Social Risk Factors Associated With Daily Tobacco Smoking and Binge Drinking Among Zambians: Evidence From the 2017 STEPS Survey

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Abstract

Background: The burden of disease attributable to tobacco smoking and harmful alcohol consumption poses a major threat to sustainable development in most low- and middle-income countries. However, evidence on tobacco use and harmful alcohol consumption to inform context-specific interventions addressing these harmful social behaviours is limited in the African context. This study aimed to determine the social risk factors associated with daily tobacco smoking and binge drinking in Zambia.

Methods: The study stems from nationwide population-based representative survey data collected using the World Health Organization’s STEPwise approach for non-communicable disease risk factor surveillance in 2017 among 18–69-year-old Zambians. The main outcomes were daily tobacco smoking and binge drinking, and the demographic and socioeconomic variables included sex, marital status, age, residence, level of education and occupation. Prevalence ratios were calculated using log-binomial regression analysis.

Results: Overall, 4302 individuals (weighted percentage 49.0% men and 51.0% women) participated in the survey. The prevalence of daily tobacco smoking was 9.04%, and 11.6% of participants engaged in binge drinking, both of which were higher among men than women (17.1% vs. 1.28% and 18.6% vs. 5.29%, respectively). The risk of daily tobacco smoking was significantly higher in men (PR 14.3; 95% CI [9.74, 21.0]) than women, in the >45-year-old group (PR 1.44; 95% CI [1.03, 1.99]) compared to the 18–29-year-old group, and in those with no education (PR 2.70; 95% CI [1.79, 2.99]) or primary education (PR 1.86; 95% CI [1.22, 2.83]) compared to those with higher secondary or tertiary education. The risk of binge drinking was 3.67 times higher (95% CI [2.83, 4.76]) in men than in women. Significantly lower levels of binge drinking were observed among rural residents (PR 0.59; 95% CI [0.46, 0.77]) compared to urban residents and students/homemakers (PR 0.58; 95% CI [0.35, 0.94]) compared to the employed.

Conclusion: This study shows huge differences between men and women regarding tobacco smoking and binge drinking in Zambia. A high occurrence of tobacco smoking was observed among men, older members of society and those with lower levels of education, while binge drinking was more common in men and in those living in urban areas. There is a need to reshape and refine preventive and control interventions for tobacco smoking and binge drinking to target the most at-risk groups in the country.

Background

Tobacco smoking and harmful alcohol consumption are major risk factors for non-communicable diseases such as cardiovascular and respiratory disease, different types of cancers, mental illness and injuries [1, 2]. Tobacco smoking alone accounts for more than 8 million global deaths annually, with more than 85% of these deaths the result of direct use and the rest due to second-hand smoke exposure in non-smokers [3]. Over 80% of the 1.3 billion tobacco users worldwide live in low- and middle-income countries (LMICs), where the burden of tobacco-related illness and death is heaviest [4]. Furthermore, harmful alcohol consumption contributes to 3 million deaths annually, and it is responsible for 5.1% of the global
burden of disease and injury [5]. In 2016, the alcohol-attributable disease burden was highest in LMICs compared to high-income countries [4].

While considerable gains in reducing the burden of tobacco and harmful alcohol consumption have been made in high-income countries, progress has been much slower in most LMICs, particularly in sub-Saharan Africa (SSA) [6]. SSA is poised to experience the largest growth in tobacco users over the next decade. A majority of countries in the region remain off-track to meet the global target to cut tobacco use among people aged 15 years or older by 30% by the year 2025 [7]. This is largely due to weak policy control measures, population growth and an increase in consumer purchasing power, providing attractive and accessible markets to the expanding tobacco industry [8, 9]. Sociocultural practices in SSA that view tobacco smoking as a symbol of hospitality and consider it a key element of the socialisation process have also contributed to the increase in tobacco use [10]. In addition, SSA faces a growing burden of harmful alcohol consumption, with alcohol responsible for 6.4% of all deaths and 4.7% of all disability-adjusted life years lost in the region [11]. In SSA as a whole, the level of alcohol abstention is relatively high [12]. However, among the 30% of the SSA adult population who do consume alcohol, the reported average consumption is high, with current drinkers consuming 40.0 g of pure alcohol per day, which is 20% higher than the global average [12]. Harmful alcohol consumption can take the form of high total levels of drinking or binge drinking (episodic excessive drinking), each with its own pattern of determinants and different health consequences [13]. According to the World Health Organization (WHO), SSA is characterized by binge drinking, which significantly contributes to poor health-related quality of life in the region [5, 14, 15]. The prevalence of binge drinking in SSA is among the highest in the world, at over 60% of current drinkers [5].

Various social factors contribute to the tobacco smoking and binge drinking problem in SSA. For example, a South African study found that being 25–64 years old, male, belonging to a coloured population group, residing in an urban area, having experienced three or more traumatic events, and poor self-rated health were associated with tobacco use and risky drinking behaviour [16]. Another study investigating tobacco consumption and binge drinking among university students in African countries found that tobacco users and binge drinkers were more likely to be older men with wealthier family backgrounds [17]. In a study of young people in The Gambia, smoking was common among students attending private schools, those living with parents who allowed smoking in their homes, with family members or friends who smoked, and of Christian or other faiths compared to Muslims. Another study found that binge drinking among men was associated with a lower economic status and lower education level, but that it was associated with higher income among women [18]. Thus, the risk factors associated with tobacco smoking and binge drinking can differ depending on the country’s sociocultural environment. It is therefore imperative to understand the context-specific social factors associated with these two risky behaviours to inform locally relevant tobacco and alcohol control efforts.

In Zambia, the prevalence of tobacco smoking has fluctuated over the years. According to the Zambia demographic health surveys, the percentage of men aged 15–49 years who smoked cigarettes increased from 15% in 2000–2001 to 23% in 2007 before declining to 19% in both 2013–2014 and 2018 [19, 20].
Two other studies have reported a tobacco smoking prevalence of 20% among Zambian men, with the most affected being those aged 24–39 years [21, 22]. A recent study estimated an overall tobacco smoking prevalence of 8.2% and 11% among urban and rural Zambians of both genders, respectively [23]. In addition, alcohol per capita consumption has remained rather stable over the years at 5 litres of pure alcohol per year in the general Zambian population, which was over three times higher among drinkers (18 litres) [24]. The WHO has reported that as many as 76% of men and 23% of women in Zambia consume alcohol regularly [24]. Minimising the impact of tobacco smoking and harmful alcohol consumption in countries like Zambia, which are increasingly becoming the target of the tobacco and alcohol industries, requires a better understanding of the social distribution of tobacco smoking and binge drinking [21].

While there is some literature on tobacco smoking and alcohol consumption in Zambia, most studies are not nationally representative or were conducted on specific subpopulations such as adolescents, males, people living with HIV/AIDS or pregnant women [25, 26]. Furthermore, these studies did not explore the social differences influencing tobacco smoking or binge drinking patterns.

While there is no national policy on tobacco control in the country, the alcohol policy emphasises an increased provision of services aimed at mitigating the harmful use of alcohol [27]. However, the lack of information about the patterns and extent of harmful use of alcohol, particularly binge drinking, may hamper the implementation of effective public health strategies to tackle these unhealthy habits.

This study aimed to identify the social risk factors for daily tobacco smoking and binge drinking among Zambian men and women using a nationally representative sample from the 2017 WHO STEPS survey.

**Methods**

**The STEPS survey**

Data for this study originate from the WHO STEPS survey for NCD risk factor surveillance conducted in Zambia in 2017 among adults aged 18–69 years old. The first STEPS effort in Zambia was performed on a small pilot sample in Lusaka and Kitwe in 2008 as formative preparation for the nationwide survey that followed in 2017 [28, 29].

**Sampling and data collection**

The Zambia STEPS survey of 2017 comprised population representative data on NCD risk factors collected using a multistage cluster sampling approach [30]. A total of 5791 households from 347 standard enumeration areas (SEA) were identified using the Zambia Population-based HIV Impact Assessment (ZAMPHIA) survey. Overall, 4302 participants were included, representing a response rate of 77.7%. The sampling process consisted of three stages. Firstly, SEAs were selected from the 10 provinces using a probability proportional to the population size. Secondly, 15 households in rural and 20 households in urban SEAs were then selected systematically using an appropriate sampling interval.
based on the number of households in that SEA. Lastly, one eligible member of each household was randomly selected to be interviewed. The STEPS questionnaire was translated into all seven common local Zambian languages [30]. A tablet with the WHO e-STEPS software was used to collect and transmit data to a central server [30]. Details of the STEPS methodology have been reported elsewhere [30].

Variable description and measurement

Two outcome variables were selected for this study: daily tobacco smoking and binge drinking. For daily tobacco smoking, participants were asked the question, “do you currently smoke any tobacco products (such as cigarettes, shisha, cigars or pipes) daily?” Daily tobacco smoking was dichotomised into those who did or did not report smoking tobacco daily (yes or no). According to the WHO, binge drinking or heavy episodic drinking is defined as consuming more than five alcoholic drinks for men and four for women on three or more days per week [25]. However, for this study, a proxy measure for binge drinking was derived from the question, “how many times did you have six or more standard drinks in a single drinking occasion over the past 30 days?” Binge drinking was dichotomised into those who responded positively or negatively to this question.

The sociodemographic variables included sex, defined as men and women; marital status, divided into single, married/cohabiting and divorced/separated/widowed; age groups, classified as 18–29, 30–44 and > 44 years; and residence, split into rural and urban locations. Socioeconomic variables in the survey included the level of education, classified as no education, primary, lower secondary and higher secondary/tertiary, and occupation, categorised into student/homemaker, unemployed and employed. Given the small size of some categories, higher secondary education was merged with tertiary education, employed with self-employed and students with homemakers. Although self-reported income was asked in the survey, the large number of missing values meant this variable could not be used.

Statistical analysis

Both descriptive and inferential statistics were used to determine the prevalence of daily tobacco smoking and binge drinking, as well as the associated sociodemographic and socioeconomic risk factors. Sampling weights accounted for non-response, and sampling procedures were applied to all analyses [30]. Descriptive statistics were calculated using frequencies and proportions. To estimate the risk of daily tobacco smoking and binge drinking, prevalence ratios with 95% confidence intervals (CI) were calculated in crude and adjusted models using log-binomial regression analyses. Given their relevance in the crude analysis, two separate log-binomial regression models stratified by sex (male and female) and residence (rural and urban) were also conducted (Appendix 1). All analyses were carried out using Stata 14.2 (Stata Corp, College Station, Texas, USA).

Ethical considerations

The STEPS survey protocol received ethical approval from the University of Zambia Biomedical Research Committee (UNZABREC) and the Zambia National Research Authority (ZNHRA). The survey also received
authorisation from the Ministry of Health (MoH) and the WHO country office. Informed consent was obtained from all people who participated in the study. The final dataset was compiled and deposited at the MoH headquarters, Lusaka. To access the secondary data for this study, ethical approval was provided by the ZNHRA and the ERES Converge Ethics Review Board (ref. no. 2019-Dec-007). This research was performed in accordance with the Declaration of Helsinki[31].

Results

Participation and distribution

In the actual sample, 62% of respondents were women; however, the weighted sample was equally represented for sex, with 49.0% men and 51.0% women. More than half (58.9%) of the sample were married or cohabiting, and nearly half (46.9%) were 18–29 years old. There was a similar rural and urban representation, nearly a third (28.8%) had no education and half (50.3%) reported that they were employed. More women than men had no education (34.7% vs. 22.5%). The largest occupational category in women was unemployed, while most men were self-employed (38.3% vs. 43.7%; Table 1).

Daily tobacco smoking and binge drinking prevalence

The overall prevalence of daily tobacco smoking was 9.04%, being higher among men than women (17.1% vs. 1.28%). Higher daily tobacco smoking was observed in > 45-year-old (12.9%), non-educated (12.7%) and employed (11.9%) participants, as well as in rural residents (11.8%; Table 2).

Binge drinking was observed in 11.6% of the sample participants, again higher in men than women (18.6% vs. 5.29%). A higher prevalence of binge drinking was observed among employed participants (14.0%), those with higher secondary or tertiary education (13.8%), residents of urban areas (13.5%), those aged 30–44 years (13.4%) and those who were married or cohabiting (12.6%; Table 2).
Table 1
Weighted description of social variables and outcomes in the total sample separated by sex.

| Variables                        | Total sample | Men     | Women    |
|----------------------------------|--------------|---------|----------|
|                                  | n (%)        | n (%)   | n (%)    |
| **Total sample**                 | 4302 (100.0) | 2109 (49.0) | 2193 (51.0) |
| **Marital status**               |              |         |          |
| Single                           | 1286 (31.0)  | 726 (35.5)  | 559 (25.6)  |
| Married/cohabitating             | 2527 (58.9)  | 1274 (60.5) | 1253 (57.3) |
| Divorced/widowed                 | 480 (11.2)   | 105 (5.0)   | 374 (17.1)   |
| **Age (years)**                  |              |         |          |
| 18–29                            | 2015 (46.9)  | 1002 (47.5) | 1013 (46.2) |
| 30–44                            | 1470 (34.2)  | 732 (34.7)  | 739 (33.7)  |
| >45                              | 816 (19.0)   | 375 (17.8)  | 441 (20.1)  |
| **Residence**                    |              |         |          |
| Urban                            | 2104 (48.9)  | 970 (46.0)  | 1333 (51.7) |
| Rural                            | 2198 (51.1)  | 1138 (54.0) | 1060 (48.3) |
| **Education level**              |              |         |          |
| Higher secondary/tertiary        | 1145 (26.6)  | 658 (31.3)  | 487 (22.2)  |
| Lower secondary                  | 929 (21.6)   | 504 (23.9)  | 424 (19.4)  |
| Primary                          | 989 (23.0)   | 470 (22.3)  | 519 (23.7)  |
| No education                     | 1236 (28.8)  | 475 (22.5)  | 761 (34.7)  |
| **Occupation**                   |              |         |          |
| Employed                         | 2159 (50.3)  | 1262 (59.9) | 897 (41.0)  |
| Unemployed                       | 1415 (32.9)  | 578 (27.4)  | 837 (38.3)  |
| Student/homemaker                | 721 (16.8)   | 267 (12.7)  | 454 (20.8)  |
| **Daily tobacco use**            |              |         |          |
| Yes                              | 389 (9.04)   | 361 (17.1)  | 28 (1.28)   |
| No                               | 3912 (91.0)  | 1748 (82.9) | 2164 (98.7) |
| **Binge drinking**               |              |         |          |
| Variables | Total sample | Men | Women |
|-----------|--------------|-----|-------|
|           | n (%)        | n (%) | n (%) |
| Yes       | 468 (11.6)   | 355 (18.6) | 113 (5.3) |
| No        | 3578 (88.4)  | 1557 (81.4) | 2020 (94.7) |
Table 2
Prevalence and social risk factors associated with self-reported daily tobacco smoking and binge drinking in Zambia (2017 STEPS survey).

| Variable                | Tobacco smoking | Binge drinking |
|-------------------------|-----------------|---------------|
|                         | Prevalence      | Crude PR      | Adjusted PR |
|                         | n (%)           | (95% CI)      | (95% CI)    |
|                         |                 |               |             |
| Sex                     |                 |               |             |
| Women                   | 34 (1.28)       | 1             | 1           |
| Men                     | 276 (17.1)      | 13.34 (9.19, 19.36)* | 14.30 (9.74, 21.01)* |
|                         | 138 (5.29)      | 3.51 (2.74, 4.50)* | 3.67 (2.83, 4.76)* |
| Marital status          |                 |               |             |
| Single                  | 61 (6.48)       | 1             | 1           |
| Married/cohabitating    | 283 (10.8)      | 1.66 (1.19, 2.31)* | 1.05 (0.71, 1.55) |
|                         | 310 (12.6)      | 1.20 (0.90, 1.60) | 1.17 (0.83, 1.65) |
| Divorced/widowed        | 51 (6.95)       | 1.07 (0.66, 1.75) | 1.30 (0.78, 2.15) |
|                         | 64 (9.12)       | 0.87 (0.58, 1.30) | 1.21 (0.76, 1.93) |
| Age (years)             |                 |               |             |
| 18–29                   | 112 (6.88)      | 1             | 1           |
|                         | 158 (10.2)      | 1.32 (1.01, 1.71)* | 1.10 (0.82, 1.50) |
| 30–44                   | 149 (9.86)      | 1.43 (1.06, 1.93)* | 1.07 (0.77, 1.48) |
|                         | 189 (13.4)      | 1.32 (1.01, 1.71)* | 1.10 (0.82, 1.50) |
| >45                     | 151 (12.9)      | 1.87 (1.39, 2.53)* | 1.44 (1.03, 1.99)* |
|                         | 129 (11.9)      | 1.17 (0.87, 1.56) | 0.99 (0.71, 1.40) |
| Residence               |                 |               |             |
| Urban                   | 102 (6.22)      | 1             | 1           |
| Rural                   | 312 (11.6)      | 1.89 (1.43, 2.48)* | 1.13 (0.84, 1.53) |
|                         | 243 (9.7)       | 0.72 (0.57, 0.90)* | 0.59 (0.46, 0.77)* |
| Education level         |                 |               |             |
| Higher secondary/tertiary | 49 (5.50)      | 1             | 1           |
|                         | 116 (13.8)      | 1             | 1           |

* P-value < 0.05.
Regression analysis

In the crude analysis, all the sociodemographic and socioeconomic variables were associated with daily tobacco smoking. After adjustment, the risk of daily tobacco smoking was higher among men (PR 14.3; 95% CI [9.74, 21.01]) than women, among participants aged > 45 years (PR 1.44; 95% CI [1.03, 1.99]) compared to those aged 18–29 years, and among those with no education (PR 2.70; 95% CI [1.79, 2.99]) or primary education (PR 1.86; 95% CI [1.22, 2.83]) compared to those with higher education. The risk of daily tobacco smoking was 63% lower among students and homemakers compared to employed participants (Table 2). After stratifying by sex, similar factors were associated in men but not in women. Similarly, in rural areas, men, older age and lower education were associated with smoking, while being a student or homemaker had a lower risk than being employed. However, in urban areas, only men and a low education level were associated with smoking (Appendix 1, Tables 1 and 3).

For binge drinking, being male, 30–44 years, urban resident, primary education and being unemployed or a student or homemaker were associated with binge drinking in the crude analysis. In the adjusted model, the risk of binge drinking was 3.67 times higher (95% CI [2.83, 4.76]) in men compared to women, but the statistically significant difference disappeared regarding age and education. Significantly lower risks of binge drinking were found in rural residents (PR 0.59; 95% CI [0.46, 0.77]) compared to urban residents and in students/homemakers (PR 0.58; 95% CI [0.35, 0.94]) compared to employed participants (Table 2).

| Variable           | Tobacco smoking | Binge drinking |
|--------------------|-----------------|----------------|
| Lower secondary    | 64 (7.69)       | 89 (11.5)      |
|                    | 1.40 (0.89, 2–21)| 1.47 (0.92, 2.34)|
|                    | 0.83 (0.59, 1.17)| 1.04 (0.73, 1.47)|
| Primary            | 100 (9.70)      | 95 (9.83)      |
|                    | 1.76 (1.17, 2.65)*| 1.86 (1.22, 2.83)*|
|                    | 0.71 (0.51, 0.99)*| 0.96 (0.68, 1.35)|
| No education       | 197 (12.7)      | 160 (11.0)     |
|                    | 2.31 (1.59, 3.36)*| 2.70 (1.79, 4.07)*|
|                    | 0.80 (0.60, 1.07)| 1.33 (0.95, 1.86)|
| Occupation         |                 |                |
| Employed           | 256 (11.9)      | 279 (14.0)     |
|                    | 1                | 1              |
|                    | 1                | 1              |
| Unemployed         | 124 (8.07)      | 160 (10.9)     |
|                    | 0.68 (0.53, 0.87)*| 0.86 (0.67, 1.10)|
|                    | 0.77 (0.60, 0.99)*| 1.02 (0.78, 1.33)|
| Student/homemaker  | 14 (2.21)       | 35 (6.03)      |
|                    | 0.19 (0.08, 0.43)*| 0.37 (0.16, 0.86)*|
|                    | 0.43 (0.27, 0.67)*| 0.58 (0.35, 0.94)*|

* P-value < 0.05.
After stratifying by sex, similar factors were associated with binge drinking among men; however, among women, unemployed participants (PR 1.62; 95% CI [1.04, 2.54]) were more likely to binge drink than employed participants. Both in rural and urban areas, being male was associated with binge drinking, while only middle aged (30–44 years; PR 1.59; 95% CI [1.03, 2.45]) participants were more likely to binge drink than those aged 18–29 years in rural areas (Appendix 1, Tables 2 and 4).

**Discussion**

This study investigated the social risk factors for daily tobacco smoking and binge drinking among Zambians using a nationally representative sample from the 2017 WHO STEPS survey. The overall prevalence of daily tobacco smoking was 9.04%, while 11.6% of participants engaged in binge drinking, both of which were higher among men than women. Being male, older age, and having primary or no education were significant factors related to daily tobacco smoking. Compared to employed participants, students and homemakers had a lower risk of daily tobacco smoking. Binge drinking was associated with being male and living in an urban area. Again, students and homemakers had a lower risk of binge drinking than employed participants.

The high prevalence of tobacco smoking amongst Zambian men (17.1%) has been reported in other studies, although slightly higher at 20% [21, 22]. This gender difference was expected due to the differing social norms regarding gender that promote tobacco use. Tobacco smoking is much more tolerated in men than women, owing to dominant internalised gender stereotypes such as masculinity, meaning smoking is socially approved for men but not women [10]. Although tobacco smoking trends in Zambia have fluctuated over the years, they clearly indicate a major public health threat, particularly among men, that requires urgent attention from policy makers. Men from Zambia, in addition to those from Ethiopia, Malawi and Rwanda, have some of the highest smoking rates in SSA [32]. The American Cancer Society further reports that there are more than 695,200 men in Zambia who smoke tobacco daily, 107 of whom die every week due to tobacco-related complications [33].

This study found that older age was significantly associated with tobacco smoking. Similar findings were reported in a systematic review of smoking data from 30 SSA countries [34]. A possible explanation may be that in some SSA cultures, tobacco smoking is viewed as a practice reserved for elderly people [10]. However, other studies in countries such as Kenya and Burkina Faso have reported that tobacco smoking is more common in younger people [35, 36]. Our findings suggest that tobacco smoking in Zambia may have been more popular among younger groups some years back, resulting in higher consumption among elderly individuals now. This highlights a need for public health interventions to target all age groups to effectively fight the tobacco epidemic.

A lower education level was significantly associated with daily tobacco smoking, which confirms the already established association reported in other studies [34, 37, 38]. This finding has huge implications for current tobacco control efforts in Zambia. Indeed, studies have pointed out that poor people and those with a lower education status tend to be missed by large public health prevention efforts [39]. Perhaps
this could be the case in the Zambian setting, where public health interventions such as health education and anti-tobacco smoking campaign efforts are only reaching those with some form of literacy.

Compared to the employed, students and homemakers had a lower risk of daily tobacco smoking. Similar findings have been reported in studies from other LMIC such as Ethiopia, Madagascar and Nepal [40–42]. These studies found that adult manual laborers engaging in activities such as construction or farming were more likely to smoke than their formally employed counterparts. Such occupations are likely to lead people to smoke tobacco as a form of stress relief [23, 43]. The results of our study could be explained by the fact that most students were young and subjected to rules at school that prohibit smoking while homemakers were women.

To reduce tobacco smoking, prevention efforts should focus on factors early in life that influence smoking risk over the adult life span, because nearly 9 out of 10 adults who smoke cigarettes daily first tried smoking at a younger age [37, 44]. Adolescent smoking has been highlighted in previous studies in Zambia [45–47]. The need to address tobacco in youths is even more urgent given that the tobacco industry is targeting this vulnerable age group in Africa [48]. It is critical that health providers cater for people with a lower education level when designing tobacco control efforts by ensuring that tobacco messages are delivered in the most simple and effective way possible across a spectrum of media platforms [35].

The prevalence of binge drinking was higher in men than women but slightly lower than the overall WHO estimate among the Zambian population > 15 years old of 13.5%. The high level of binge drinking among men could be explained by the fact that culturally, binge drinking by men is more acceptable, and such a risky behaviour may even indicate power and strength [49]. In other countries like South Africa, the overall prevalence of binge drinking among people aged > 15 years was reported to be 18.3%, and it was also higher in men than women (22.8% vs. 6.4%) [14, 50]. The few studies on binge drinking in Zambian subpopulations have described a much higher prevalence [25, 51, 52], for instance, 81.4% among people living with HIV [25]. Binge drinking varies across different subpopulations and tends to be worse in HIV-positive people, those in psychiatric settings and college students compared to the general population [25, 51, 52]. These subpopulations may be binge drinking as a way to overcome stressful situations.

The risk of binge drinking was significantly lower among rural residents compared to those from urban areas. This finding has also been reported in studies from other countries, such as South Africa [18]. According to Letsela et al., in urban areas, alcohol is cheap, easily accessible and highly marketed through rigorous advertising in the media, facilitating its consumption [53, 54].

We found that students and homemakers were less likely to binge drink compared to people who were employed. Similar findings were reported in an Ethiopian study which found that the likelihood of heavy episodic drinking was lower among housewives compared to farmers [55]. Our finding could possibly be due to students still living with their parents, while homemakers are women [56]. Furthermore, after stratifying by sex, unemployed women had a higher risk of binge drinking than employed women. Interestingly, most evidence seems to show a strong association between the *volume* of alcohol
consumed and chronic social problems such as unemployment, but less so for drinking patterns such as binge drinking [57, 58]. However, our finding may indicate the presence of related issues, such as feelings of boredom, loneliness, loss of job and depression, which may contribute to binge drinking among unemployed women in the Zambian context [59, 60].

Addressing binge drinking will require the strengthening of interventions such as early screening and referrals for treatment and counselling services for alcohol-dependent individuals within primary healthcare facilities to ensure access to services at the lowest level of care [61]. In addition, multilevel interventions, including increased taxation, regulation of alcohol advertising and awareness of the general population of problems associated with binge drinking, are required [18].

The predictors for tobacco smoking and binge drinking tend to be similar in most contexts, as people who smoke tobacco are also likely to engage in binge drinking. However, in our study, rural residents smoked more, and urban residents drank more. This finding emphasises the importance of local, tailored tobacco and alcohol control interventions to ensure relevance and utility.

**Strengths and limitations of the study**

The major strength of this study was the national representativeness of the data, and consequently, the generalisability of our findings. The STEPS survey uses validated and reliable tools and has a methodologically sound design. In addition, although the response rate was lower among men than women, this was adjusted by weighting. Since survey weights are constructed with the aim to build a population-representative sample, this should compensate for the potential non-randomness of drop-outs; however, there may still be residual non-randomness that could bias the results. One limitation of this study is that some of the variables, such as binge drinking, were answered retrospectively, which could be affected by recall bias. Another limitation is the lack of data on HIV/AIDS in our study participants, as this variable tends to be a major predictor of both tobacco smoking and binge drinking in the Zambian context. Lastly, we are aware that the merging of small variable categories for education, age and employment may have also affected our estimations. Despite these limitations, our findings are valuable for informing tobacco and alcohol control efforts in Zambia.

**Conclusion**

We found a high occurrence of tobacco smoking predominantly among men, older members of society and those with a lower education level, while binge drinking was more prevalent in men and individuals living in urban areas. There is a need to reshape and refine preventive and control interventions for tobacco smoking and harmful alcohol consumption to target the most at-risk populations in Zambia. Given that there are already ongoing strategies such as health education campaigns to address tobacco use and a national alcohol policy to target harmful alcohol consumption, we argue that integrating these strategies and grounding them in known family- and community-centred models are critical for sustaining any gains in reducing the uptake of these risky social behaviours by society. We recommend that efforts should focus on the development of a national tobacco policy in Zambia built on national
commitments made in the Framework Convention on Tobacco Control, as well as to contextualise these commitments to local needs and realities. Further, to ensure successful implementation of the alcohol policy, there is a need to strengthen the policy implementation framework and enhance government support. Monitoring trends in tobacco smoking and harmful alcohol consumption among at-risk groups will be vital to inform the effectiveness of national control efforts.

**Abbreviations**

MoH; Ministry of health, LMICs; Low-and middle-Income countries, UNZABREC; University of Zambia bioethics research ethics committee, ZNHRA; Zambia national health research authority

**Declarations**

**Ethics approval and consent to participate**

The STEPS survey protocol received ethical approval from the University of Zambia Biomedical Research Committee (UNZABREC) and the Zambia National Research Authority (ZNHRA). The survey also received authorisation from the Ministry of Health (MoH) and the WHO country office. Informed consent was obtained from all people who participated in the study. The final dataset was compiled and deposited at the MoH headquarters, Lusaka. To access the secondary data for this study, ethical approval was provided by the ZNHRA and the ERES Converge Ethics Review Board (ref. no. 2019-Dec-007). This research was performed in accordance with the Declaration of Helsinki[31].

**Consent for publication**

Not applicable

**Availability of data and materials**

The data is publicly available and can be accessed upon request

**Competing Interests**

The authors declare that they have no competing Interests

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**Author's contribution**

AS, MS and KJ conceived the study, conducted the data analysis together with CM. AS drafted and revised the manuscript. KJ, MS, CM and JMZ reviewed and provided feedback. KJ, MS, CM, JMZ guided on various aspects of scientific writing as well as edited the draft manuscript. KJ provided overall
oversight on the writing process and gave a final go-ahead to submit the manuscript. All authors read and approved the final manuscript.

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