Africa with populations who use substances [5, 40] and other studies conducted in Southern Africa [41,

42]. Consequently, the median values for daily and weekly drinks were used instead of the AUDIT-C.

For any other drug misuse (biological), if any of the drug screening test results for the 7 drugs—benzodiazepines, cocaine, methamphetamine, ecstasy, opiates, marijuana or methaqualone—were positive, this variable was classified as positive. If all of the results were negative, this variable was classified as negative. For any other drug misuse (self-reported), several validated questions were used to classify participants who reported the use of the following drugs—marijuana, methamphetamine, cocaine, heroin, methaqualone, inhalants, other amphetamines, prescription drugs not prescribed, or other drugs in the past 30 days. If participants indicated they used any of the aforementioned drugs, they were classified as yes for any self-reported drug misuse. Of note, these data were collected before the legalization of marijuana in South Africa and assessment did not distinguish between legal and illicit substances; therefore, marijuana was included in the measurement of drug use.

#### Exposure

Several measures for social determinants were assessed: educational attainment, type of housing, having running water in home, housing instability, and food insecurity.

**Educational Attainment.** Educational attainment was an ordinal variable recoded into a dichotomous variable (Completed Grade 10 to Grade 12 as compared with Completed Grade 9 or below) to reflect the distinction made between foundation, intermediate, and lower secondary (compulsory education) and upper secondary or further education in South Africa, which encompasses up to Grade 9 [43].

**Housing Material.** The materials used to construct the walls was assessed with a question asking what type of materials their housing was made with. Six types of materials were listed as response options. Responses were recoded as a dichotomous variable with plastic bags/cardboard/metallic sheet (informal housing) compared with wood/bricks/tiles/cement block (formal housing).

**Running Water in Home.** Participants were asked whether there is running water inside where they currently live, with dichotomous responses (Yes/No).

**Housing Instability.** Housing instability was assessed with a single-item question about whether the participant considered themselves to be homeless currently—that is, they did not have a permanent living situation.

**Food Insecurity.** Food insecurity was assessed with a question asking how often in the past year did the participant go to bed hungry, with the 5 responses ranging from never to daily or almost daily. Any instance of going to bed hungry (less than monthly, monthly, weekly, and daily or

**Table 1** Baseline Characteristics of Study Sample (N = 480)

Variables	Total (N = 480)	
	N	%
Age (years)		
19 to 29	162	33.8
30 to 39	226	47.1
40 to 45	92	19.2
Race		
Black African	447	93.1
Coloured	33	6.9
Educational Attainment		
Grade 9 or lower	188	39.2
Grade 10 to Grade 12	292	60.8
Housing Material		
Informal	239	49.8
Formal	241	50.2
Running Water in Home		
No	220	45.8
Yes	260	54.2
Housing Instability		
No	372	77.5
Yes	108	22.5
Food Insecurity (Past Year)		
No	308	64.2
Yes	172	35.8
<b>Alcohol</b>		
Alcohol Screening Test Results		
Negative	374	77.9
Positive	106	22.1
Self-reported Drinks (Per Day)		
≤ 12	248	51.7
≥ 13	232	48.3
Self-reported Average Drinks (Per Week)		
≤ 28	247	51.5
≥ 29	233	48.5
<b>Other Drugs</b>		
Drug Screening Test Results		
Negative	378	78.8
Positive	102	21.3
Self-reported Drug Use (Past 30 Days)		
No	412	85.8
Yes	68	14.2

almost daily) was coded as 1 and never going to bed hungry was coded as 0.

### Covariates

Age was recoded into three categories: 19 to 29; 30 to 39; and 40 to 45. The clinic variable, with 8 possible responses, indicated the clinic catchment area or community in which the participant resided.

### Analyses

Analyses were conducted in Stata MP/IC Version 16. First, descriptive statistics were run to examine frequencies and missingness. No data were missing for the variables of interest. To examine the associations between social determinants and AOD misuse, multilevel logistic regression analyses were conducted using the *melogit* command. Clinic, which is a proxy for community, was factored into multilevel models to account for and model the clustering at this level. Each of these models also included the categorical form of age to control for potential confounding by age. For food insecurity, we also adjusted for the number of children given birth to, which served as a proxy for children in a participant's household; this was not assessed in the survey. This variable was recoded as a dichotomous variable (0 to 1 child as compared with 2 or more children). Associations with *p*-values less than 0.05 were considered statistically significant.

### Results

#### Participant Characteristics — Demographics, Social Determinants, and Alcohol and Other Drug Misuse

Table 1 presents the baseline characteristics of the 480 study participants, a majority of whom were Black African (93%). The median age was 32 (IQR = 10; not shown), with most of the participants in the 30 to 39 age group. Approximately 61% had completed Grade 10 to Grade 12—with 9% reporting completing Grade 12 (not shown). For housing material type, an equal proportion (50%) reported living in formal housing as informal housing. Approximately 46% of the participants did not have running water in their home, nearly 1 of every 4 participants reported current housing instability, and 36% reported going to bed hungry in the past year.

An estimated 22% of the participants had a positive alcohol screening test. The median self-reported number of drinks per day was 12 (IQR = 14; not shown) and the median number of self-reported drinks per week was 28 (IQR = 44.8; not shown). An estimated 21% of the participants had a positive drug screening test, and 14% reported the use of at least one drug in the past 30 days.

#### Multivariable Logistic Regression—Social Determinants

**Educational Attainment.** Women who had completed Grade 10 to 12 had lower odds of both biologically measured and self-reported drug use than women who had completed Grade 9 or lower. Specifically, women who completed

Grade 10 to 12 were 47% less likely to have a positive drug screening result (aOR = 0.53, 95% CI: 0.33–0.84,  $p = 0.007$ ) and 63% less likely to self-report any drug use in the past 30 days (aOR = 0.37, 95% CI: 0.22–0.64),  $p < 0.001$ ) than women who had completed Grade 9 or lower. No statistically significant differences were observed between education and any of the alcohol measures (Table 2).

**Housing Material.** Women living in formal housing (structures made of wood, bricks, tiles, or cement block) had 1.92 (95% CI: 1.16–3.18,  $p = 0.011$ ) times the odds of a positive alcohol screening test compared with women in informal housing (structures made of plastic bags, cardboard, or metallic sheet). No significant differences were observed by the type of housing material for the other outcomes of interest.

**Running Water in Home.** No statistically significant differences were observed for any of the AOD outcomes when comparing women who had access to running water in the home with women without access to running water in the home.

**Housing Instability.** Women who reported current housing instability had nearly 2 times the odds of self-reporting a daily quantity of drinks above the median (aOR = 1.99, 95% CI: 1.18–3.35,  $p = 0.010$ ) and greater odds of self-reporting a weekly amount of drinks above the median (aOR = 1.91, 95% CI: 1.19–3.07,  $p = 0.008$ ) compared with women who were stably housed. No other statistically significant differences were observed on the rest of the outcomes of interest.

**Food Insecurity.** Regarding food insecurity, which adjusted for the number of children that participants gave birth to, women who went to bed hungry in the past year had lower odds of reporting a daily number of drinks above the median (aOR = 0.40, 95% CI: 0.25–0.64,  $p < 0.001$ ) than women who never went to bed hungry in the past year. However, women who went to bed hungry in the past year had two times the odds of self-reported drug misuse in the past 30 days (aOR = 2.05, 95% CI: 1.16–3.61,  $p = 0.013$ ). No other statistically significant differences were observed for the other outcomes of interest.

## Discussion

In this study comprising 480 Black and Coloured women living with HIV who were recruited as part of a substance use and sexual risk reduction trial in South Africa, we found that educational attainment, housing, and food insecurity were associated with self-reported or biological AOD misuse. In summary, educational attainment was protective against self-reported and biological drug misuse. Women who lived in formal housing had increased odds by nearly 2 of a positive alcohol screen, whereas women who were unstably

housed had comparably higher odds of self-reported daily and weekly alcohol misuse. Women who experienced food insecurity had 2 times the odds of reporting drug misuse, but 60% reduced odds of reporting alcohol misuse.

Specifically, women with greater educational attainment had a lower likelihood of having a positive drug screening test and self-reported drug use than women with lower educational attainment. Although our findings on educational attainment and drug use are consistent with some prior studies [21, 44], other studies did not demonstrate a relationship between educational attainment and drug use [45, 46]. While we did not observe an association between educational attainment and alcohol use, prior research has reported lower educational attainment is associated with higher odds of alcohol use [17, 45]; and in some cases, higher educational attainment is associated with higher odds of alcohol use [18, 19]. The potential protective effect observed is important because the educational attainment variable was based on the South African educational tiers. Our findings suggest that certain benefits are gained with educational attainment beyond Grade 9, after which education is no longer compulsory.

We found an association between housing structure and alcohol use. Specifically, living in formal housing was associated with positive breathalyzer test results when compared with informal housing. However, no significant differences were observed when comparing women by housing structure on the other outcomes of interest (self-reported drinking, drug screening test, and self-reported drug use). While some previous research in South Africa suggests that alcohol use is common among some populations living in informal housing [47, 48], our findings demonstrate an association between formal housing and recent alcohol use. These findings may be attributable to the fact that some people living in formal housing may still have a lower SES. For example, the South African government provides affordable low-cost housing, which is made of cement or brick, to some but not all people with low or no income. Some evidence suggests that women living in better housing conditions—such as having a flushing toilet, running water, and electricity—have higher odds of alcohol use [49]. Although the type of housing material may be used as a proxy for one dimension of SES, it may not capture the nuance of women's economic position.

Experiencing housing instability was associated with higher odds of self-reported alcohol—both daily and weekly. We did not find a significant association when alcohol use was measured using a breathalyzer test. Our findings with housing stability and alcohol use were not supported by prior research showing null relationships between housing instability and alcohol use for women and men [50–52].

**Table 2** Adjusted logistic regression models predicting alcohol and other drug misuse (N = 480)

Social Determinants	Positive Alcohol Screen			Above Median Self-Reported Daily Drinks			Above Median Self-Reported Weekly Drinks			Positive Drug Screen			Self-Reported Drug Use		
	Adjusted aOR	95% CI	p-value	Adjusted aOR	95% CI	p-value	Adjusted aOR	95% CI	p-value	Adjusted aOR	95% CI	p-value	Adjusted aOR	95% CI	p-value
Educational Attainment															
Grade 9 or lower	Ref			Ref			Ref			Ref			Ref		
Grade 10 to Grade 12	1.15	(0.72–1.84)	0.550	1.38	(0.90–2.12)	0.141	1.18	(0.80–1.74)	0.407	<b>0.53</b>	<b>(0.33–0.84)</b>	<b>0.007</b>	<b>0.37</b>	<b>(0.22–0.64)</b>	<b>&lt; 0.001</b>
Housing Material															
Informal	Ref			Ref			Ref			Ref			Ref		
Formal	<b>1.92</b>	<b>(1.16–3.18)</b>	<b>0.011</b>	1.04	(0.66–1.63)	0.876	0.95	(0.63–1.43)	0.808	1.55	(0.95–2.53)	0.080	1.19	(0.68–2.08)	0.537
Running Water in Home															
No	Ref			Ref			Ref			Ref			Ref		
Yes	1.28	(0.79–2.07)	0.315	0.77	(0.50–1.20)	0.250	0.90	(0.61–1.35)	0.620	1.27	(0.78–2.05)	0.337	1.13	(0.65–1.96)	0.672
Housing Instability															
No	Ref			Ref			Ref			Ref			Ref		
Yes	1.26	(0.74–2.13)	0.395	<b>1.99</b>	<b>(1.18–3.35)</b>	<b>0.010</b>	<b>1.91</b>	<b>(1.19–3.07)</b>	<b>0.008</b>	1.03	(0.59–1.82)	0.905	1.27	(0.68–2.38)	0.452
Food Insecurity															
No	Ref			Ref			Ref			Ref			Ref		
Yes	1.31	(0.77–2.24)	0.307	<b>0.40</b>	<b>(0.25–0.64)</b>	<b>&lt; 0.001</b>	1.02	(0.65–1.59)	0.942	1.22	(0.74–2.02)	0.432	<b>2.05</b>	<b>(1.16–3.61)</b>	<b>0.013</b>

\*All models were adjusted for clinic cluster and age. The models with food insecurity also were adjusted for number of children.

Note: aOR, adjusted odds ratio; CI, confidence interval; Ref, Reference

Housing instability may differentially affect women's alcohol misuse compared with men.

We also observed an association between food insecurity and self-reported drinking behavior. Specifically, the likelihood of self-reported daily number of drinks that were above the median was lower among women who experienced food insecurity in the past year than among women who did not experience food insecurity in the past year. However, we did not observe any differences when alcohol misuse was assessed using an alcohol screening test. Our results are inconsistent with a cross-sectional study in South Africa that showed alcohol consumption among women was higher in women with food insecurity [53]. Moreover, we observed a significant association between food insecurity and self-reported drug use. Women who experienced food insecurity in the past year were more likely to self-report drug use in the past 30 days than women who did not report experiencing food insecurity in the past year. In some research, drug use has been found to serve as a coping strategy for food insecurity [54]. When drug use was biologically assessed, we did not find any significant differences. Our findings align with prior research on food insecurity and drug use [55, 56], specifically a longitudinal study in the US that found that women who experienced food insecurity had a higher odds of substance use [56].

This study has several limitations. Our data are cross-sectional and therefore temporality cannot be assessed. Additionally, although an alcohol breathalyzer test and urine drug screening tests were used to assess alcohol use and drug use, respectively, we also used validated measures for self-report to assess the outcomes of interest. Self-reported data are subject to recall bias and social desirability, which may explain the difference between the proportion of participants who reported drug use recently and participants who had a positive urine drug screen (14% as compared with 21%, respectively). Misclassification bias is possible, given the cutoff point for the 2 measures of alcohol use were based on participant responses. However, because of the highly skewed data, established measures such as the AUDIT-C could not be used. Further, other social determinants of health, such as unemployment, were not assessed in the study survey. However, we know from our previous research in this study area with women who use AODs, unemployment tends to be very high and often does not have adequate variation to examine its relationship with AOD use [3, 57].

Given the eligibility criterion of at least weekly AOD use in the past 3 months for the parent trial, these findings are not intended to be generalizable to the general population of women living with HIV in South Africa. Instead, the focus of this research was on two priority populations in South Africa—high-risk drinkers and recreational drug users—as they have a higher prevalence of HIV than the

general population [29]. Consequently, inferences are not being made about the general population.

This study has several strengths, including the examination of both self-reported and biological measures of AOD misuse. Additionally, this study focused on Black and Coloured women, two key populations that have experienced a disproportionate burden of the HIV epidemic—and are underserved in substance use research and treatment. Understanding potential determinants of AOD misuse among these populations is critical because of the adverse effects of substances on ART adherence and viral suppression [58]. These findings may provide indicators to screen for in primary care settings to encourage entry into substance use treatment—a health service to which South African women living in economically underserved communities traditionally have had limited access [59]. Additionally, these determinants, which are modifiable through interventions and programs, have the opportunity to be addressed.

## Conclusion

The study findings suggest a relationship between social determinants and the use of AODs. With COVID-19 impacting social determinants and exacerbating existing inequalities [60, 61], it is critical that this relationship is addressed. Programs and policies in South Africa have been successful in addressing social determinants of health, such as education [62, 63]. To reduce AOD misuse, which is linked to ART adherence and viral suppression [58], interventions will need to address key social determinants of health, especially among women living with HIV.

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**Authors' Contributions** FAB drafted the manuscript and led data analysis. WMW conceived, designed, and acquired funding for the study. MWG and NS drafted sections of the manuscript. JN, CPB, and WMW reviewed the manuscript and provided feedback/edits. All authors read and approved the final version to be published.

**Data Availability** The dataset analyzed during the current study are not publicly available due to ongoing analyses, but will be available once placed in the NIAAA data repository after completion of all manuscripts.

## Declarations

**Ethics Approval and Consent to Participate** This study was approved by the South African Medical Association Research Ethics Committee (SAMAREC); City of Cape Town, City Health Research Committee; and the RTI International Committee for the Protection of Human Subjects.

**Consent for Publication** Not applicable.

**Competing Interests** The authors declare that they have no competing interests.

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