

Heavy drinking and problem drinking among youth in Uganda: A structural equation model of alcohol marketing, advertisement perceptions and social norms

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Abstract

Introduction: To determine the role of alcohol marketing, perceptions of marketing and social norms on heavy alcohol use and problem drinking among vulnerable youth in Uganda.

Methods: The Kampala Youth Survey is a cross-sectional study conducted in 2014 with service-seeking youth (ages 12–18 years) living in the slums of Kampala ($n = 1134$) who were participating in Uganda Youth Development Link drop-in centres. Survey measures assessed perceptions of alcohol advertisements, social norms regarding alcohol use, heavy alcohol use and problem drinking. Factor analyses and structural equation models were computed to determine the predictors (e.g. social norms and alcohol marketing exposure) for drinking amounts, heavy drinking and problem drinking.

Results: Alcohol marketing allure, perceptions of adults' alcohol attitudes and respondent's male gender were significantly predictive of heavy drinking. Similarly, in addition to drinking amount and heaviness, only alcohol marketing exposure and friends' alcohol attitudes, as well as respondent's own attitudes about alcohol, significantly predicted variation in problem drinking.

Discussion and Conclusions: Alcohol marketing exposure and allure are significant predictors of heavy drinking and problem drinking among youth in Uganda. Prevention programs that reduce exposure to and allure of alcohol marketing may prove promising for reducing alcohol use and related problems among these vulnerable youth in a low-resource setting.

KEYWORDS

Africa, alcohol marketing, global health, social norms, Uganda

1 | INTRODUCTION

Limited progress has been made to address the harm caused by alcohol [1], one of the most commonly used substances globally. In fact, alcohol use contributes to about 5% of deaths and 5% of the global disease burden [2]. There is ample evidence demonstrating the levels of alcohol harm across populations and settings and for both communicable and non-communicable diseases as well as violence and injuries [2–4]. The acute consequences of alcohol use, however, are of the greatest concerns for youth. These include unintentional injuries from road traffic crashes, falls and drowning, among others, and also interpersonal and self-directed violence [2–4]. While the risk factors for these acute consequences are complex, frequent and heavy alcohol consumption are typically the key factors.

More recent research has also focused on alcohol marketing as a key driver of youth drinking [2, 5–8]. An extensive body of research, conducted primarily in North America and in Europe, demonstrates that alcohol marketing is an important risk factor for the intent to drink alcohol among youth [9–11]. In fact, the amount of exposure to alcohol advertising in magazines, on television and online are associated with higher levels of alcohol consumption among youth [5, 7, 12]. Also, awareness of alcohol advertisement is predictive of increased frequency of alcohol use [6] and similarly, receptivity to alcohol advertisement has been predictive among youth transitioning to multiple drinking outcomes [13]. Other studies have suggested that a potential pathway between alcohol advertising and behavioural influence is through favourable attitudes towards alcohol [11]. There are likely also other potential cognitive mechanisms that may link alcohol marketing exposure to alcohol use [14]; however, few studies, if any, have examined these among youth in sub-Saharan Africa. In addition, there is a scarcity of alcohol marketing research in low- and middle-income countries. This lack of alcohol marketing research is particularly troublesome in sub-Saharan Africa, where marketing has become particularly predatory [15–18] and where the industry often regulates itself, a practice that has been found to be highly counterproductive in terms of protecting youth from alcohol marketing exposure and addressing alcohol-related harm [19]. In low- and middle-income countries, focusing on policy strategies to address alcohol use may be particularly relevant and strategic, given that restricting alcohol marketing has been referred to as a “best buy” and an evidence-based intervention strategy.

Another key driver of underage drinking is adolescent social norms and peer networks, which impact adolescents’ willingness to consume alcohol and also their

perceptions of alcohol use [7]. Social norms include perceptions of other’s attitudes as well as their behaviours, a distinction that is important because they capitalise on different sources of motivation [20]. Social Norms Theory [21] posits that exposure to alcohol-related messages and imagery may result in an overestimation of peers’ engagement in and acceptance of heavy drinking behaviour. Specifically, research shows that higher perceived norms were significantly related to heavier drinking. In addition, higher perceived norms were related to a lower likelihood of being a non-drinker and a lower likelihood of having no alcohol-related consequences [22]. However, we could not find any research addressing this issue among vulnerable youth in Uganda or in the broader region. Previous research has documented the high levels of alcohol use and alcohol-related harm in this population [23–25], which raises an important question about the potential impact of alcohol marketing and social norms.

Uganda has the 7th highest alcohol consumption rate in Africa [2]. Alcohol use is also common and widely acceptable across the country [26]. Among youth living in the slums of Kampala, a population at high-risk for HIV [27, 28], violence [24, 25, 29, 30], child maltreatment [31, 32] and sexual exploitation [28, 33, 34], nearly one-third consumed alcohol in the past year [25]. More than half of youth reported consuming beer (57.9%), followed by distilled spirits, local spirits, wine and local brews [25]. Our previous findings also demonstrate that women and girls consume alcohol at comparable percentages to boys and men [25]. This is concerning, particularly since recent research has found a gender modification association between drinking and depression among persons living with HIV in Uganda, such that women who drink have a stronger association with depression compared to men [35].

Alcohol use is also common among pregnant women in Uganda, with an estimated 33% consuming alcohol during pregnancy [36]. Alcohol use during pregnancy in this study was also associated with having more than one sexual partner and working in a bar/restaurant [36]. In addition, alcohol use is high among individuals living in fishing communities in Uganda with nearly half reporting past-year alcohol use consumption [37].

In Uganda, there are no regulations on food and beverage marketing [38], and the industry largely ‘self-regulates’. While alcohol sachets were banned in 2018, alcohol marketing towards underage and vulnerable youth continues to be problematic [39]. Dia and colleagues found that nearly one-fourth of advertising around schools were for alcohol products [38]. In addition, the legal drinking age is 18 years old in Uganda, but this is poorly enforced as evident by the high prevalence

of underage drinking [24, 25]. However, there is little known about the links between alcohol marketing exposure and underage drinking in Uganda, particularly among at-risk youth living in the slums of Kampala. To address this gap in literature, the current study applies an innovative approach using structural equation modelling (SEM) to examine several composite factors (i.e. alcohol marketing exposure, alcohol marketing allure, alcohol marketing attitudes, adult alcohol attitudes, friends' alcohol attitudes, perceived alcohol attitudes) as predictors of three different alcohol drinking outcomes, also assessed as composite scores (i.e. drinking amount, heavy drinking and problem drinking). In addition, since our previous research demonstrates comparable rates of alcohol use between girls and boys, we seek to determine if there are differences in the associations between alcohol marketing and alcohol drinking outcomes by gender. Since this population is drastically understudied, examining marketing influences on alcohol use among these youth is innovative. Particularly, analysing both alcohol marketing allure and exposure in a low-resource and a population that faces dire environmental hardships is also novel. Findings from this study are intended to extend the limited research on alcohol use and alcohol marketing in low- resource settings and to inform prevention strategies seeking to address alcohol marketing exposure among underage youth.

2 | METHODS

2.1 | Data collection

The Kampala Youth Survey was a cross-sectional survey conducted in March and April 2014 to examine risk behaviours and exposures, with a primary focus on alcohol use, violence, sexual risk behaviours and HIV, in a sample of youth aged 12–18 years who were, at that time, living in the slums of Kampala. At the time of the survey, the youth were participating in a Uganda Youth Development Link drop-in centre [40]. The urban Uganda Youth Development Link centres provide vocational training, reproductive health services and psycho-social counselling for disadvantaged youth who are living on the streets or in the slums of Kampala. Study participants comprised a non-probability sample of youth, included service-seeking youth who were recruited at six of the urban drop-in centres as well as the neighbourhoods surrounding the drop-in centres ($n = 1134$). As such, our participants do not represent a random sample and the overall representativeness cannot be assured. Other study details are published elsewhere [27, 28]. The median age of participants was 17 years of age (interquartile range: 3) and

TABLE 1 Factors and their indicator topics

| Factor | Indicators |
|------------------------|---|
| SES | Parents alive, social media, electricity, phone, texting, radio, TV, internet, homelessness, safe neighbourhood |
| Exposure ^a | TV (actors, brand, news), radio, newspaper, Kampala, billboards, general exposure |
| Allure ^a | Discounts, quality, friends, fun, attraction |
| Attitudes ^a | Ban, necessity, age, health |
| Adults ^b | Discourage, upset, approve |
| Friends ^b | Age, discourage |
| Your ^b | Age, drink amount |
| Amount ^c | Frequency, volume, days |
| Heaviness ^c | Drunk, 5+ drinking days, 1st drink and drunk ages |
| Problems ^c | Problem days, injuries, help, concern, CAGE |

CAGE, Cut-Annoy-Guilt-Eye-opener; SES, socioeconomic status. ^aAlcohol marketing. ^bAlcohol attitudes. ^cDrinking.

comprised of approximately 56% girls and 44% boys. Institutional Review Board approvals were obtained from Georgia State University and the Uganda National Council on Science and Technology (Approval code: SS3338).

2.2 | Measures

The Kampala Youth Survey 2014 was composed of questions examining alcohol use and exposure to alcohol marketing, physical and sexual violence perpetration and victimisation, sexual risk behaviours and mental health symptoms among adolescents. Less than 2% of observations were missing for each variable modelled in this analysis.

An overview of all measures is listed in Table 1, and specific questions used in this analysis are listed in Table S1 (Supporting Information). The main outcomes for this study were alcohol outcomes, including drinking amount, heavy drinking and problem drinking. As is common in cross-sectional survey batteries in public health, as well as in education, psychology and other fields, participants were asked myriad similar questions to pool factor variation together and ameliorate measurement error that a standalone question presents. Similarly common for these kinds of surveys, all questions were binary or ordinal (Likert-type) indicators that were initially modelled using logistic regression. Drinking amount was conceptualised as drinking frequency (frequency of drinking across weeks and/or months), drinking volume (number of drinks consumed in a typical day) and drinking days (number of days alcohol was consumed in the past month). Heavy drinking utilised four

separate measures, including heavy drinking frequency (number of days drunk in past month), number of times when five or more drinks were consumed, age at first alcohol consumption and age at first drunkenness. Problem drinking used measures on the number of days that alcohol use was problematic and whether problem drinking resulted in injuries to one's self or others. Problem drinking also included whether the individual has sought help for drinking, if others were concerned about drinking behaviour, and the CAGE questions (Cut-Annoy-Guilt-Eye-opener) [41, 42]. In addition, these conceptualisations of heavy drinking and problem drinking are similar for both low- and middle-income countries compared to high-income countries [41].

2.3 | Predictor measures

Predictor measures include alcohol marketing exposure, alcohol marketing allure, alcohol marketing attitudes, adult alcohol attitudes, friends' alcohol attitudes and perceived alcohol attitudes (Table S1). Alcohol marketing exposure assessed alcohol exposure via television, print advertisements, advertisements across Kampala and whether the individual was given free alcohol or alcohol merchandise. Alcohol marketing allure included measures on advertisement attractiveness, such as advertisement quality, alcohol discounts in advertisements, and alluring friends and fun in the alcohol advertisements. Alcohol attitudes included attitudes towards alcohol advertisements' images, necessity, and whether alcohol marketing advertisements should target youth and display health warnings. Adult alcohol attitudes included perceptions about the adults in the youth's life, including whether they discourage youth drinking. Adult alcohol attitudes also included parental perception questions, including whether parents would approve of the individual drinking and if they would be upset if they knew the individual was drinking. Friends' alcohol attitudes included whether friends are delaying alcohol use until they are older and perceptions of friends towards the individual's drinking behaviour. Perceived alcohol attitudes included how the youth perceived their peers drinking.

We also collected data on several control variables, including socioeconomic status (SES) (see Table 1 below for proxy variables), gender (binary), age, physical health (4-point ordinal scale) and education (7-point ordinal from nothing to completed tertiary) that were also included in the analysis.

2.4 | Data analysis

SEM and factor analysis were utilised to determine the structure of, and associations between, the factors (alcohol

marketing exposure, alcohol marketing allure, alcohol marketing attitudes, adult alcohol attitudes, friends' alcohol attitudes, perceived alcohol attitudes) as predictors of three different alcohol drinking outcomes, also assessed as composite scores (i.e. drinking amount, heavy drinking and problem drinking). In addition, these associations accounted for control variables, which included SES, education, self-rated physical health, age and gender. Factors were created by testing for latent structures between theoretically related indicators* (see Table 1 below for some topics covered), and then composited based on fit criteria. Factor analysis specifically tests whether variation in observed, correlated variables† (i.e. indicators, e.g. survey questions) can be better modelled by a fewer number of latent variables (i.e. factors, e.g. SES). Factor analysis of latent factors improves the accuracy and power of what a priori composite structures provide; we can use latent factor analysis to estimate the optimal factor loadings and link functions for indicators to weight their composite loadings rather than a priori assuming them (e.g. simply adding up indicator scores 1-to-1 linearly). Given the large number of highly related variables observed, factor analysis is particularly apt for this study, although our relatively small sample size, especially for observations in more extreme, higher endorsement categories (e.g. extremely heavy drinking), barred us from estimating our factors as latent in our final model, requiring the compromise of estimating them latently in separate models to inform their composite scores' indicators' weights. This research was conducted on R version 4.1.2, particularly with packages Lavaan [43] (version 0.6–10) and semTools [44] (version 0.5–5).

SEM allows us not only to create factors, but also to test for the multiple relationships of our factors and other variables (e.g. gender, education, age, etc.) in a single analysis. This allows us to account for familywise error, or the increased Type I error for each additional statistical test conducted. It also allows us to control for interrelations between our variables (e.g. collinearity; see Figure 1) in a single model. We can also fix exogenous/dependent variables' variances to 1 and means to 0, such that parameter estimates will be standardised across all segments of the model (e.g. regression and covariance coefficients will be $<|1|$). SEM lends itself therein to modelling complex webs of sociopsychological public health phenomena like those observed in this study.

For the main analysis, we used a robust maximum likelihood estimator (with maximum likelihood for missing data). This is because while we treated the composite factors (built from the simple addition of three to 13 binary and ordinal indicators, the latter with ranges of three to seven) like continuous variables, their distributions did not necessarily match a bell curve, nor could we assume that distortions from a normal distribution between composite factors would be analogous. For the

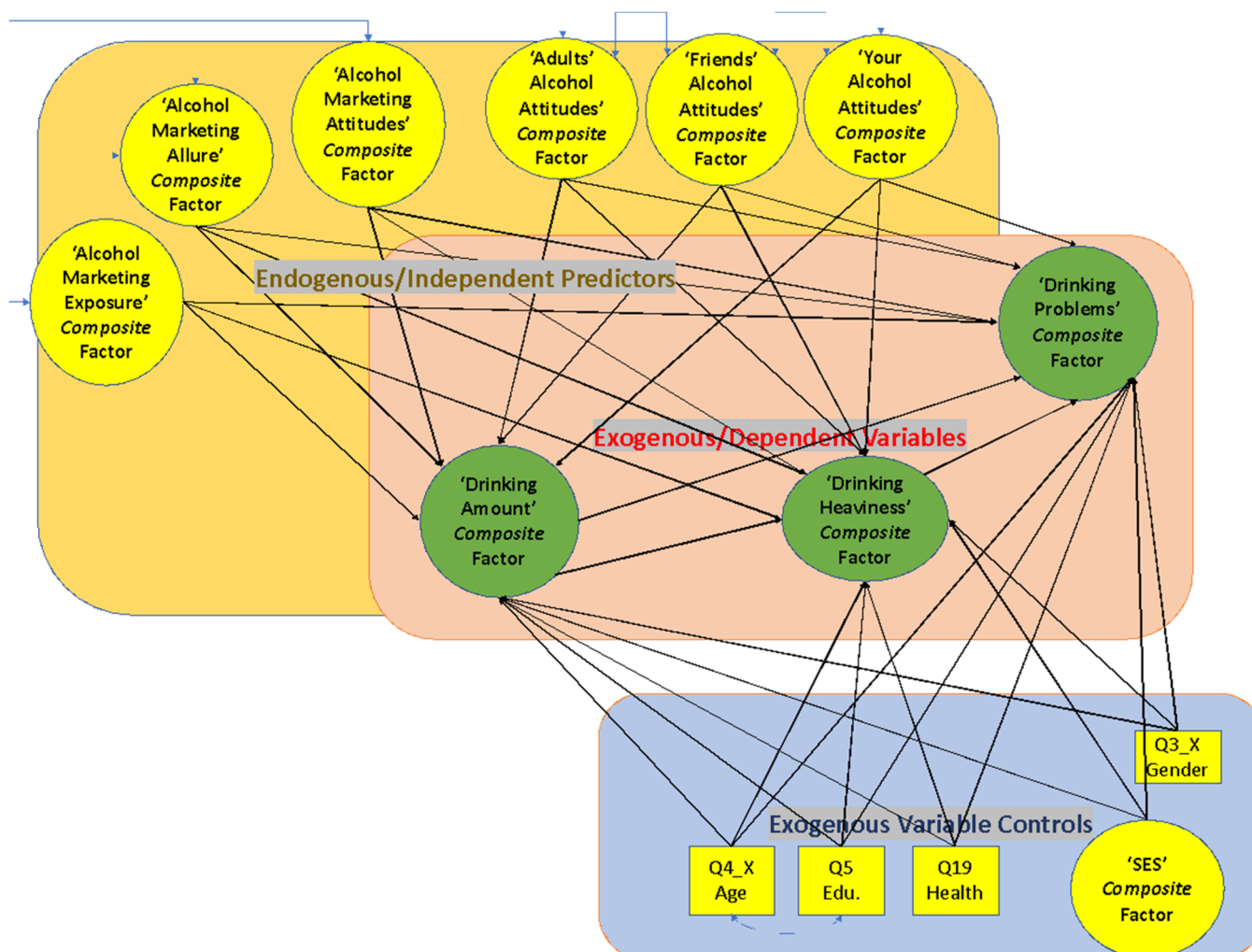


FIGURE 1 Alcohol marketing to drinking behaviour model. Composite factors are visualised as circles, while non-factor variables are visualised as squares. Single-headed, black arrows represent regression paths, while double-headed, blue arrows represent covariances (intercepts not shown). SES, socioeconomic status.

factor analysis of each set of factors, however, weighted least squares with mean-and-variance-adjusted [45] estimators were used (with pairwise deletion for missing values) in order to decrease bias given the sample's small n relative to the overall number and type of parameters, asymmetric ordinal thresholds, and large factor loadings [46]. The goodness-of-fit indices χ^2 , comparative fit index, Tucker–Lewis index, root mean square error of approximation and weighted root mean square residual were used given their various strengths and weaknesses with sample sizes, model complexity and ordinal data.

3 | RESULTS

While all variables (save for gender \ddagger) were significantly predictive of drinking amount (all in expected directions; see Figure 2), only a select few were predictive of

drinking heaviness and problems (see Table 2). Specifically, beyond drinking amount (accounting for $\sim 82\%$ of variation in drinking heaviness), alcohol marketing allure ($\sim 9\%$), adults' alcohol attitudes and respondent's gender ($\sim 5\%$ each) were significantly predictive of drinking heaviness, such that boys, those who drink more, experience more alcohol marketing allure and/or whose adults in their lives have more positive alcohol consumption attitudes are more likely to drink more heavily (see Figure 3). Similarly, in addition to drinking amount ($\sim 49\%$) and heaviness ($\sim 34\%$), only alcohol marketing exposure ($\sim 5\%$) and friends' alcohol attitudes ($\sim 7\%$), if not your own alcohol marketing attitudes ($\sim 5\%$), significantly predicted variation in drinking problems, such that those who drink more and more heavily, are more exposed to alcohol marketing, and whose friends have more positive alcohol consumption attitudes are more likely to experience more drinking problems (see

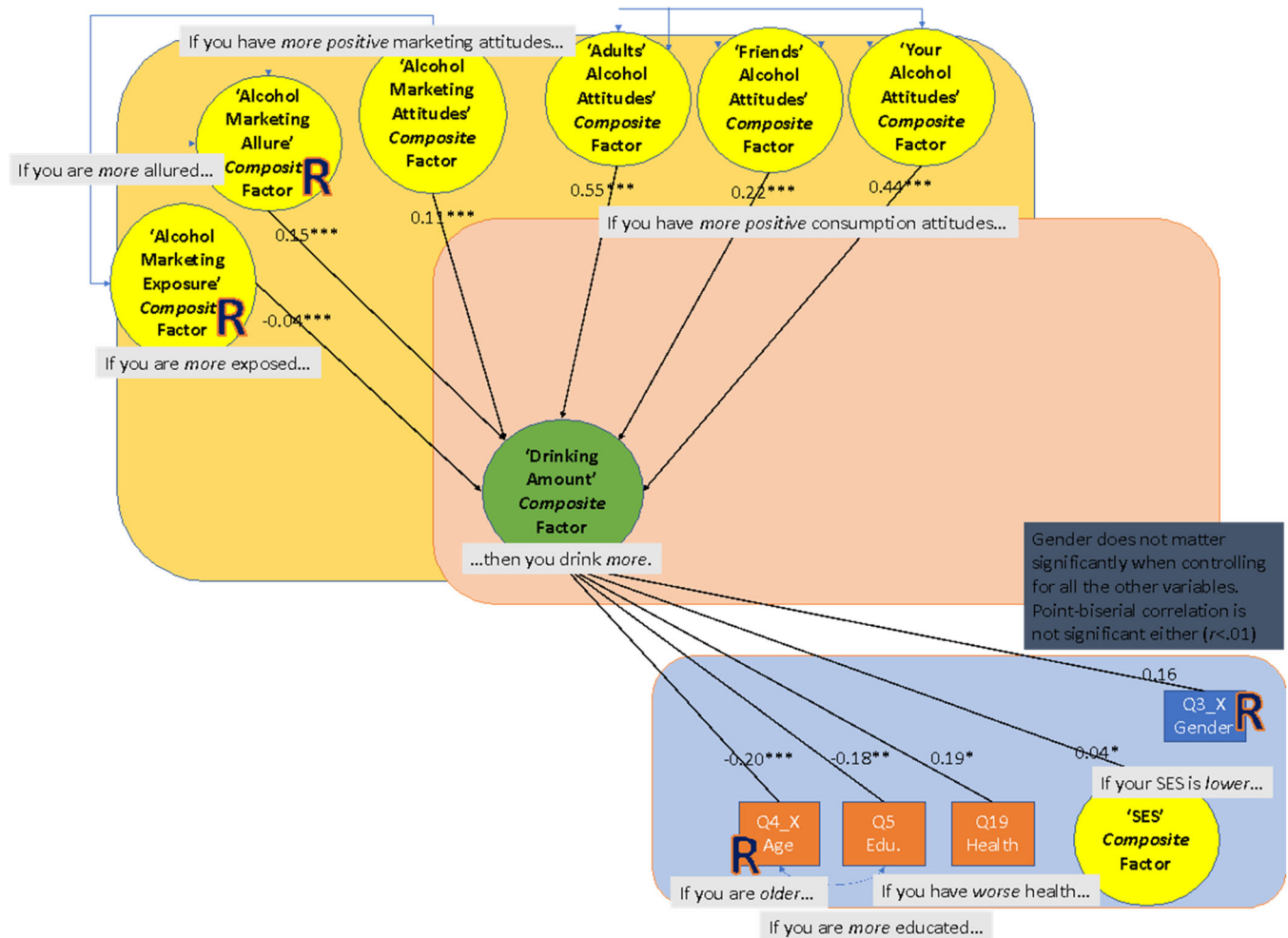


FIGURE 2 Regression onto drinking amount model portion parameter estimates. The large R 's refer to reverse-scored items. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. SES, socioeconomic status.

Figure 4). Note that covariances, variances and intercepts were excluded from the tables and figures, but not the model; all were found to be significant, though intercept interpretations are not useful for the composite factors.

Note that Figures 2, 3 and 4 all pertain to the same final model. We layered visualising the findings in three stages given the model's complexity: Figure 2 does not show paths to drinking heaviness and drinking problems, Figure 3 does not show paths to drinking problems and Figure 4 shows all model paths. We highlight each dependent variable to focus on in each figure with the green coloration.

Age was positively associated with drinking amount at an average increased score rate of 20%, such that 18-year-olds had 120% higher drinking amounts than 12-year-olds. Note that age explains 4% of the variance in drinking amount. Conversely, those with lower education (18% per each of 7 ordinal levels), worse health (19% per each of 4 ordinal levels), and worse SES (4% per point on a 15-point scale) had higher drinking amount scores.

4 | DISCUSSION

In this study, we examined the role of alcohol marketing, perceptions of marketing and social norms on heavy alcohol use and problem drinking among vulnerable youth in Uganda. Our findings, consistent with previous research on alcohol marketing in other settings, show that alcohol marketing exposure, alcohol marketing allure and positive alcohol marketing attitudes predicted youth's higher drinking amount (Swahn *et al.*, unpublished findings). Similarly, we found that positive alcohol attitudes perceived to be held by respondents' adults (parents and adults generally) and peers, as well as their own positive attitudes towards alcohol, predicted their higher drinking amounts. However, unlike in previous research [47], heavy drinking was *only* significantly predicted by alcohol marketing allure (*not* exposure or attitudes about marketing) and adults' alcohol attitudes in addition to the participant's own drinking amount. Similarly, we found that drinking problems were only significantly

TABLE 2 Drinking amount, heaviness and problems regression model estimates

| Variable | Parameter estimate | SE | Std. estimate |
|---|--------------------|-----------|---------------|
| <i>Regression onto drinking amount</i> | | | |
| Exposure ^a | -0.04*** | 0.01 | -0.10*** |
| Allure ^a | 0.15*** | 0.01 | 0.34*** |
| Attitudes ^a | 0.11*** | 0.03 | 0.10*** |
| Adults ^b | 0.55*** | 0.07 | 0.28*** |
| Friends ^b | 0.22*** | 0.05 | 0.14*** |
| Your ^b | 0.44*** | 0.08 | 0.18*** |
| SES | 0.04* | 0.02 | 0.06* |
| Age | -0.20*** | 0.03 | -0.14*** |
| Education | -0.18** | 0.09 | -0.08** |
| Health | 0.19* | 0.09 | 0.06* |
| Gender ^c | 0.16 | 0.12 | 0.03 |
| <i>Regression onto drinking heaviness</i> | | | |
| Amount ^d | 0.98*** | 0.03 | 0.82*** |
| Exposure ^a | -0.01 | 0.01 | -0.01 |
| Allure ^a | 0.05*** | 0.01 | 0.09*** |
| Attitudes ^a | -0.01 | 0.02 | -0.08 |
| Adults ^b | 0.12* | 0.06 | 0.05* |
| Friends ^b | 0.01 | 0.03 | 0.00 |
| Your ^b | 0.04 | 0.06 | 0.02 |
| SES | 0.01 | 0.02 | 0.00 |
| Age | 0.05 | 0.03 | 0.03 |
| Education | -0.01 | 0.04 | 0.00 |
| Health | 0.13 | 0.02 | 0.03 |
| Gender ^c | -0.28*** | 0.09 | -0.05*** |
| <i>Regression onto drinking problems</i> | | | |
| Amount ^d | 0.42*** | 0.05 | 0.49*** |
| Heaviness ^d | 0.24*** | 0.05 | 0.34*** |
| Exposure ^a | -0.02* | 0.01 | -0.05* |
| Allure ^a | -0.00 | 0.01 | -0.01 |
| Attitudes ^a | 0.01 | 0.02 | 0.01 |
| Adults ^b | 0.02 | 0.06 | 0.01 |
| Friends ^b | -0.09** | 0.03 | -0.07** |
| Your ^b | -0.09~ | 0.06 | -0.05~ |
| SES | 0.01 | 0.01 | 0.02 |
| Age | -0.04 | 0.02 | -0.03 |
| Education | 0.04 | 0.04 | 0.02 |
| Health | 0.04 | 0.01 | 0.02 |
| Gender ^c | 0.09 | 0.08 | 0.02 |
| <i>Goodness of fit indices</i> | | | |
| <i>n</i> | 1134 | Missing | 21 |
| χ^2 | 1100.74*** | <i>df</i> | 48 |

(Continues)

TABLE 2 (Continued)

| Variable | Parameter estimate | SE | Std. estimate |
|-----------------|--------------------|-----------------------|---------------|
| Robust χ^2 | 1085.14*** | Yuan-Bentler correct. | 1.01 |
| CFI | 0.83 | TLI | 0.67 |
| RMSEA | 0.14 | WRMR | 3.04 |

Note: Intercepts, variances and covariances (within alcohol Marketing (a) and attitudes (b) factors respectively, as well as between age and education) are excluded from the table. $-P < 0.1$, $*P < 0.05$, $**P < 0.01$, $***P < 0.001$. CFI, comparative fit index; RMSEA, root mean square error of approximation; SES, socioeconomic status; TLI, Tucker-Lewis index; WRMR, weighted root mean square residual. ^aAlcohol marketing. ^bAlcohol attitudes. ^cGender is coded from men (0) to women (1). ^dDrinking.

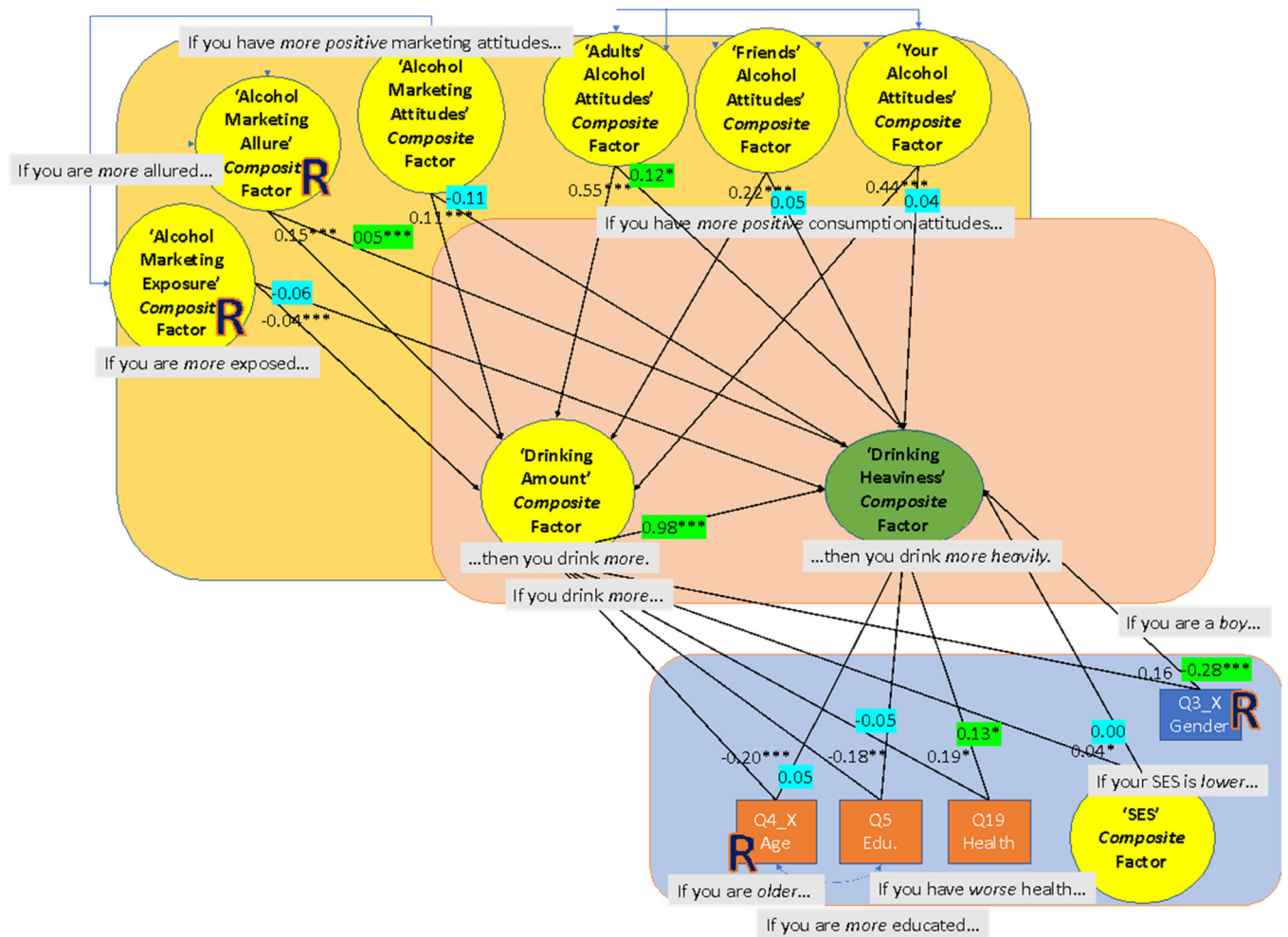


FIGURE 3 Regression onto drinking heaviness model portion parameter estimates. The large R's refer to reverse-scored items. $*P < 0.05$, $**P < 0.01$, $***P < 0.001$. Parameters highlighted in green are significant predictors of drinking heaviness, while those highlighted in blue are not. SES, socioeconomic status.

predicted by alcohol marketing exposure, friends' alcohol attitudes and participant's own alcohol marketing attitudes (not adults') in addition to participants' drinking amount and heaviness.

We might interpret the data as telling an interesting story of divergent influences. The drinking heaviness among these Kampala youth seems to be influenced, above and beyond their drinking amount, by specifically

alcohol marketing's allure—but not participants' reported exposure to it, nor even their attitudes about it—and the attitudes participants report adults in their life demonstrate regarding alcohol—but not their peers' or even their own attitudes thereof. It would seem, then, that it is not alcohol advertising's dosage (or repeated exposure) that leads directly to heavier drinking, nor peers' and youths' own attitudes, but the influence of

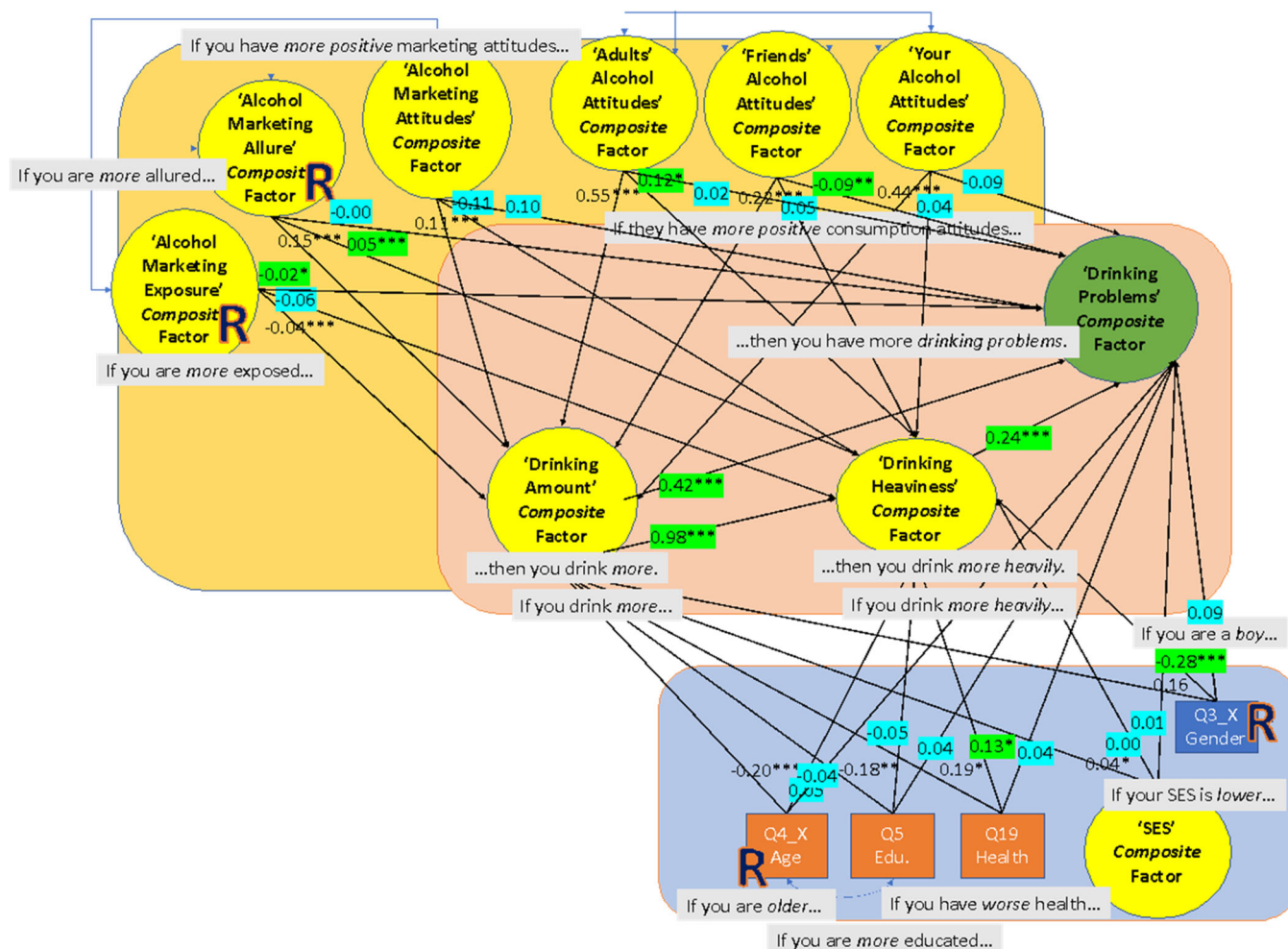


FIGURE 4 Regression onto drinking problems model portion parameter estimates. The large R's refer to reverse-scored items. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. Parameters highlighted in green are significant predictors of either drinking heaviness or drinking problems, while those highlighted in blue are not. SES, socioeconomic status.

their role models—that is, via how ‘cool’ and ‘attractive’ they report alcohol advertising campaign components to be (e.g. TV and billboard presentation), as well as what the adults in their lives do and say around alcohol. Indeed, we see advertising often co-opting the allure of adult-like figures that youth aim to emulate (e.g. the comical James Bond-like drinking rooster in the Crazy Cock brand advertisement previously marketed in Uganda). Conversely, in our study, Kampala youths’ rates and degrees of drinking problems seem to be more directly influenced by their *exposure* to alcohol advertising, as well as their peers and own attitudes around alcohol, above and beyond the amount, and heaviness with which, they drink. Perhaps drinking problems, then, are due not to the influence of their role models so much as peer pressure, their own cavalier attitudes around drinking, and the mere exposure effect [48], which might all increase their likelihood of drinking excessively. Indeed, unlike drinking heaviness which may increase over time

(and therefore might require more role modelling), it potentially only takes one drinking occasion to engage in problem drinking (e.g. an accident or altercation) with the push of peer pressure or seeing many ads for some new, popular alcohol drink.

Overall, however, our findings demonstrate that youth who have more exposure to alcohol marketing, who find alcohol marketing appealing, who have more positive marketing attitudes also drink more alcohol. While this finding was expected, and is consistent with previous research [49], it provides clear recommendations for prevention strategies to modify these perceptions and address early exposure to alcohol marketing. As such, strategies for reducing alcohol advertisement exposure are urgently needed in this setting and a recommended strategy by the World Health Organization [2]. Given the alcohol marketing exposure and allure reported by youth in our study, it also seems that the self-regulation of alcohol marketing by the industry, as is

the case in Uganda, is not conducive for protecting underage youth in this setting.

Intriguingly, we also found significant gender differences with respect to drinking heaviness, but not for drinking problems. There is an extant literature on gender differences in alcohol use and harm [50–53]. However, our findings are of particular interest given that we did *not* find differences in the most problematic forms of alcohol use, nor in the amount of alcohol drunk, by gender. These findings will need to be explored in more detail in future research to understand the risk of alcohol problems, particularly for girls who may not be recognised by treatment providers in a cultural context where girls are thought to be less likely to drink [54]. Research also demonstrate that women are less likely to report their drinking, primarily due to cultural norms and stigma, which presents a problem in health-care settings [55, 56].

While the population studied is very poor and represent vulnerable youth who live in the slums and informal settlements in Kampala, they still also represent a relatively heterogeneous group with various levels of adversity. This is evidenced by our findings which show that youth who were older, with worse health and lower SES were more likely to drink more. As such, even in this setting, there is variation in terms of drinking patterns and alcohol problems that may be driven by SES and other factors such as marketing exposure and access to alcohol. Future research should investigate the differential harms in alcohol-related consequences by SES and other contextual factors to inform prevention strategies. Research shows that individuals in low-income countries experience worse disparities and harm from alcohol compared to individuals in high-income countries, despite comparable levels of alcohol consumption which underscores the urgent need for prevention and intervention strategies that are feasible for mitigating alcohol harm in low-resource settings [57].

4.1 | Limitations

There are several limitations that should be considered when interpreting these findings. Due to the cross-sectional nature of this study, causal mechanisms cannot be assumed from our structural equation models. Also, the convenience sample of service-seeking youth is also limiting; not only do they represent a heterogeneous group, but they are also understudied and considered hard to reach. A clear sampling frame does not exist for this population. This study did not collect data on the type of alcohol that was marketed towards youth or whether the marketing was for local versus international

alcohol brands. There may be substantial differences in beer advertising compared to distilled spirit advertising, as well as for local versus international brands. Future studies should examine marketing strategies and content and their potential differential impact on alcohol consumption and preferences among youth. In addition, our data were collected in 2014 and does not capture any recent changes or trends with respect to alcohol use or marketing in Uganda, particularly, the ban of alcohol sachets [39]. Moreover, since all measures were self-reported, results may be influenced by social desirability bias. In terms of our approach for data analysis, one major limitation we cannot overlook is our model's poor fit. It is not surprising, given the complexity of our model, the non-normal nature of our data, and both our sample size and degrees of freedom therein, that our model does not meet most goodness-of-fit thresholds despite significant parameter estimates. While the local fit and significant parameter estimates speak to the viability of our model, by no means do we assert it to be the 'final say' on how these variables might relate to one another, nor how this specific sample may be best modelled. Ultimately, this is an exploratory study that we hope will engender future research with more powerful statistical tools, larger sample sizes and more comprehensive measures to understand the role of alcohol marketing in alcohol use, particularly among youth.

4.2 | Implications and recommendations

Despite our limitations, this study is the first to our knowledge to assess different aspects of alcohol marketing such as the overall exposure, the allure and also the attitudes in terms of alcohol use, and problems in Uganda or the broader region. These findings will be of importance in efforts to curb alcohol use and may inform prevention strategies to focus on modifiable factors such as attitudes and norms endorsing alcohol use by adults and friends. Social marketing campaigns have been conducted elsewhere to reduce alcohol use and other substances and may be effective in this setting as well [58]. In sum, this study presents important findings on a hard-to-reach and understudied population that is heavily exposed to aggressive alcohol marketing [59] and where national or broader alcohol prevention initiatives have been scarce.

Research has clearly demonstrated and underscored that alcohol is a major contributor to the burden of social and health problems in a number of African countries (i. e. Kenya, Nigeria, South Africa and Uganda) [18]. Although, drinking patterns vary in many African countries and where many have a substantial proportion of its

population who abstain from alcohol consumption, primarily for religious reasons, drinkers in African countries consume 13% more alcohol per capita than the average among drinkers globally [60]. With limited research on alcohol marketing exposure among vulnerable youth in sub-Saharan Africa and aggressive alcohol marketing, it is suggested that stronger alcohol marketing regulations be considered as recommended by the World Health Organization and leading alcohol researchers to reduce alcohol-related problems [1, 2, 61]. For example regulations on the content and placement of alcohol marketing (i.e. advertising deliberately targeting youth or placing alcohol marketing near schools) and further bans on accessible forms of alcohol have been recommended and are typically part of prevention strategies in other settings. It is clear that the recent ban on alcohol sachets in Uganda has been largely successful [39], but further strategies should be considered to mitigate the high levels of alcohol-related harms among at-risk youth.

While policies and intervention strategies were not examined in our study, the influence of alcohol marketing on alcohol use and problems in our young study population are troubling. In fact, the legal drinking age is 18 years in Uganda. As such, the majority of the participants in our study ($n = 788$, 69%) were younger than the legal drinking age. This context should make it even more clear that there is a need for policies and interventions in Uganda, as has been recommended previously, that consider strategies for restricting alcohol access and marketing as well as social norms endorsing alcohol use for those under the legal drinking age [59, 62, 63]. Moreover, alcohol awareness campaigns can also be considered and should target youth, particularly those out of school, and emphasise the direct and indirect harms of alcohol to delay alcohol use initiation and influence social norms regarding alcohol use.

5 | CONCLUSIONS

Our study found that alcohol marketing allure and adults' alcohol attitudes were associated with heavy drinking. Similarly, we found that drinking problems were only significantly predicted by alcohol marketing exposure, friends' alcohol attitudes and participant's own alcohol marketing attitudes (not adults') in addition to participants' drinking amount and heaviness. Importantly we also did not find gender differences in terms of problem drinking indicating the need for targeting both girls and boys with prevention strategies. More research is urgently needed to develop targeted intervention approaches for low resource-settings to reduce problem drinking and harm among these youth. Finally, we hope that these findings spur interest in new alcohol

marketing research to expand the much needed, but limited alcohol prevention strategies, given the prevalence of alcohol use and harm among youth in Uganda.

AUTHOR CONTRIBUTIONS

Monica H. Swahn conceptualised the study, and Monica H. Swahn and Rogers Kasiryeg Kasirye collected the data. Monica H. Swahn, Rachel Culbreth, Cherell Cottrell-Daniels, Nazarius Mbona Tumesigye, Ari Fodeman and David H. Jernigan wrote the manuscript. Fodeman and Culbreth analysed the data. Rogers Kasirye and Isidore Obot edited the manuscript. All authors contributed to and have approved the final manuscript.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

ETHICS STATEMENT

All relevant ethical safeguards have been met in relation to participant or subject protection. The research has complied with the World Medical Association Declaration of Helsinki.

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ENDNOTES

* Save for those with only two or three indicators.

† Whether continuous, binary, or ordinal—the latter two making up the vast majority of observations in this study, which we account for in our latent estimates and then composited.

‡ We also tested for and found that gender was not significantly correlated point-biserially with drinking amount.

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