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## Gender-based violence, psychological distress, sexual behaviors, and binge drinking among female entertainment workers in Cambodia: A midterm survey of the Mobile Link trial

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3 1 **Gender-based violence, psychological distress, sexual behaviors, and binge drinking among female**  
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5 2 **entertainment workers in Cambodia: A midterm survey of the Mobile Link trial**  
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3 26 **ABSTRACT**  
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5 27 **Objective** To examine the relationship between gender-based violence, HIV risks, psychological distress,  
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7 28 and binge drinking among female entertainment workers (FEWs) in Cambodia.  
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9 29 **Design** Cross-sectional study.  
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11 30 **Setting** Phnom Penh and three provinces in Cambodia  
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13 31 **Participants** We recruited 600 FEWs from entertainment venues using a stratified random sampling  
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15 32 method. Participants were eligible if they were at least 18 years old, working in the selected entertainment  
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17 33 venues, and self-identified as a FEW.  
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19 34 **Primary outcome measure** Binge drinking was defined as drinking more than four units of alcoholic  
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21 35 drinks in 24 hours on at least one occasion in the past three months.  
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24 36 **Results** The prevalence of binge drinking was 76.7%. Adjusted odds of binge drinking were significantly  
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26 37 higher among FEWs who earned >USD250 per month than those who earned ≤USD120 per month, had  
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28 38 been forced to drink >one time per month in the past three months than those who had never been forced  
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30 39 to drink, worked at karaoke bars than those working at a restaurants/café, and experienced emotional  
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32 40 abuse in the past six months than those who did not experience it. Interestingly, the odds of binge  
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34 41 drinking were significantly higher among FEWs with lower psychological distress than those with higher  
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36 42 psychological distress.  
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39 43 **Conclusions** This study highlights a high prevalence of binge drinking among FEWs, resulting from the  
40  
41 44 working environment, conditions, and context. Our findings suggested that individual-based behavioral  
42  
43 45 intervention may not be effective in reducing binge drinking among FEWs; structural and occupational  
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45 46 health policy interventions are needed to change the working environment.  
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48 48 **Keywords:** Female sex workers, mental health, substance abuse, violence exposure, HIV risk, Asia  
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3 **52 Strengths and limitations of this study**  
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- 5 53 • This is the first study that determined the factors associated with binge drinking among female  
6 entertainment workers in Cambodia.  
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9 55 • The authors used the validated measures of binge drinking and psychological distress that allows  
10 us to compare the prevalence of these variables to other study.  
11 56  
12  
13 57 • Binge drinking and other sexual practices data were self-reported; therefore, they may be  
14 subjected to social desirability bias.  
15 58  
16  
17 59 • Cross-sectional study could not draw a causal inference.  
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## 60 INTRODUCTION

61 Female entertainment workers (FEWs) are a key population targeted for human immunodeficiency virus  
62 (HIV) and other health interventions in Cambodia. FEWs work in entertainment venues such as karaoke  
63 bars, massage parlors, restaurants, or beer gardens.<sup>1 2</sup> Due to the government sanction, the brothel  
64 business system became illegal in 2008.<sup>3</sup> An increasing number of female sex workers has moved to  
65 entertainment venues,<sup>4 5</sup> and the FEW populations have grown significantly over the past decade. The  
66 FEW population sizes in Cambodia increased from approximately 40,000 in 2014 to 70,000 in 2019.<sup>6 7</sup>  
67 The proportion of FEWs who reported having sex in exchange for money or gifts with commercial sex  
68 partners in the past three months ranged from 22.5% to 28.1%.<sup>2 8 9</sup> Another factor contributing to the  
69 increasing number of FEWs is women's movement from garment factories to entertainment venues to  
70 supplement their low wages from the garment industry.<sup>10</sup>

71 The growing number of FEWs means more effort is needed to provide resources and health care for  
72 this population. FEWs are generally at a greater risk of contracting HIV and other sexually transmitted  
73 infections (STIs) than the general population due to the nature of their work.<sup>11</sup> In Cambodia, the estimated  
74 HIV prevalence among the adult population aged 15-49 years was 0.6% in 2016;<sup>12</sup> the prevalence was  
75 3.2% among FEWs in 2016.<sup>13</sup> Gender-based violence (GBV) and substance abuse among FEWs are also  
76 prevalent.<sup>14</sup> A Cambodian study found that 60.5% of FEWs experienced a form of GBV in their lifetime,  
77 and 37.5% experienced it in the past six months.<sup>15</sup> Additional to occupational risks, FEWs suffer from  
78 social stigma resulting in various forms of abuse and harassment in workplaces, communities, and from  
79 law-enforcement authorities because of the illegality of sex work.<sup>16</sup> A study found that 43.2% of FEWs in  
80 Cambodia reported having psychological distress, 19.5% having suicidal thoughts, and 7.3% attempting  
81 to commit suicide in the past three months.<sup>2</sup>

82 Most FEWs work in alcohol-based venues where they are pressured to drink. Across the globe,  
83 studies have reported high alcohol consumption rates among women working in the sex and entertainment  
84 industry.<sup>17-22</sup> In Cambodia, 83.4% of FEWs and sex workers reported binge drinking, defined as having  
85 more than four alcoholic drinks on at least one occasion in the past three months.<sup>23</sup> Moreover, 23.7% of

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3 86 sex workers aged less than 29-year-old reported being drunk for more than 20 days in the last month.<sup>14</sup> A  
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5 87 similar study found that 33.1% of FEWs had been forced to drink alcohol more than once a month.<sup>7</sup>  
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8 88 Excessive drinking is correlated with adverse health and social outcomes among FEWs and sex  
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10 89 workers in other countries. Alcohol use may negatively influence the ability of FEWs to negotiate safer  
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12 90 sex with commercial sex partners.<sup>24-26</sup> For instance, a cohort study of Kenyan female sex workers found  
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14 91 that hazardous and harmful drinking was associated with unprotected sex and a higher number of sex  
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16 92 partners than non-drinkers.<sup>19</sup> Hazardous drinking is defined as having an Alcohol Use Disorders  
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18 93 Identification Test (AUDIT) score between 8 to 15, and harmful drinking is defined as having an AUDIT  
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20 94 score  $\geq 16$ , which includes alcohol dependence.<sup>27</sup> A systematic literature review identified the health  
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22 95 impacts of alcohol use among female sex workers. The impacts include adverse physical health such as  
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24 96 fatigue, sleep problems, acute intoxication, and chronic alcoholic cirrhosis.<sup>28</sup> Alcohol drinking was also  
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26 97 associated with mental health problems, sexual-violence victimization, condomless sex, HIV, and other  
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28 98 STIs.<sup>28</sup> Similarly, a study among female sex workers in China found that problem drinking (risk drinking,  
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30 99 heavy drinking, and hazardous drinking) was associated with unprotected sex and an STI history.<sup>29</sup>  
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33 100 Finally, alcohol use was associated with illicit drug use and heavy cigarette smoking among female sex  
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35 101 workers in India and Nigeria.<sup>20 28 30</sup>

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37 102 Young Cambodian women from low-income families in rural areas migrate to urban areas to earn a  
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39 103 better income and send money to their families.<sup>31</sup> Many of them work for the garment sector.<sup>32</sup>  
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41 104 Nevertheless, women still struggle financially due to low-paid jobs, and a large portion of their income  
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43 105 contributed to their families.<sup>10</sup> Therefore, to improve their livelihoods, many decide to supplement their  
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45 106 garment work income by working at entertainment venues, including beer gardens, massage parlors, and  
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47 107 karaoke bars. Many women also engage in transactional sex work.<sup>13</sup> Hence, entertainment venues have  
48  
49 108 been identified as one of the critical places targeting HIV and STI prevention. In Cambodia, women have  
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51 109 accounted for more than half of all HIV infections.<sup>33</sup>

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54 110 Heavy alcohol use is an issue among FEWs and paves a difficult path for reducing HIV and STIs.  
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56 111 Examining factors associated with binge drinking among FEWs is essential to design an effective  
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3 112 intervention to reduce the binge drinking prevalence that would, in turn, reduce the incidence of HIV,  
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5 113 STIs, GBV, and mental health problems in this population. A recent qualitative study reported several  
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7 114 factors associated with binge drinking among FEWs in Cambodia, such as experiencing economic shock,  
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9 115 sustaining a family income, experiencing psychological distress, bettering at work, and drinking for social  
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11 116 life.<sup>34</sup> No previous quantitative studies have yet been conducted to determine the factors associated with  
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13 117 binge drinking among FEWs in Cambodia. Therefore, this study aimed to examine the relationship  
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15 118 between GBV, HIV risk behaviors, psychological distress, and binge drinking among FEWs in  
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17 119 Cambodia.  
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## 22 121 **METHODS**

### 23 24 122 **Design and study population**

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26 123 Data were collected in November 2018 as part of the mid-term survey of the *Mobile Link* trial.<sup>5</sup> The trial  
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28 124 was a multisite, single-blinded randomized controlled trial with two arms. Six hundred FEWs were  
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30 125 randomly assigned to the arms – 300 for the intervention and 300 for the control arms. FEWs assigned to  
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32 126 the intervention arm received either short messages or voice messages, depending on their choices. FEWs  
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34 127 in the control arm received the existing standard health care provided by the government and non-  
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36 128 governmental organizations (NGOs). Standard health care included access to HIV and sexual and  
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38 129 reproductive health services, including free HIV and STI testing, counseling, and linkages to care and  
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40 130 treatment services. The trial was implemented in Phnom Penh and three provinces: Battambang, Banteay  
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42 131 Meanchey, and Siem Reap. Details of the *Mobile Link* trial have been published elsewhere.<sup>5</sup>  
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### 47 133 **Sample and sampling procedures**

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49 134 The study employed a stratified random sampling method to recruit FEWs from entertainment venues.  
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51 135 Thirty venues were selected from a list of entertainment venues in the study sites based on the geographic  
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53 136 information system mapping of HIV key populations in Cambodia.<sup>35</sup> The selected venues were then  
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55 137 matched with 30 similar venues and randomized for their size and type. FEWs were sampled from the  
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3 138 selected venues until the sample pool reached 600 FEWs. Female interviewers approached the FEWs to  
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5 139 conduct the interviews. FEWs were eligible for the study if they (a) were at least 18 years old at the time  
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7 140 of the interview, (b) were working in the selected entertainment venues, (c) self-identified as a FEW, (d)  
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9 141 were able to communicate in Khmer, (e) could provide written informed consent to participate in the  
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11 142 study, and (f) agreed to present themselves on the day of the interview.  
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### 15 144 **Data collection training and procedures**

16 145 Female data collectors who previously worked with the research team on studies related to HIV among  
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18 146 key populations were recruited. The data collection team received one-day training on interview  
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20 147 techniques, confidentiality, privacy assurance, and quality control skills. Due to the high illiteracy among  
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22 148 FEWs, the interviewers verbally explained the study to FEWs as part of the informed consent process  
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24 149 before starting an interview. After obtaining their informed consent, the interviewer conducted the  
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26 150 interviews with the FEWs in a place of their choice. The interview took approximately 30 minutes per  
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28 151 participant. The participants received USD5 as time compensation.  
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### 34 153 **Questionnaire development**

35 154 A structured questionnaire was developed in English and translated into Khmer, the Cambodian national  
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37 155 language. Back-translation from Khmer to English was conducted to ensure that the contents and meaning  
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39 156 of the original questionnaire were maintained. The Khmer questionnaire was then pretested to ensure that  
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41 157 the participants understood the questionnaire, and the contents were culturally appropriate. The Kobo  
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43 158 Humanitarian Response platform was used to program the questionnaire, and the questionnaire was  
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45 159 downloaded into the KoBoCollect application installed on tablets.  
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### 51 161 **Variables and measurements**

52 162 Alcohol drinking was assessed using the AUDIT-Concise.<sup>36</sup> The participants were first asked how often  
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54 163 they drank at least one can or one small bottle of beer or one glass of other alcoholic beverages in the past  
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3 164 three months. If the participant responded to any quantity (once a month or less, 2–4 times a month, 2–3  
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5 165 times a week, and  $\geq 4$  times a week), the participants were then asked, “how often did you have more than  
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7 166 four units of alcoholic drinks in 24 hours in the past three months.” Binge drinking was defined as  
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9 167 drinking more than four units of alcoholic drinks in 24 hours on at least one occasion in the past three  
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11  
12 168 months.

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14 169 The independent variables of interest comprise sociodemographic characteristics, entertainment  
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16 170 work, sexual behaviors, GBV experiences in the past six months, psychological distress, type of venue  
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18 171 best describes the current entertainment job, and work duration in entertainment establishments.

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20 172 Sexual behaviors included the number of commercial partners in the past three months, condom use  
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22 173 in the last sexual intercourse with non-commercial partners, sexual intercourse with commercial partners  
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24 174 in the past three months, and frequency of forced drinking in the past three months.

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26 175 The GBV experiences in the past six months were classified into four categories, namely emotional  
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28 176 abuse, physical abuse (beating, kicking, or hitting from commercial sex partners, non-commercial sex  
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30 177 partners or husbands), forced sex, and forced substance use (alcohol and drugs). Emotional abuse  
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32 178 included verbal threats and controlling the ability to leave the house.

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35 179 Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12).<sup>37</sup>  
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37 180 The GHQ-12 consists of 12 questions measured on a four-point Likert scale, ranging from 0 to 3. Scoring  
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39 181 was conducted through a method of the ‘0-0-1-1.’ Those who responded 0 or 1 were coded as “0” and  
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41 182 those who responded 2 or 3 were coded as “1.” This method was used to avoid biases resulting from the  
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43 183 tendency that participants choose to respond 0 and 3 or 1 and 2.<sup>38</sup> The mean of the total score for the  
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45 184 entire sample was used as the cut-off to define lower or higher psychological distress among FEWs. The  
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47 185 GHQ-12 score of  $\leq 3$  was defined as “low psychological distress,” and  $\geq 4$  or more was defined as “high  
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49 186 psychological distress”.<sup>39</sup> The Cronbach’s alpha for the GHQ-12 among study participants was 0.69.

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## 53 54 188 **Statistical analyses**

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3 189 Data were imported in Excel for editing to ensure the accuracy, consistency, and completeness of the  
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5 190 data. The data were then imported into STATA 14 (Stata Corporation, Texas, USA) for analyses. We  
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7 191 conducted descriptive statistics to describe the prevalence and characteristics of drinking among the  
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9 192 participants. We used the Chi-square test (or Fisher's exact test when the sample sizes were smaller than  
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11 193 five in one cell) for categorical variables and Student's *t*-test for continuous variables to compare the  
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13 194 sociodemographic characteristics, GBV experiences, psychological distress, and sexual behavior  
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15 195 characteristics among binge drinkers and non-binge drinkers.

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18 196 We performed bivariate and multiple logistic regression analyses to examine the associated factors  
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20 197 of binge drinking. Regarding the multiple logistic regression, we first included age, education, and all  
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22 198 variables significantly associated with binge drinking at the *p*-value <0.20 in the bivariate logistic  
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24 199 regression analyses in the model. Then we used the backward elimination method to eliminate variables  
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26 200 with the highest *p*-value one-by-one from the multiple logistic regression models. Overall, five multiple  
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28 201 logistic regression models were run. The odds ratios (OR) and adjusted odds ratio (AOR) with their 95%  
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30 202 confidence interval (95% CI) were calculated.

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#### 34 204 **Ethical considerations**

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37 205 Participants were informed about the study's objectives, risks, and benefits from the participation.  
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39 206 Participation was voluntary, and participants could refuse or discontinue the participation anytime. To  
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41 207 ensure the participants' privacy and confidentiality, we conducted interviews at a private place and  
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43 208 assigned personal identification numbers in place of their personal identifiers.

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#### 46 210 **Patients and public involvement**

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49 211 Representatives of FEWs and community-based organizations were involved in the design, conduct, and  
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51 212 dissemination plans of our research.

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#### 54 214 **RESULTS**

215 **Drinking prevalence and characteristics**

216 Table 1 shows drinking prevalence and characteristics in the past three months among FEWs. More than  
 217 two-thirds of the participants (61.7%) reported drinking at least one standard alcoholic drink  $\geq 4$  times a  
 218 week, 15.5% drinking 2–3 times a week, 13.7% drinking 2–4 times per month, and 5.8% drinking once a  
 219 month or less. On a typical day, the participants reported drinking 10 or more cans of beer or glasses of  
 220 wine (28.1%), 7–9 cans of beer or glasses of wine (9.1%), 5–6 cans of beer or glasses of wine (22.2%), 3–  
 221 4 cans of beer or glasses of wine (22.2%), and 1–2 cans of beer or glasses of wine (18.3%). The  
 222 prevalence of binge drinking was 76.7%. Almost one in five (19.5%) reported having been forced to drink  
 223 at least once a month.

224  
 225 **Table 1** Prevalence and characteristics of alcohol drinking among female entertainment workers

Alcohol drinking in the past three months	Total number	Number (%)
Frequency of drinking at least one can of beer or one glass of wine	600	
Never		20 (3.3)
Once a month or less		35 (5.8)
2–4 times a month		82 (13.7)
2–3 times a week		93 (15.5)
4 or more times a week		370 (61.7)
Number of standard drinks containing alcohol on a typical day	580	
1–2		106 (18.3)
3–4		129 (22.2)
5–6		129 (22.3)
7–9		53 (9.1)
10 or more		163 (28.1)
Frequency of drinking more than 4 drinks in 24 hours	580	

Never		120 (20.7)
Less than once a month		39 (6.7)
Once a month		36 (6.2)
1–3 times a week		118 (20.3)
≥ 4 times a week		267 (46.0)
Had binge drinking at least once*	600	460 (76.7)
Frequency of forced drinking	600	
Never		404 (67.3)
≤ 1 time per month		117 (19.5)
> 1 time per month		79 (13.2)

\* Binge drinking was defined as drinking more than four units of alcoholic drinks in 24 hours on at least one occasion in the past three months.

### Socio-demographic characteristics

As shown in Table 2, most of the participants (72.5%) were born in rural areas, and their mean age was 24.8 (standard deviation = 4.0) years. More than half of them had six years of formal education or less, and 13% had finished grade 10 or higher. More than 40% of them had never been married, and 29.5% were currently married or cohabitated. A small portion (12.8%) of the participants lived in their own home, 26.8% rented a house by themselves, 25.0% rented a house with their families, 9.2% shared a rental house with friends, and 26.2% stayed in a dormitory at their workplaces. The proportion of participants working in Karaoke bars (64.6% vs. 48.6%), having monthly income of more than USD250 (42.0% vs. 29.3%), and having been forced to drink more than once a month in the past three months (16.1% vs. 3.6%) was significantly higher among binge drinkers than non-binge drinkers.

**Table 2** Comparison of socio-demographic characteristics, GBV, and psychological distress among binge drinkers and non-binge drinkers

Characteristics	Binge drinking*			P-value†
	Total (n = 600)	Yes (n = 460)	No (n = 140)	
Type of venue best describes the current job in the entertainment				0.002
Restaurant/café	173 (28.8)	118 (25.7)	55 (39.3)	
Karaoke bar	365 (60.8)	297 (64.6)	68 (48.6)	
Beer garden/massage parlor/freelance	62 (10.3)	45 (9.8)	17 (12.1)	0.002
Age group in years (mean ± SD)	24.8 ± 4.0	24.9 ± 4.0	24.4 ± 4.1	0.19
18–24	280 (46.7)	214 (46.5)	66 (47.1)	0.52
25–29	239 (39.8)	180 (39.1)	59 (42.1)	
30–35	81 (13.5)	66 (14.4)	15 (10.7)	
Education level (in year)				0.15
Primary School (0–6)	309 (51.5)	245 (53.3)	64 (45.7)	
Secondary School (7–9)	213 (35.5)	161 (35.0)	52 (37.1)	
High School or above (≥ 10)	78 (13.0)	54 (11.7)	24 (17.1)	
Current marital status				0.80
Never married	243 (40.5)	183 (39.8)	60 (42.9)	
Currently married	180 (30.0)	139 (30.2)	41 (29.3)	
Widowed/divorced	177 (29.5)	138 (30.0)	39 (27.9)	
Level of monthly income (USD)				0.002
≤ 120	44 (7.3)	26 (5.7)	18 (12.9)	
121–250	322 (53.7)	241 (52.4)	81 (57.9)	
> 250	234 (39.0)	193 (42.0)	41 (29.3)	
Born in rural area	435 (72.5)	336 (73.0)	99 (70.7)	0.59
Current type of house				0.56

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2					
3					
4	Their own/family house	77 (12.8)	55 (12.0)	22 (15.7)	
5	Rental house on their own	161 (26.8)	126 (27.4)	35 (25.0)	
6	Rental house with family	150 (25.0)	112 (24.4)	38 (27.1)	
7	Rental house with friends	55 (9.2)	41 (8.9)	14 (10.0)	
8	Dormitory at their workplace	157 (26.2)	126 (27.4)	31 (22.1)	
9					
10					
11					
12					
13					
14	Number of children				0.36
15					
16	0	305 (50.8)	229 (49.8)	76 (54.3)	
17					
18	1	188 (31.3)	151 (32.8)	37 (26.4)	
19					
20	≥ 2	107 (17.8)	80 (17.4)	27 (19.3)	
21					
22					
23	Duration of work as entertainment workers				0.62
24					
25	Less than a year	226 (37.7)	171 (37.2)	55 (39.3)	
26					
27	1 - 2 years	196 (32.7)	155 (33.7)	41 (29.3)	
28					
29	More than 2 years	178 (29.7)	134 (29.1)	44 (31.4)	
30					
31	GBV experiences in the past six months				0.047
32					
33	Emotional abuse	70 (11.7)	62 (13.5)	8 (5.7)	
34					
35	Forced substance use	34 (5.7)	25 (5.4)	9 (6.4)	
36					
37	Physical abuse	28 (4.7)	24 (5.2)	4 (2.9)	
38					
39	Forced sex	4 (0.7)	4 (0.9)	0 (0.0)	
40					
41	High psychological distress (≥ 4) <sup>‡</sup>	235 (39.2)	171 (37.2)	64 (45.7)	0.007
42					

242 Abbreviations: GBV, gender-based violence; SD, standard deviation.

243 \* Binge drinking was defined as drinking more than four units of alcoholic drinks in 24 hours on at least  
244 one occasion in the past three months.

245 † Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for  
246 categorical variables, and Student's *t*-test was used for continuous variables.

247 ‡ Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The  
248 GHQ-12 score of ≥ 4 was used to define "high psychological distress."



## 249 Prevalence of gender-based violence

250 Table 2 shows that 22.7% of participants reported GBV in the past six months, including emotional abuse  
 251 (11.7%), forced substance use (5.7%), physical abuse (4.7%), and forced sex (0.7%). The proportion of  
 252 emotional abuse (13.5% vs. 5.7%), physical abuse (5.2% vs. 2.9%), and forced sex in the past six months  
 253 (0.9% vs. 0.0%).

254

## 255 Sexual behaviors and condom use

256 As shown in Table 3, 81.2% and 34.3% of participants reported having sexual intercourse with non-  
 257 commercial sex partners and commercial sex partners in the past three months, respectively. In the past  
 258 three months, 25.5% of them reported having sex with one or more commercial sex partners. Most  
 259 participants (71.0%) reported never using condoms when having sexual intercourse with their non-  
 260 commercial sex partners, and 77.8% reported consistently using condoms when having sexual course with  
 261 commercial partners in the past three months. The proportion of participants who reported having sexual  
 262 intercourse in the past three months (79.1% vs. 58.6%) and always using condoms when having sexual  
 263 intercourse with commercial partners (19.2% vs. 14.3%) was significantly higher among binge drinkers  
 264 than non-binge drinkers.

265

266 **Table 3** Comparison of sexual behaviors among binge drinkers and non-binge drinkers

Sexual behaviors in the past 3 months	Total (n = 600)	Binge drinking*		P-value†
		Yes (n = 460)	No (n = 140)	
Had sexual intercourse	446 (74.3)	364 (79.1)	82 (58.6)	<0.001
Condoms use in last sex with a non- commercial partner	98 (27.1)	85 (29.1)	13 (18.6)	0.08
Frequency of condom use with commercial partners				0.049
Always	66 (18.2)	56 (19.2)	10 (14.3)	

Frequently	8 (2.2)	7 (2.4)	1 (1.4)	
Sometimes	31 (8.6)	30 (10.3)	1 (1.4)	
Never	257 (71.0)	199 (68.2)	58 (82.9)	
Sex with commercial partners	153 (34.3)	130 (35.7)	23 (28.1)	0.19
Frequency of having sex with commercial partners				0.61
Daily/a few times a week/weekly	35 (22.9)	31 (23.9)	4 (17.4)	
Monthly	26 (17.0)	23 (17.7)	3 (13.0)	
Once in a while when needed to	92 (60.1)	76 (58.5)	16 (69.6)	
Number of commercial sex partners				0.045
0 partner	447 (74.5)	330 (71.7)	117 (83.6)	
1 partner	64 (10.7)	54 (11.7)	10 (7.1)	
2–3 partners	46 (7.7)	40 (8.7)	6 (4.3)	
> 3 partners	43 (7.2)	36 (7.8)	7 (5.0)	
Condoms use in last sex with a commercial partner	142 (92.8)	120 (92.3)	22 (95.7)	0.57
Frequency of condom use with non-commercial partners				0.32
Always	119 (77.8)	98 (75.4)	21 (91.3)	
Frequently	8 (5.2)	8 (6.2)	0 (0.0)	
Sometimes	19 (12.4)	18 (13.9)	1 (4.4)	
Never	7 (4.6)	6 (4.6)	1 (4.4)	

267 \* Binge drinking was defined as drinking more than four units of alcoholic drinks in 24 hours on at least  
 268 one occasion in the past three months.

269 † Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for  
 270 categorical variables, and Student's *t*-test was used for continuous variables.

271

## 272 Factors associated with binge drinking

273 Table 4 shows the results of bivariate and multiple logistic regression analyses. Bivariate analyses show  
 274 that the odds of binge drinking in the past three months was significantly higher among participants with  
 275 an average monthly income of >USD250 and USD121–250 than those with an average income of  $\leq$   
 276 USD120 (OR = 3.26, 95% CI: 1.64–6.49; OR = 2.06, 95% CI: 1.07–3.95), participants who experienced  
 277 forced drinking more than once than those who did not experience it in the past three months (OR = 5.68,  
 278 95% CI: 2.24–14.41), participants working in Karaoke bar than those working at restaurants/cafés (OR =  
 279 2.04, 95% CI: 1.34–3.08), and participants who experienced emotional abuse than those who did not  
 280 experience it in the past six months (OR = 2.57, 95% CI: 1.19–5.51).

281

282 **Table 4** Factors associated with binge drinking among female entertainment workers ( $n=600$ )

Characteristics	Bivariate logistic regression		Multiple logistic regression*	
	OR (95% CI)	P-value	AOR (95% CI)	P-value
Age (years)	1.03 (0.98–1.08)	0.19	1.02 (0.97–1.07)	0.46
Education level (in year)				
High school or above ( $\geq 10$ )	Reference		Reference	
Secondary school (7–9)	1.38 (0.78–2.44)	0.28	1.19 (0.64–2.20)	0.58
Primary school (0–6)	1.70 (0.98–2.96)	0.06	1.49 (0.82–2.71)	0.19
Average monthly income (USD)				
$\leq 120$	Reference		Reference	
121–250	2.06 (1.07–3.95)	0.03	1.98 (0.98–3.99)	0.06
> 250	3.26 (1.64–6.49)	0.001	2.96 (1.40–6.24)	0.004
Number of commercial sex partners in the past three months				
0 partner	Reference			
1 partner	1.91 (0.94–3.88)	0.07		
2–3 partners	2.36 (0.98–5.72)	0.06		

> 3 partners	1.82 (0.79–4.21)	0.16		
Condoms use in the last had sex with a non-commercial partner				
No	Reference			
Yes	1.80 (0.94–3.46)	0.08		
Sex with commercial sex partners in the past three months				
No	Reference			
Yes	1.43 (0.84–2.41)	0.19		
Level of psychological distress				
Higher (GHQ-12 $\geq$ 4)	Reference		Reference	
Lower (GHQ-12 $\leq$ 3)	1.42 (0.97–2.09)	0.07	1.65 (1.09–2.49)	0.02
Frequency of forced drinking in the past three months				
Never	Reference		Reference	
1 time per month	1.57 (0.95–2.59)	0.08	1.64 (0.96–2.78)	0.07
> 1 time per month	5.68 (2.24–14.41)	<0.001	5.66 (2.19–14.65)	<0.001
Type of venue best describes the current job in the entertainment				
Restaurant/café	Reference		Reference	
Karaoke bar	2.04 (1.34–3.08)	0.001	1.85 (1.19–2.88)	0.006
Beer garden/massage parlor/freelance	1.23 (0.65–2.35)	0.52	0.92 (0.46–1.85)	0.82
Duration of work as an entertainment worker				
< 1 year	Reference			
1–2 years	1.22 (0.77–1.92)	0.40		
> 2 years	0.98 (0.62–1.55)	0.09		
Experience emotional abuse in the past six months				
No	Reference		Reference	

Yes	2.57 (1.19–5.51)	0.02	2.71 (1.22–6.02)	0.01
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283 Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

284 \* Adjusted for variables significantly associated with binge drinking at the  $p$ -value  $\leq 0.20$  in the bivariate  
 285 logistic regression analyses and that remained statistically significant in six multiple logistic regression  
 286 models using the backward elimination method.

287 † Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The  
 288 GHQ-12 score of  $\geq 4$  was used to define “high psychological distress.”

290 After adjustment, the odds of binge drinking remained significantly higher among participants with  
 291 an average monthly income of  $>$ USD250 than those with an average income of  $\leq$ USD120 (AOR = 2.96;  
 292 95% CI: 1.40–6.24), participants who experienced forced drinking more than once per month than those  
 293 who did not experience it in the past three months (AOR = 5.66; 95% CI: 2.19 – 14.65), participants  
 294 working in karaoke bars than those working at restaurants/cafés (AOR = 1.85; 95% CI: 1.19 – 2.88), and  
 295 participants who experienced emotional abuse than those who did not experience it in the past six months  
 296 (AOR = 2.71; 95% CI: 1.22–6.02). Interestingly, the odds of binge drinking were significantly higher  
 297 among participants with lower psychological distress than those with higher psychological distress (AOR  
 298 = 1.65; 95% CI: 1.09–2.49).

## 300 DISCUSSION

301 This study explored the magnitude of binge drinking and its relationships with GBV, psychological  
 302 distress, and sexual behaviors among FEWs in Cambodia, a key population working in an environment  
 303 prone to HIV risks and substance abuse. We found a prevalence of binge drinking in the past three  
 304 months of 76.7%. A prevalence of binge drinking of 83.4% has been reported in another study of  
 305 Cambodian FEWs who were more heavily engaged in commercial sex (reporting two or more different  
 306 sexual partners within the last month).<sup>23</sup> In our study, only 25.5% of participants reported having sex with  
 307 one or more commercial sex partners in the past three months, which may explain the difference in the

1  
2  
3 308 binge-drinking prevalence. Consistent with our findings, the prevalence of alcohol drinking among female  
4  
5 309 sex workers in other countries also appears high, ranging from 67.8% to 88.5%.<sup>17 20 21 40</sup>  
6

7 310 We identified a significant relationship between binge drinking among FEWs and higher monthly  
8  
9 311 income. Evidence suggests that FEWs discuss receiving better tips from commercial sex partners or  
10  
11 312 monetary incentives from their bosses for drinking.<sup>34</sup> FEWs also discussed how they use alcohol to reduce  
12  
13 313 shyness to perform their job better.<sup>34</sup> These might explain the correlation between binge drinking and  
14  
15 314 higher monthly income among FEWs in Cambodia. Another plausible explanation for this correlation was  
16  
17 315 suggested in the literature, as other studies have noted this same pattern. Higher levels of income among  
18  
19 316 Kenyan female sex workers were associated with increases in higher-risk drinking.<sup>19</sup> As the level of risk  
20  
21 317 for drinking increased, the median number of commercial sex partners also increased, from three in the  
22  
23 318 past week among non-drinkers and low-risk drinkers to six partners in the past week among harmful  
24  
25 319 drinkers.<sup>19</sup>  
26  
27

28 320 Our findings suggest that lower psychological distress was associated with binge drinking. FEWs  
29  
30 321 who had lower psychological distress were 1.7 times more likely to report binge drinking than those who  
31  
32 322 had higher psychological distress. A literature review shows that alcohol use was correlated with adverse  
33  
34 323 mental health problems.<sup>28</sup> Therefore, we expected FEWs with higher psychological distress would be  
35  
36 324 more likely to be binge drinkers. The possible explanation for our finding is that those who thought they  
37  
38 325 had an issue with mental health might decide not to drink. Also, in a qualitative study in Cambodia,  
39  
40 326 FEWs expressed feeling shy working in entertainment venues, and drinking alcohol helped them forget  
41  
42 327 those feelings and perform the job better, resulting in better earnings.<sup>34</sup> Once FEWs earn better, they are  
43  
44 328 less likely to be distressed, which may explain why those who have lower psychological distress were  
45  
46 329 associated with binge drinking.  
47  
48

49 330 In our study, FEWs who worked in karaoke bars had a higher propensity to engage in binge  
50  
51 331 drinking than those who worked in restaurants/cafés, beer gardens, massage parlor, or freelance. This  
52  
53 332 finding is consistent with previous studies, which have discussed how karaoke bars are not just a place  
54  
55 333 where commercial sex partners go for singing but also a place for drinking and entertaining with  
56  
57  
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60

1  
2  
3 334 women.<sup>26 41</sup> In such settings, FEWs can also be pressured by supervisors and commercial sex partners to  
4  
5 335 drink.<sup>26 41</sup> Our findings also showed that FEWs who experienced forced drinking four times or more in the  
6  
7 336 past three months were significantly more likely to report binge drinking.  
8

9 337 Binge drinkers reported experiencing more emotional abuse in the past six months than non-binge  
10  
11 338 drinkers. In line with this finding, in a qualitative study in Cambodia, FEWs shared their experience in  
12  
13 339 excessive drinking to cope with the challenges in life and jobs.<sup>34</sup> Similarly, a Tanzanian study showed that  
14  
15 340 female sex workers who reported hazardous or harmful drinking were two times more likely to  
16  
17 341 experience GBV than those who reported less hazardous or harmful drinking.<sup>42</sup>  
18

19  
20 342 Alcohol consumption has been associated with the global burden of diseases and substantial health  
21  
22 343 loss.<sup>43</sup> Alcohol consumption particularly becomes a significant public health concern among female sex  
23  
24 344 workers because hazardous and harmful drinking is correlated with sexual risk behaviors, such as  
25  
26 345 unprotected sex and a more significant number of commercial sex partners, than those who were  
27  
28 346 abstained from drinking.<sup>19 44</sup> Consequently, the high binge-drinking prevalence among Cambodian FEWs  
29  
30 347 implicates the need for occupational health intervention programs to mitigate alcohol use among FEWs.  
31  
32 348 For instance, a WHO Brief Intervention for hazardous and harmful drinking<sup>27</sup> effectively reduced self-  
33  
34 349 reporting alcohol consumption among non-dependent and non-treatment-seeking female sex workers in  
35  
36 350 Mombasa, Kenya.<sup>45</sup>  
37

38  
39 351 Our study has several limitations. Firstly, this study is cross-sectional; therefore, we could not draw  
40  
41 352 a causal inference between the risk factors and binge drinking. Secondly, social desirability bias<sup>46</sup> might  
42  
43 353 be present since we asked women about sensitive issues such as sexual practices and substance use.  
44  
45 354 Women might be less likely to report this type of sensitive information, resulting in underestimating the  
46  
47 355 prevalence of the study variables. Moreover, since half of the participants were receiving an intervention,  
48  
49 356 they might be more likely to have been exposed to health education than other FEWs who were not.  
50  
51 357 Therefore, the results from this study might not be generalizable to other FEWs in Cambodia. The small  
52  
53 358 sample size in some sub-populations is another limitation of this study. For instance, “beer gardens” are  
54  
55 359 also supposed to be a drinking place and entertainment for commercial partners. However, due to the  
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57  
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1  
2  
3 360 small sample size, we grouped FEWs working in “beer gardens” with those working in “massage parlors”  
4  
5 361 and as “freelancers.” Therefore, an adequate sample size of FEWs working in “beer gardens” is needed to  
6  
7 362 determine whether women working in “beer gardens” are at risk of binge drinking. Additionally, physical  
8  
9 363 and sexual abuse might be linked to alcohol drinking and HIV risk. Nevertheless, given the small sample  
10  
11 364 size, we could not include these variables in the multiple logistic regression.  
12  
13  
14 365

## 15 366 **CONCLUSIONS**

16  
17 367 This study highlights a relatively high prevalence of binge drinking among FEWs in Cambodia. Factors  
18  
19 368 associated with binge drinking were those linked to working environments and working conditions. Binge  
20  
21 369 drinking was mainly reported by FEWs working in karaoke bars and those who experienced forced  
22  
23 370 drinking as part of the job requirement. FEWs who experienced emotional abuse, defined as verbal threats  
24  
25 371 or having the ability to leave the house not being under their control, were more likely to experience  
26  
27 372 binge drinking than those who did not experience emotional abuse. The results from our study can be  
28  
29 373 used to design interventions to reduce binge drinking among FEWs by providing safer working  
30  
31 374 environments and addressing work-related violence, such as emotional abuse by commercial sex partners  
32  
33 375 and entertainment establishment managers. The results from our study suggest that individual-based  
34  
35 376 behavioral interventions may not be sufficient in reducing binge drinking among FEWs unless  
36  
37 377 accompanied by structural and occupational health policy interventions that change these exploitative  
38  
39 378 working environments.  
40  
41  
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53  
54 384



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2  
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4  
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6  
7 387 collection. SO conducted literature reviews, analyzed the data, and drafted the manuscript. PMG advised  
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31

32 399  
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48  
49 407 Investigator (Dr. Siyan Yi) at [siyan@doctor.com](mailto:siyan@doctor.com).  
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# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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	Reporting Item	Page Number
<b>Title and abstract</b>		
Title	<a href="#">#1a</a> Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	<a href="#">#1b</a> Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>		
Background / rationale	<a href="#">#2</a> Explain the scientific background and rationale for the investigation being reported	4 – 6
Objectives	<a href="#">#3</a> State specific objectives, including any prespecified hypotheses	6
<b>Methods</b>		
Study design	<a href="#">#4</a> Present key elements of study design early in the paper	6
Setting	<a href="#">#5</a> Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6



1	Eligibility criteria	<a href="#">#6a</a>	Give the eligibility criteria, and the sources and methods of selection of participants.	7
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5		<a href="#">#7</a>	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7 – 8
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10	Data sources / measurement	<a href="#">#8</a>	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	7 – 8
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18	Bias	<a href="#">#9</a>	Describe any efforts to address potential sources of bias	7
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20	Study size	<a href="#">#10</a>	Explain how the study size was arrived at	6 – 7
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23	Quantitative variables	<a href="#">#11</a>	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	9
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27	Statistical methods	<a href="#">#12a</a>	Describe all statistical methods, including those used to control for confounding	9
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31	Statistical methods	<a href="#">#12b</a>	Describe any methods used to examine subgroups and interactions	n/a (small sample size)
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35	Statistical methods	<a href="#">#12c</a>	Explain how missing data were addressed	n/a (no missing data)
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39	Statistical methods	<a href="#">#12d</a>	If applicable, describe analytical methods taking account of sampling strategy	n/a
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42	Statistical methods	<a href="#">#12e</a>	Describe any sensitivity analyses	n/a
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46	<b>Results</b>			
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48	Participants	<a href="#">#13a</a>	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	n/a (already mentioned in method)
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57	Participants	<a href="#">#13b</a>	Give reasons for non-participation at each stage	n/a
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1	Participants	<a href="#">#13c</a>	Consider use of a flow diagram	n/a
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3	Descriptive data	<a href="#">#14a</a>	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	11 – 13
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10	Descriptive data	<a href="#">#14b</a>	Indicate number of participants with missing data for each variable of interest	n/a
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14	Outcome data	<a href="#">#15</a>	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	16 – 18
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19	Main results	<a href="#">#16a</a>	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	16 – 18
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26	Main results	<a href="#">#16b</a>	Report category boundaries when continuous variables were categorized	16 – 17
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34	Other analyses	<a href="#">#17</a>	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	n/a
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38	<b>Discussion</b>			
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40	Key results	<a href="#">#18</a>	Summarise key results with reference to study objectives	18 – 20
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42	Limitations	<a href="#">#19</a>	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	20
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47	Interpretation	<a href="#">#20</a>	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	21
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53	Generalisability	<a href="#">#21</a>	Discuss the generalisability (external validity) of the study results	20
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57	<b>Other</b>			
58	<b>Information</b>			
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1 Funding [#22](#) Give the source of funding and the role of the funders for the 22  
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# BMJ Open

## Gender-based violence, psychological distress, sexual behaviors, and binge drinking among female entertainment workers in Cambodia: A cross-sectional study

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3 1 **Gender-based violence, psychological distress, sexual behaviors, and binge drinking among female**  
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5 2 **entertainment workers in Cambodia: A cross-sectional study**  
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9 4 Sreymom Oy,<sup>1,2,3</sup> Pheak Chhoun,<sup>4</sup> Sovannary Tuot,<sup>4,5,6</sup> Carinne Brody,<sup>7</sup> Pamina M. Gorbach,<sup>1</sup> Siyan Yi,<sup>2,</sup>  
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3 26 **ABSTRACT**  
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5 27 **Objective** To examine the relationship between gender-based violence, HIV risks, psychological distress,  
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7 28 and binge drinking among female entertainment workers (FEWs) in Cambodia.

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9 29 **Design** Cross-sectional study.

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11 30 **Setting** Phnom Penh and three other provinces in Cambodia.

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13 31 **Participants** We recruited 600 FEWs from entertainment venues using a stratified random sampling  
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15 32 method. Participants were eligible if they were at least 18 years old, working in the selected entertainment  
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17 33 venues, and self-identified as a FEW.

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19 34 **Primary outcome measure** Binge drinking was defined as drinking more than four units of alcoholic  
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21 35 drinks in 24 hours on at least one occasion in the past three months.

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23 36 **Results** The prevalence of binge drinking was 76.7%. Adjusted odds of binge drinking were significantly  
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25 37 higher among FEWs who earned >USD250 per month than those who earned ≤USD120 per month  
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27 38 (adjusted odds ratio [AOR] 2.96, 95% CI: 1.40–6.24), had been forced to drink more than once per month  
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29 39 in the past three months than those who had never been forced to drink (AOR 5.66, 95% CI: 2.19–14.65),  
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31 40 worked at karaoke bars than those working at a restaurants/café (AOR 1.85, 95% CI: 1.19–2.88), and  
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33 41 experienced emotional abuse in the past six months than those who did not experience it (AOR 2.71, 95%  
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35 42 CI: 1.22–6.02. Interestingly, the odds of binge drinking were significantly higher among FEWs with  
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37 43 lower psychological distress than those with higher psychological distress (AOR 1.65, 95% CI: 1.09–  
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39 44 2.49).

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41 45 **Conclusions** This study highlights a high prevalence of binge drinking among FEWs, resulting from the  
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43 46 working environments, conditions, and contexts. Our findings suggest that individual-based behavioral  
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45 47 intervention may not be effective in reducing binge drinking among FEWs. Structural and occupational  
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47 48 health policy interventions are needed to change the working environment.

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50 49 **Keywords:** Female sex workers, mental health, substance abuse, violence exposure, HIV risk, Asia  
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## 52 **Strengths and limitations of this study**

- 53 • This is one of the few studies that determine the factors associated with binge drinking among  
54 female entertainment workers in Cambodia.
- 55 • We used the validated measures of binge drinking and psychological distress that allowed us to  
56 compare the prevalence of these variables to other studies.
- 57 • Binge drinking and other sexual practices data were self-reported; therefore, they may be subject  
58 to social desirability bias.
- 59 • The study's cross-sectional design did not allow us to draw a causal inference.



## 60 INTRODUCTION

61 Female entertainment workers (FEWs) in Cambodia are disproportionately experienced issues such as  
62 violence, sexual harassment, rights abuses, and lack of access to health services.<sup>1</sup> Many FEWs work in  
63 alcohol-based entertainment venues such as karaoke bars, massage parlors, restaurants, or beer gardens.<sup>2,3</sup>  
64 The FEW populations also include women working as freelance sex workers in public places, including  
65 streets, parks, or on call.<sup>4</sup> Frequently, FEWs are pressured to alcohol drinking during working hours,  
66 especially by their clients and supervisors.<sup>5</sup> Studies have reported high alcohol consumption rates among  
67 women working in the sex and entertainment industry across many countries.<sup>6-11</sup> In Cambodia, 83.4% of  
68 FEWs reported binge drinking, defined as having more than four alcoholic drinks on at least one occasion  
69 in the past three months.<sup>12</sup> Moreover, 23.7% of sex workers aged less than 29-year-old reported being  
70 drunk for more than 20 days in the last month.<sup>13</sup> A similar study found that 33.1% of FEWs had been  
71 forced to drink alcohol more than once a month.<sup>14</sup>

72 Excessive drinking is correlated with adverse health and social outcomes among female sex  
73 workers (FSWs) in other countries. Alcohol use may negatively influence the ability of FEWs to negotiate  
74 safer sex with commercial sex partners.<sup>15-18</sup> For instance, a cohort study of Kenyan FSWs found that  
75 hazardous and harmful drinking, as defined by having an Alcohol Use Disorders Identification Test  
76 (AUDIT) score between 8 to 15 for hazardous drinking and having an AUDIT score  $\geq 16$  for harmful  
77 drinking, which includes alcohol dependence,<sup>19</sup> was associated with unprotected sex and a higher number  
78 of sex partners than non-drinkers.<sup>8</sup> A systematic literature review identified the health impacts of alcohol  
79 use among FSWs. The impacts include adverse physical health such as fatigue, sleep problems, acute  
80 intoxication, and chronic alcoholic cirrhosis.<sup>20</sup> Alcohol drinking was also associated with mental health  
81 problems, sexual-violence victimization, condomless sex, HIV, and other sexually transmitted infections  
82 (STIs).<sup>20</sup> Likewise, a study among FSWs in China found that problem drinking (risk drinking, heavy  
83 drinking, and hazardous drinking) was associated with unprotected sex and an STI history.<sup>21</sup> Furthermore,  
84 alcohol drinking was associated with illicit drug use and heavy cigarette smoking among FEWs in India  
85 and Nigeria.<sup>9,20,22</sup>

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3 86 In Cambodia, the FEW populations have grown significantly over the past decade, from  
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5 87 approximately 40,000 in 2014 to 70,000 in 2019.<sup>1,14</sup> It is worth noting that most FEWs are migrants from  
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7 88 rural low-income families and have to provide regular financial support to their families.<sup>23</sup> The pathway  
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9 89 from rural community livelihood to the entertainment sector is common among the majority of FEWs.<sup>14</sup>  
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11 90 Transactional sex is also common among FEWs.<sup>4</sup> For example, the proportion of FEWs who reported  
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13 91 having sex in exchange for money or gifts with commercial sex partners in the past three months ranged  
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15 92 from 22.5% to 28.1%.<sup>3,24,25</sup> The growing number of FEWs means more effort is needed to provide  
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17 93 resources and health care for this population.  
18  
19

20 94 FEWs are generally at a greater risk of contracting HIV and other STIs than the general women  
21  
22 95 population due to the nature of their work.<sup>26</sup> In Cambodia, the estimated HIV prevalence among pregnant  
23  
24 96 women attending antenatal care aged 15-49 years was 0.6% in 2016.<sup>27</sup> The prevalence among FEWs was  
25  
26 97 3.2% in the same year.<sup>4</sup> Gender-based violence (GBV) among FEWs is also prevalent.<sup>28</sup> A Cambodian  
27  
28 98 study found that 60.5% of FEWs experienced a form of GBV in their lifetime, and 37.5% experienced it  
29  
30 99 in the past six months.<sup>29</sup> Additional to occupational risks, FEWs suffer from social stigma and  
31  
32 100 discrimination, resulting in various forms of abuse and harassment in workplaces and communities and by  
33  
34 101 law-enforcement authorities because of the illegality of sex work.<sup>30</sup> A study found that 43.2% of FEWs in  
35  
36 102 Cambodia reported having psychological distress, 19.5% having suicidal thoughts, and 7.3% attempting  
37  
38 103 to commit suicide in the past three months.<sup>3</sup>  
39  
40

41 104 Heavy alcohol drinking has been shown to increase the FEWs' risk of contracting HIV and other  
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43 105 STIs by limiting FEWs' ability to successfully negotiate and use condoms with partners.<sup>31</sup> Examining  
44  
45 106 factors associated with binge drinking among FEWs is essential to design an effective intervention to  
46  
47 107 reduce the binge drinking prevalence that would, in turn, reduce the incidence of HIV and STIs in this  
48  
49 108 population. A recent qualitative study reported several factors linked to binge drinking among FEWs in  
50  
51 109 Cambodia, such as experiencing economic shock, sustaining a family income, experiencing psychological  
52  
53 110 distress, working better, and drinking for social life.<sup>5</sup> No previous quantitative studies have identified  
54  
55 111 factors associated with binge drinking among FEWs in Cambodia. Therefore, this study examined the  
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3 112 associations between socio-demographic characteristics, mental health-related factors, sexual risk  
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5 113 behaviors, GBV, and binge drinking among FEWs in Cambodia.  
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7 114

## 9 115 **METHODS**

### 11 116 **Design and study population**

13 117 Data were collected in November 2018 as part of the mid-term survey of the *Mobile Link* trial.<sup>32</sup> The trial  
14  
15 118 was a multisite, single-blinded randomized controlled trial with two arms. Six hundred FEWs were  
16  
17 119 randomly assigned to the arms – 300 for the intervention and 300 for the control arms. FEWs assigned to  
18  
19 120 the intervention arm received either short messages or voice messages, depending on their choices. FEWs  
20  
21 121 in the control arm received the existing standard health care provided by the government and non-  
22  
23 122 governmental organizations (NGOs). Standard health care included access to HIV and sexual and  
24  
25 123 reproductive health services, including free HIV and STI testing, counseling, and sexual and reproductive  
26  
27 124 health services. The trial was implemented in Phnom Penh and three other provinces: Battambang,  
28  
29 125 Banteay Meanchey, and Siem Reap. Details of the *Mobile Link* trial have been published elsewhere.<sup>32</sup>  
30  
31 126

### 33 127 **Sample and sampling procedures**

34  
35 128 This study employed a stratified random sampling method to recruit FEWs from entertainment venues.  
36  
37 129 Thirty venues were selected from a list of entertainment venues in the study sites based on the geographic  
38  
39 130 information system mapping of HIV key populations in Cambodia.<sup>33</sup> The selected venues were then  
40  
41 131 matched with 30 similar venues and randomized for their size and type. FEWs were sampled from the  
42  
43 132 selected venues until the sample pool reached 600 FEWs. Female interviewers approached the FEWs to  
44  
45 133 conduct the interviews. FEWs were eligible for the study if they (a) were at least 18 years old at the time  
46  
47 134 of the interview, (b) were working in the selected entertainment venues, (c) were able to communicate in  
48  
49 135 Khmer, (d) could provide written informed consent to participate in the study, and (e) agreed to present  
50  
51 136 themselves on the day of the interview.  
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### 138 **Data collection training and procedures**

139 Female data collectors who previously worked with the research team on studies related to HIV among  
140 key populations were recruited. The data collection team received one-day training on interview  
141 techniques, confidentiality, privacy assurance, and quality control skills. Due to the high illiteracy among  
142 FEWs, the interviewers verbally explained the study to FEWs as part of the informed consent process  
143 before starting an interview in a place of their choice. The interview took approximately 30 minutes per  
144 participant. The participants received USD5 as time compensation.

### 146 **Questionnaire development**

147 A structured questionnaire was developed in English and translated into Khmer, the Cambodian national  
148 language. Back-translation from Khmer to English was conducted to ensure that the contents and meaning  
149 of the original questionnaire were maintained. The Khmer questionnaire was then pretested to ensure that  
150 the participants understood the questionnaire and that the contents were culturally appropriate. The Kobo  
151 Humanitarian Response platform was used to program the questionnaire, and the questionnaire was  
152 downloaded into the KoBoCollect application installed on tablets.

### 154 **Outcome variable measure**

155 Alcohol drinking was assessed using the AUDIT-Consumption.<sup>34</sup> The participants were first asked how  
156 often they drank at least one can or one small bottle of beer or one glass of other alcoholic beverages in  
157 the past three months. If the participant responded to any quantity (once a month or less, 2–4 times a  
158 month, 2–3 times a week, and  $\geq 4$  times a week), the participants were then asked, “how often did you  
159 have more than four units of alcoholic drinks in 24 hours in the past three months.” Binge drinking was  
160 defined as drinking more than four units of alcoholic drinks in 24 hours on at least one occasion in the  
161 past three months.

### 163 **Independent variables measure**

1  
2  
3 164 The independent variables of interest comprise sociodemographic characteristics, including age,  
4  
5 165 education level, current marital status, monthly income, place of birth, number of children, entertainment  
6  
7 166 venue, and duration of work as an entertainment worker. We collected information on sexual intercourse,  
8  
9 167 the number of partners, and the frequency of condom use with non-commercial and commercial partners  
10  
11 168 in the past three months.

12  
13  
14 169 Regarding GBV, we assessed FEWs' experiences of emotional abuse, forced substance use, physical  
15  
16 170 abuse, and forced sex using three questions for each type of GBV with multiple-choice response options.  
17  
18 171 The questions were (1) "What type of violence, if any, have you ever experienced in your lifetime?"; (2)  
19  
20 172 "What type of violence, if any, have you experienced in the past 6 months?"; and (3) "Who was the main  
21  
22 173 perpetrator of the violence?" The GBV experiences in the past six months were classified into four  
23  
24 174 categories – emotional abuse, physical abuse (beating, kicking, or hitting from commercial sex partners,  
25  
26 175 non-commercial sex partners or husbands), forced sex, and forced substance use (alcohol and drugs).  
27  
28 176 Emotional abuse included verbal threats and controlling the ability to leave the house.

29  
30 177 Psychological distress was measured using the 12-item General Health Questionnaire (GHQ-12).<sup>35</sup>  
31  
32 178 The GHQ-12 consists of 12 questions assessed on a four-point Likert scale, ranging from 0 to 3. Scoring  
33  
34 179 was conducted through a method of the '0-0-1-1.' Those who responded 0 or 1 were coded as "0" and  
35  
36 180 those who responded 2 or 3 were coded as "1." This method was used to avoid biases resulting from the  
37  
38 181 tendency that participants choose to respond 0 and 3 or 1 and 2.<sup>36</sup> The mean of the total score for the  
39  
40 182 entire sample was used as the cut-off to define lower or higher psychological distress among the  
41  
42 183 respondents. The GHQ-12 score of  $\leq 3$  was defined as "low psychological distress," and  $\geq 4$  or more was  
43  
44 184 defined as "high psychological distress."<sup>37</sup> The Cronbach's alpha for the GHQ-12 among this study's  
45  
46 185 participants was 0.69.

47  
48  
49 186

## 50 51 52 187 **Statistical analyses**

53  
54 188 Data were imported in Excel for editing to ensure accuracy, consistency, and completeness. The data were  
55  
56 189 then imported into STATA 14 (Stata Corporation, Texas, USA) for analysis. We conducted descriptive

1  
2  
3 190 statistics to describe the prevalence and characteristics of alcohol drinking among the participants. We  
4  
5 191 used the Chi-square test (or Fisher's exact test when the sample sizes were smaller than five in one cell)  
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7 192 for categorical variables and Student's *t*-test for continuous variables to compare the sociodemographic  
8  
9 193 characteristics, entertainment work, GBV experiences, psychological distress, and sexual behavior  
10  
11 194 characteristics among binge drinkers and non-binge drinkers.

12  
13  
14 195 We performed bivariate and multiple logistic regression analyses to examine the associated factors  
15  
16 196 of binge drinking in the total sample of 600 FEWs and among a subgroup of 365 FEWs working in  
17  
18 197 karaoke bars. In the multiple logistic regression, we first included age, education, and all variables  
19  
20 198 significantly associated with binge drinking at the *p*-value <0.20 in the bivariate logistic regression  
21  
22 199 analyses in the model. Then we used the backward elimination method to eliminate variables with the  
23  
24 200 highest *p*-value one-by-one from the multiple logistic regression models. Overall, five multiple logistic  
25  
26 201 regression models were run. The final multiple logistic regression model was evaluated according to the  
27  
28 202 model calibration with Hosmer-Lemeshow goodness-of-fit (*p*-value >0.05), variance inflation factors  
29  
30 203 (VIF) to check for the multi-collinearity and predictive accuracy with areas under the curve. The odds  
31  
32 204 ratios (OR) and adjusted odds ratio (AOR) with their 95% confidence interval (95% CI) were calculated.  
33  
34  
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36

205

### 206 **Ethical considerations**

37  
38  
39 207 Participants were informed about the study's objectives and anticipated risks and benefits of their  
40  
41 208 participation. Participation was voluntary, and participants could refuse or discontinue the participation  
42  
43 209 anytime. To ensure the participants' privacy and confidentiality, we conducted interviews at a private  
44  
45 210 place and assigned personal identification numbers in place of their identifiers.

211

### 212 **Patients and public involvement**

51  
52 213 Representatives of FEWs and community-based organizations were involved in designing, conducting,  
53  
54 214 and disseminating our research. We invited the key stakeholder representatives to a consultative  
55  
56 215 workshop to design the study and develop the study protocol and materials. The workshop aimed to  
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gather the stakeholders' opinions to ensure that our study addressed their critical health issues and responded to their needs. We also invited them to discuss the questionnaire to receive their feedback on its contents and wording.

219

## 220 RESULTS

### 221 Drinking prevalence and characteristics

As shown in Table 1, 28.1% of the participants reported drinking 10 or more cans of beer or glasses of other alcoholic beverages on a typical day in the past three months. The prevalence of binge drinking was 76.7% among all FEWs, 81.4% among FEWs working in karaoke bars, 68.2% among FEWs working in restaurant/café, and 72.6% among FEWs working in other entertainment venues including beer gardens, massage parlors, and as freelance sex workers. Almost one in five (19.5%) reported having been forced to drink at least once a month in the past three months.

228

**Table 1** Prevalence and characteristics of alcohol drinking among female entertainment workers stratified by type of entertainment venues

Alcohol drinking in the past three months	Total (n = 600)	Type of entertainment venues		
		Karaoke bar (n = 365)	Restaurant/café (n = 173)	Other* (n = 62)
Frequency of drinking at least one can of beer or one glass of wine				
Never	20 (3.3)	4 (1.1)	9 (5.2)	7 (11.3)
Once a month or less	35 (5.8)	18 (4.9)	14 (8.1)	3 (4.8)
2–4 times a month	82 (13.7)	53 (14.5)	24 (13.9)	5 (8.1)
2–3 times a week	93 (15.5)	62 (16.9)	29 (16.8)	2 (3.2)
4 or more times a week	370 (61.7)	228 (62.5)	97 (56.1)	45 (72.6)
Number of standard drinks containing alcohol on a typical day				

1 – 2	106 (18.3)	35 (9.7)	63 (38.4)	8 (14.6)
3 – 4	129 (22.2)	76 (21.1)	45 (27.4)	8 (14.6)
5 – 6	129 (22.2)	90 (24.9)	21 (12.8)	18 (32.7)
7 – 9	53 (9.1)	37 (10.3)	11 (6.7)	5 (9.1)
10 or more	163 (28.1)	123 (34.1)	24 (14.6)	16 (29.1)
Frequency of drinking more than 4 drinks in 24 hours				
Never	120 (20.7)	64 (17.7)	46 (28.1)	10 (18.2)
Less than once a month	39 (6.7)	23 (6.4)	15 (9.2)	1 (1.8)
Once a month	36 (6.2)	18 (4.9)	14 (8.6)	4 (7.3)
1 – 3 times a week	118 (20.3)	81 (22.4)	32 (19.5)	5 (9.1)
≥ 4 times a week	267 (46.0)	175 (48.5)	57 (34.8)	35 (63.6)
Had binge drinking at least once <sup>†</sup>	460 (76.7)	297 (81.4)	118 (68.2)	45 (72.6)
Frequency of forced drinking				
Never	404 (67.3)	245 (67.1)	116 (67.1)	43 (69.4)
≤ 1 time per month	117 (19.5)	75 (20.6)	33 (19.1)	9 (14.5)
> 1 time per month	79 (13.2)	45 (12.3)	24 (13.9)	10 (16.1)

231 Values are numbers (%).

232 \* Other venues included beer gardens, massage parlors, and freelance.

233 † Binge drinking was defined as drinking more than four units of alcoholic drinks in 24 hours on at least  
 234 one occasion in the past three months.

235

### 236 Sociodemographic characteristics

237 Table 2 shows that most of the participants (72.5%) were born in rural areas, and their mean age was 24.8  
 238 (standard deviation [SD] 4.0) years. More than half of them had six years of formal education or less, and  
 239 13% had finished grade 10 or higher. More than 40% of them had never been married, and 29.5% were  
 240 currently married or cohabitated. The proportion of participants working in karaoke bars (64.6% vs.



241 48.6%), having monthly income of more than USD250 (42.0% vs. 29.3%), and having been forced to  
 242 drink more than once a month in the past three months (16.1% vs. 3.6%) was significantly higher among  
 243 binge drinkers than non-binge drinkers.

244

245 **Table 2** Comparison of sociodemographic characteristics, GBV, and psychological distress among binge  
 246 drinkers and non-binge drinkers

Characteristics	Total <i>n</i> = 600	Binge drinking*		P-value <sup>†</sup>
		Yes ( <i>n</i> = 460)	No ( <i>n</i> = 140)	
Type of venue best describes the current job in the entertainment				0.002
Restaurant/café	173 (28.8)	118 (25.7)	55 (39.3)	
Karaoke bar	365 (60.8)	297 (64.6)	68 (48.6)	
Beer garden/massage parlor/freelance	62 (10.3)	45 (9.8)	17 (12.1)	
Age group in years (mean ± SD)	24.8 ± 4.0	24.9 ± 4.0	24.4 ± 4.1	0.19
18–24	280 (46.7)	214 (46.5)	66 (47.1)	0.52
25–29	239 (39.8)	180 (39.1)	59 (42.1)	
30–35	81 (13.5)	66 (14.4)	15 (10.7)	
Education level (in year)				0.15
Primary School (0–6)	309 (51.5)	245 (53.3)	64 (45.7)	
Secondary School (7–9)	213 (35.5)	161 (35.0)	52 (37.1)	
High School or above (≥ 10)	78 (13.0)	54 (11.7)	24 (17.1)	
Current marital status				0.80
Never married	243 (40.5)	183 (39.8)	60 (42.9)	
Currently married	180 (30.0)	139 (30.2)	41 (29.3)	

Widowed/divorced	177 (29.5)	138 (30.0)	39 (27.9)	
Level of monthly income (USD)				0.002
≤ 120	44 (7.3)	26 (5.7)	18 (12.9)	
121–250	322 (53.7)	241 (52.4)	81 (57.9)	
> 250	234 (39.0)	193 (42.0)	41 (29.3)	
Born in rural area	435 (72.5)	336 (73.0)	99 (70.7)	0.59
Current type of house				0.56
Their own/family house	77 (12.8)	55 (12.0)	22 (15.7)	
Rental house on their own	161 (26.8)	126 (27.4)	35 (25.0)	
Rental house with family	150 (25.0)	112 (24.4)	38 (27.1)	
Rental house with friends	55 (9.2)	41 (8.9)	14 (10.0)	
Dormitory at their workplace	157 (26.2)	126 (27.4)	31 (22.1)	
Number of children				0.36
0	305 (50.8)	229 (49.8)	76 (54.3)	
1	188 (31.3)	151 (32.8)	37 (26.4)	
≥ 2	107 (17.8)	80 (17.4)	27 (19.3)	
Duration of work as entertainment workers				0.62
Less than a year	226 (37.7)	171 (37.2)	55 (39.3)	
1 - 2 years	196 (32.7)	155 (33.7)	41 (29.3)	
More than 2 years	178 (29.7)	134 (29.1)	44 (31.4)	
GBV experiences in the past six months				0.047
Emotional abuse	70 (11.7)	62 (13.5)	8 (5.7)	
Forced substance use	34 (5.7)	25 (5.4)	9 (6.4)	
Physical abuse	28 (4.7)	24 (5.2)	4 (2.9)	
Forced sex	4 (0.7)	4 (0.9)	0 (0.0)	

High psychological distress ( $\geq 4$ ) <sup>‡</sup>	235 (39.2)	171 (37.2)	64 (45.7)	0.007
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247 Abbreviations: GBV, gender-based violence; SD, standard deviation.

248 Values are numbers (%) for continuous variables and mean (SD) for continuous variables.

249 \* Binge drinking was defined as drinking more than four units of alcoholic drinks in 24 hours on at least  
250 one occasion in the past three months.

251 † Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for  
252 categorical variables, and Student's *t*-test was used for continuous variables.

253 ‡ Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The  
254 GHQ-12 score of  $\geq 4$  was used to define "high psychological distress."

255

### 256 **Prevalence of gender-based violence**

257 Table 2 shows that 22.7% of participants reported having experienced GBV in the past six months,  
258 including emotional abuse (11.7%), forced substance use (5.7%), physical abuse (4.7%), and forced sex  
259 (0.7%). The proportion of emotional abuse (13.5% vs. 5.7%), physical abuse (5.2% vs. 2.9%), and forced  
260 sex (0.9% vs. 0.0%) in the past six months were higher among binge drinkers than non-binge drinkers.  
261 Sensitivity analyses, including only FEWs working in karaoke bars, showed similar sociodemographic  
262 characteristics, GBV experiences, and psychological distress. However, a significantly higher proportion  
263 of binge drinkers were born in rural areas than non-binge drinkers (73.4% vs. 57.4%) (Supplementary  
264 Table S1).

265

### 266 **Sexual behaviors and condom use**

267 As shown in Table 3, 25.5% of the study participants reported having sex with one or more commercial  
268 sex partners in the past three months. The proportion of participants who reported having sexual  
269 intercourse in the past three months (79.1% vs. 58.6%) and always using condoms when having sexual  
270 intercourse with non-commercial partners (19.2% vs. 14.3%) was significantly higher among binge

271 drinkers than non-binge drinkers. Overall, the characteristics of sexual behaviors and condom use of the  
 272 total participants were similar to those of FEWs working in karaoke bars only (Supplementary Table S2).

273

274 **Table 3** Comparison of sexual behaviors among binge drinkers and non-binge drinkers

Sexual behaviors in the past 3 months	Total (n = 600)	Binge drinking*		P-value†
		Yes (n = 460)	No (n = 140)	
Had sexual intercourse	446 (74.3)	364 (79.1)	82 (58.6)	<0.001
Condoms use in last sex with a non-commercial partner	98 (27.1)	85 (29.1)	13 (18.6)	0.08
Frequency of condom use with non-commercial partners				0.049
Always	66 (18.2)	56 (19.2)	10 (14.3)	
Frequently	8 (2.2)	7 (2.4)	1 (1.4)	
Sometimes	31 (8.6)	30 (10.3)	1 (1.4)	
Never	257 (71.0)	199 (68.2)	58 (82.9)	
Sex with commercial partners	153 (34.3)	130 (35.7)	23 (28.1)	0.19
Frequency of having sex with commercial partners				0.61
Daily/a few times a week/weekly	35 (22.9)	31 (23.9)	4 (17.4)	
Monthly	26 (17.0)	23 (17.7)	3 (13.0)	
Once in a while, when needed to	92 (60.1)	76 (58.5)	16 (69.6)	
Number of commercial sex partners				0.045
0 partner	447 (74.5)	330 (71.7)	117 (83.6)	
1 partner	64 (10.7)	54 (11.7)	10 (7.1)	
2–3 partners	46 (7.7)	40 (8.7)	6 (4.3)	
> 3 partners	43 (7.2)	36 (7.8)	7 (5.0)	

Condoms use in last sex with a commercial partner	142 (92.8)	120 (92.3)	22 (95.7)	0.57
Frequency of condom use with commercial partners				0.32
Always	119 (77.8)	98 (75.4)	21 (91.3)	
Frequently	8 (5.2)	8 (6.2)	0 (0.0)	
Sometimes	19 (12.4)	18 (13.9)	1 (4.4)	
Never	7 (4.6)	6 (4.6)	1 (4.4)	

275 Values are numbers (%).

276 \* Binge drinking was defined as drinking more than four units of alcoholic drinks in 24 hours on at least  
277 one occasion in the past three months.

278 † Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for  
279 categorical variables.

280

### 281 **Factors associated with binge drinking**

282 Table 4 shows the results of bivariate and multiple logistic regression analyses. Bivariate analyses show  
283 that the odds of binge drinking in the past three months was significantly higher among participants with  
284 an average monthly income of >USD250 and USD121–250 than those with an average income of  
285 ≤USD120 (OR 3.26, 95% CI: 1.64–6.49; OR 2.06, 95% CI: 1.07–3.95), participants who experienced  
286 forced drinking more than once than those who did not experience it in the past three months (OR 5.68,  
287 95% CI: 2.24–14.41), participants working in karaoke bars than those working at restaurants/cafés (OR  
288 2.04, 95% CI: 1.34–3.08), and participants who experienced emotional abuse than those who did not  
289 experience it in the past six months (OR 2.57, 95% CI: 1.19–5.51).

290

291 **Table 4** Factors associated with binge drinking among female entertainment workers ( $n = 600$ )

Characteristics	Bivariate logistic regression	Multiple logistic regression*
-----------------	-------------------------------	-------------------------------

	OR (95% CI)	P-value	AOR (95% CI)	P-value
Age (years)	1.03 (0.98–1.08)	0.19	1.02 (0.97–1.07)	0.46
Education level (in years)				
High school or above ( $\geq 10$ )	Reference		Reference	
Secondary school (7–9)	1.38 (0.78–2.44)	0.28	1.19 (0.64–2.20)	0.58
Primary school (0–6)	1.70 (0.98–2.96)	0.06	1.49 (0.82–2.71)	0.19
Average monthly income (USD)				
$\leq 120$	Reference		Reference	
121–250	2.06 (1.07–3.95)	0.03	1.98 (0.98–3.99)	0.06
$> 250$	3.26 (1.64–6.49)	0.001	2.96 (1.40–6.24)	0.004
Level of psychological distress				
Higher (GHQ-12 $\geq 4$ )	Reference		Reference	
Lower (GHQ-12 $\leq 3$ )	1.42 (0.97–2.09)	0.07	1.65 (1.09–2.49)	0.02
Frequency of forced drinking in the past three months				
Never	Reference		Reference	
1 time per month	1.57 (0.95–2.59)	0.08	1.64 (0.96–2.78)	0.07
$> 1$ time per month	5.68 (2.24–14.41)	$< 0.001$	5.66 (2.19–14.65)	$< 0.001$
Type of venue best describes the current job in the entertainment				
Restaurant/café	Reference		Reference	
Karaoke bar	2.04 (1.34–3.08)	0.001	1.85 (1.19–2.88)	0.006
Beer garden/massage parlor/freelance	1.23 (0.65–2.35)	0.52	0.92 (0.46–1.85)	0.82
Experience emotional abuse in the past six months				
No	Reference		Reference	
Yes	2.57 (1.19–5.51)	0.02	2.71 (1.22–6.02)	0.01

292 Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

293 \* Adjusted for variables significantly associated with binge drinking at the  $p$ -value  $\leq 0.20$  in the bivariate  
294 logistic regression analyses and those that remained statistically significant in six multiple logistic  
295 regression models using the backward elimination method.

296 † Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The  
297 GHQ-12 score of  $\geq 4$  was used to define “high psychological distress.”

298

299 After adjustment, the odds of binge drinking remained significantly higher among participants with  
300 an average monthly income of  $>USD250$  than those with an average income of  $\leq USD120$  (AOR 2.96,  
301 95% CI: 1.40–6.24), participants who experienced forced drinking more than once per month than those  
302 who did not experience it in the past three months (AOR 5.66, 95% CI: 2.19–14.65), participants working  
303 in karaoke bars than those working at restaurants/cafés (AOR 1.85, 95% CI: 1.19–2.88), and participants  
304 who experienced emotional abuse than those who did not experience it in the past six months (AOR 2.71,  
305 95% CI: 1.22–6.02). Interestingly, the odds of binge drinking were significantly higher among  
306 participants with lower psychological distress than those with higher psychological distress (AOR 1.65,  
307 95% CI: 1.09–2.49).

308 Among participants who worked at karaoke bars, the odds of binge drinking were significantly  
309 higher among those who were born in rural areas than those who were born in urban areas (AOR 0.51,  
310 95% CI: 0.28–0.92), had sexual intercourse in the past three months than those who did not (AOR 2.94,  
311 95% CI: 1.64–5.29), and those with lower psychological distress than those with higher psychological  
312 distress (AOR 2.15, 95% CI: 1.22–3.81) (Supplemental Table S3).

313

## 314 DISCUSSION

315 This study explored the magnitude of binge drinking and its relationships with GBV, psychological  
316 distress, and sexual behaviors among FEWs in Cambodia, a key population working in an environment  
317 prone to HIV risks and substance abuse. We found an overall prevalence of binge drinking in the past  
318 three months of 76.7% and 81.4% among those who worked at karaoke bars. A prevalence of binge

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3 319 drinking of 83.4% has been reported in another study of Cambodian FEWs who were more heavily  
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5 320 engaged in commercial sex (reporting two or more different sexual partners within the last month).<sup>12</sup> In  
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7 321 our study, only 25.5% of participants reported having sex with one or more commercial sex partners in  
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9 322 the past three months, which may explain the difference in the binge-drinking prevalence. Consistent with  
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11 323 our findings, the prevalence of alcohol drinking among FSWs in other countries also appears high,  
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13 324 ranging from 67.8% to 88.5%.<sup>6,9,10,38</sup>

15 325 We identified a significant relationship between binge drinking among FEWs and higher monthly  
16  
17 326 income. Evidence suggests that FEWs discuss receiving better tips from commercial sex partners or  
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19 327 monetary incentives from their bosses for drinking.<sup>5</sup> FEWs also discussed how they use alcohol to reduce  
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21 328 shyness to perform their job better.<sup>5</sup> These might explain the correlation between binge drinking and  
22  
23 329 higher monthly income among FEWs in Cambodia. Another plausible explanation for this correlation was  
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25 330 suggested in the literature, as other studies have noted this same pattern. Higher-income was associated  
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27 331 with increases in higher-risk drinking among Kenyan FSWs.<sup>8</sup> As the level of risk for drinking increased,  
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29 332 the median number of commercial sex partners also increased, from three in the past week among non-  
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31 333 drinkers and low-risk drinkers to six partners in the past week among harmful drinkers.<sup>8</sup>

34 334 Our findings suggest that lower psychological distress was associated with binge drinking. FEWs  
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36 335 who had lower psychological distress were 1.7 times more likely to report binge drinking than those who  
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38 336 had higher psychological distress. A literature review shows that alcohol use was correlated with adverse  
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40 337 mental health problems.<sup>20</sup> Therefore, we expected FEWs with higher psychological distress would be  
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42 338 more likely to be binge drinkers. The possible explanation for our finding is that those who thought they  
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44 339 had an issue with mental health might decide not to drink. Also, in a qualitative study in Cambodia,  
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46 340 FEWs expressed feeling shy working in entertainment venues, and drinking alcohol helped them forget  
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48 341 those feelings and perform the job better, resulting in better earnings.<sup>5</sup> Once FEWs earn better, they are  
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50 342 less likely to be distressed, which may explain why those who have lower psychological distress were  
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52 343 associated with binge drinking. This finding emphasizes the social need to support the FEWs with their  
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54 344 health and psychological wellbeing in Cambodia.



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3 345 In our study, FEWs who worked in karaoke bars had a higher propensity to engage in binge  
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5 346 drinking than those who worked in restaurants/cafés, beer gardens, massage parlors, or freelance. This  
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7 347 finding is consistent with previous studies, which have discussed how karaoke bars are not just a place  
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9 348 where clients go for singing but also a place for drinking and entertaining with women.<sup>17,39</sup> In such  
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11 349 settings, FEWs can also be pressured by supervisors and clients to drink.<sup>17,39</sup> Our findings also showed  
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13 350 that FEWs who experienced forced drinking four times or more in the past three months were  
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15 351 significantly more likely to report binge drinking. These findings highlight the need to target karaoke bars  
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17 352 to improve their working conditions and reduce forced alcohol and drug use. Additionally, interventions  
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19 353 that help FEWs transit to other safer occupations, such as hairdressing, should also be an alternative.

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22 354 Binge drinkers reported experiencing more emotional abuse in the past six months than non-binge  
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24 355 drinkers. Emotional abuse is a type of GBV that has received less attention from researchers,  
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26 356 policymakers, and intervention programs. Emotional abuse is associated with several social, economic,  
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28 357 and health problems.<sup>40</sup> In line with this finding, in a qualitative study in Cambodia, FEWs shared their  
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30 358 experience in excessive drinking to cope with the challenges in life and jobs.<sup>5</sup> Similarly, a Tanzanian  
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32 359 study showed that FSWs who reported hazardous or harmful drinking were two times more likely to  
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34 360 experience GBV than those who reported less hazardous or harmful drinking.<sup>41</sup>

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37 361 Alcohol consumption has been associated with the global burden of diseases and substantial health  
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39 362 loss.<sup>42</sup> Alcohol consumption particularly becomes a significant public health concern among FSWs  
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41 363 because hazardous and harmful drinking is correlated with sexual risk behaviors, such as condomless sex  
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43 364 and a higher number of sexual partners, than those who were abstained from alcohol drinking.<sup>8,43</sup> Findings  
44  
45 365 from this study provide important information for program implementation and policy to reduce the  
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47 366 prevalence of binge drinking among FEWs in Cambodia. For instance, the high binge-drinking  
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49 367 prevalence among Cambodian FEWs implicates the need for occupational health intervention programs to  
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51 368 mitigate alcohol use among FEWs. For instance, the WHO's Brief Intervention for Hazardous and  
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53 369 Harmful Drinking<sup>19</sup> effectively reduced self-reporting alcohol consumption among non-dependent and  
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55 370 non-treatment-seeking FSWs in Mombasa, Kenya.<sup>44</sup> Additionally, findings from our study indicate that

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3 371 individual-level interventions would not be sufficient to reduce binge alcohol consumption among FEWs  
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5 372 in Cambodia. It requires interventions addressing the structural and social contexts.<sup>45</sup>  
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7 373 This study has several limitations. Firstly, the study's cross-sectional design did not allow us to  
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9 374 draw a causal inference between risk factors and binge drinking. Secondly, social desirability bias<sup>46</sup> might  
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11 375 be present since we asked women about sensitive issues such as GBV, sexual practices, and substance  
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13 376 use. Women might be less likely to report this type of sensitive information, resulting in underestimating  
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15 377 the prevalence of the study variables. Moreover, since half of the participants received an intervention,  
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17 378 they might be more likely to have been exposed to health education than other FEWs who were not.  
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19 379 Therefore, the results from this study might not be generalizable to other FEWs in Cambodia. The small  
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21 380 sample size in some sub-populations is another limitation of this study. For instance, FEWs working in  
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23 381 beer gardens are likely to be involved in heavy alcohol drinking at work. However, we grouped them with  
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25 382 FEWs working in massage parlors and as freelance sex workers due to the small sample size. Finally, we  
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27 383 could not include physical and sexual abuse in the multiple logistic regression, given the small sample  
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29 384 size.  
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## 32 385

### 33 386 **CONCLUSIONS**

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35 387 This study highlights a relatively high prevalence of binge drinking among FEWs in Cambodia. Factors  
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37 388 associated with binge drinking were those linked to working environments and working conditions. Binge  
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39 389 drinking was mainly reported by FEWs working in karaoke bars and those who experienced forced  
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41 390 drinking as part of the job requirement. FEWs who experienced emotional abuse, defined as verbal threats  
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43 391 or having the ability to leave the house not being under their control, were more likely to experience  
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45 392 binge drinking than those who did not experience it. These findings can be used to design interventions to  
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47 393 reduce binge drinking among FEWs by providing safer working environments and addressing work-  
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49 394 related violence, such as emotional abuse by clients and entertainment establishment managers. Our study  
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51 395 suggests that individual-based behavioral interventions may not be sufficient in reducing binge drinking  
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3 396 among FEWs unless accompanied by structural and occupational health policy interventions that change  
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5 397 these exploitative working environments.  
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7 398  
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21  
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23  
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25  
26 407 collection. SO conducted literature reviews analyzed the data and drafted the manuscript. PMG advised  
27  
28 408 on the study design, data analyses, and manuscript writing. All authors provided critical comments for  
29  
30 409 revisions and approved the final manuscript. SY confirmed that he has full access to all data and final  
31  
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51 419  
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5 423  
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8  
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10  
11 426 and the University of California, Los Angeles (No. 20-001053) approved this study.  
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## Supplementary Tables

**Table S1** Comparison of socio-demographic characteristics, GBV, and psychological distress among binge drinkers and non-binge drinkers who worked in karaoke bars

Characteristics	Total ( <i>n</i> = 365)	Binge drinking*		P-value <sup>†</sup>
		Yes ( <i>n</i> = 297)	No ( <i>n</i> = 68)	
Age group in years (mean ± SD)	25.1 ± 4.0	25.2 ± 3.9	24.4 ± 4.2	0.11
18–24	162 (44.4)	127 (42.8)	35 (51.5)	0.42
25–29	144 (39.5)	120 (40.4)	24 (35.3)	
30–35	59 (16.2)	50 (16.8)	9 (13.2)	
Education level (in year)	5.9 ± 2.9	5.9 ± 2.9	6.5 ± 3.2	0.09
Primary School (0–6)	199 (54.5)	168 (56.6)	31 (45.6)	0.18
Secondary School (7–9)	125 (34.3)	99 (33.3)	26 (38.2)	
High School or above (≥ 10)	41 (11.2)	30 (10.1)	11 (16.2)	
Current marital status				0.24
Never married	156 (42.7)	121 (40.7)	35 (51.5)	
Currently married	99 (27.1)	82 (27.6)	17 (25.0)	
Widowed/divorced	110 (30.1)	94 (31.7)	16 (23.5)	
Level of monthly income (USD)				0.86
≤ 120	22 (6.0)	17 (5.7)	5 (7.4)	
121–250	195 (53.4)	160 (53.9)	35 (51.5)	
> 250	148 (40.6)	120 (40.4)	28 (41.2)	
Born in rural area	257 (70.4)	218 (73.4)	39 (57.4)	0.009
Current type of house				0.36
Their own/family house	36 (9.9)	28 (9.4)	8 (11.8)	

Rental house on their own	83 (22.7)	66 (22.2)	17 (25.0)	
Rental house with family	82 (22.5)	63 (21.2)	19 (27.9)	
Rental house with friends	34 (9.3)	27 (9.1)	7 (10.3)	
Dormitory at their workplace	130 (35.6)	113 (38.1)	17 (25.0)	
Number of children				0.16
0	189 (51.8)	148 (49.8)	41 (60.3)	
1	112 (30.7)	92 (30.9)	20 (29.4)	
≥ 2	64 (17.5)	57 (19.2)	7 (10.3)	
Duration of work as entertainment workers				0.72
Less than a year	135 (36.9)	107 (36.0)	28 (41.2)	
1 - 2 years	123 (33.7)	102 (34.3)	21 (30.9)	
More than 2 years	107 (29.3)	88 (29.6)	19 (27.9)	
GBV experiences in the past six months				0.37
Emotional abuse	38 (10.4)	34 (11.5)	4 (5.9)	
Physical abuse	19 (5.2)	16 (5.4)	3 (4.4)	
Forced substance use	15 (4.1)	10 (3.4)	5 (7.4)	
Forced sex	2 (0.6)	2 (0.7)	0 (0.0)	
High psychological distress (≥ 4) <sup>†</sup>	134 (36.7)	100 (33.7)	34 (50.0)	0.01

GBV, gender-based violence; SD, standard deviation.

Values are numbers (%) for categorical variables and mean (SD) for continuous variables.

\* Binge drinking was defined as drinking more than four units of alcoholic drinks in 24 hours on at least one occasion in the past three months.

<sup>†</sup> Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for categorical variables, and Student's *t*-test was used for continuous variables.

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‡ Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The GHQ-12 score of  $\geq 4$  was used to define “high psychological distress.”

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**Table S2** Comparison of sexual behaviors among binge drinkers and non-binge drinkers who worked in karaoke bars

Sexual behaviors in the past 3 months	Total ( <i>n</i> = 365)	Binge drinking*		P-value <sup>†</sup>
		Yes ( <i>n</i> = 297)	No ( <i>n</i> = 68)	
Had sexual intercourse	264 (72.3)	228 (76.8)	36 (52.9)	<0.001
Condoms use in last sex with a non-commercial partner	66 (30.7)	59 (32.2)	7 (21.9)	0.24
Frequency of condom use with non-commercial partners				0.04
Always	45 (20.9)	41 (22.4)	4 (12.5)	
Frequently	8 (3.7)	7 (3.8)	1 (3.1)	
Sometimes	23 (10.7)	23 (12.6)	0 (0.0)	
Never	139 (64.7)	112 (61.2)	27 (84.4)	
Sex with commercial partners	100 (37.9)	90 (39.5)	10 (27.8)	0.18
Frequency of having sex with commercial partners				0.09
Daily/a few times a week/weekly	18 (18.0)	18 (20.0)	0 (0.0)	
Monthly	15 (15.0)	15 (16.7)	0 (0.0)	
Once in a while when needed to	67 (67.0)	57 (63.3)	10 (100)	
Number of commercial sex partners				0.03
0 partner	265 (72.6)	207 (69.7)	58 (85.3)	
1 partner	47 (12.9)	41 (13.8)	6 (8.8)	
2–3 partners	32 (8.8)	28 (9.4)	4 (5.9)	
> 3 partners	21 (5.8)	21 (7.1)	0 (0.0)	
Condoms use in last sex with a	89 (89.0)	80 (88.9)	9 (90.0)	1.00

commercial partner

Frequency of condom use with commercial partners 0.52

Always	77 (77.0)	68 (75.6)	9 (90.0)
Frequently	3 (3.0)	3 (3.3)	0 (0.0)
Sometimes	14 (14.0)	14 (15.6)	0 (0.0)
Never	6 (6.0)	5 (5.6)	1 (10.0)

Values are numbers (%) for categorical variables and mean (SD) for continuous variables.

\* Binge drinking was defined as drinking more than four units of alcoholic drinks in 24 hours on at least one occasion in the past three months.

† Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for categorical variables

**Table S3** Factors associated with binge drinking among Karaoke female entertainment workers ( $n = 365$ )

Characteristics	Bivariate logistic regression		Multiple logistic regression*	
	OR (95% CI)	P-value	AOR (95% CI)	P-value
Age (years)	1.05 (0.99 – 1.13)	0.11	1.01 (0.94 – 1.09)	0.73
Education level (in years)				
High school or above ( $\geq 10$ )	Reference		Reference	
Secondary school (7–9)	1.39 (0.62 – 3.15)	0.42	1.27 (0.53 – 3.05)	0.59
Primary school (0–6)	1.99 (0.90 – 4.38)	0.09	1.62 (0.68 – 3.85)	0.27
Place of birth				
Rural	Reference		Reference	
Urban	0.49 (0.28 – 0.84)	0.01	0.51 (0.28 – 0.92)	0.03
Had sexual intercourse in the past three months				
No	Reference			
Yes	2.94 (1.69 – 5.06)	<0.001	2.94 (1.64 – 5.29)	<0.001
Level of psychological distress				
Higher (GHQ-12 $\geq 4$ )	Reference		Reference	
Lower (GHQ-12 $\leq 3$ )	1.97 (1.16 – 3.36)	0.013	2.15 (1.22 – 3.81)	0.01

AOR, adjusted odds ratio; CI, confidence interval; GHQ, General Health Questionnaire; OR, odds ratio.

\* Adjusted for variables significantly associated with binge drinking at the  $p$ -value  $\leq 0.20$  in the bivariate logistic regression analyses and those that remained statistically significant in six multiple logistic regression models using the backward elimination method.

† Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The GHQ-12 score of  $\geq 4$  was used to define “high psychological distress.”



# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

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Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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		Reporting Item	Page Number
<b>Title and abstract</b>			
Title	<a href="#">#1a</a>	Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	<a href="#">#1b</a>	Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>			
Background / rationale	<a href="#">#2</a>	Explain the scientific background and rationale for the investigation being reported	4 – 6
Objectives	<a href="#">#3</a>	State specific objectives, including any prespecified hypotheses	6
<b>Methods</b>			
Study design	<a href="#">#4</a>	Present key elements of study design early in the paper	6
Setting	<a href="#">#5</a>	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6

1	Eligibility criteria	<a href="#">#6a</a>	Give the eligibility criteria, and the sources and methods of selection of participants.	7
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5		<a href="#">#7</a>	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7 – 8
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10	Data sources / measurement	<a href="#">#8</a>	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	7 – 8
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18	Bias	<a href="#">#9</a>	Describe any efforts to address potential sources of bias	7
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20	Study size	<a href="#">#10</a>	Explain how the study size was arrived at	6 – 7
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23	Quantitative variables	<a href="#">#11</a>	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	9
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27	Statistical methods	<a href="#">#12a</a>	Describe all statistical methods, including those used to control for confounding	9
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31	Statistical methods	<a href="#">#12b</a>	Describe any methods used to examine subgroups and interactions	n/a (small sample size)
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35	Statistical methods	<a href="#">#12c</a>	Explain how missing data were addressed	n/a (no missing data)
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38	Statistical methods	<a href="#">#12d</a>	If applicable, describe analytical methods taking account of sampling strategy	n/a
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42	Statistical methods	<a href="#">#12e</a>	Describe any sensitivity analyses	n/a
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46	<b>Results</b>			
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48	Participants	<a href="#">#13a</a>	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	n/a (already mentioned in method)
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56	Participants	<a href="#">#13b</a>	Give reasons for non-participation at each stage	n/a
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1	Participants	<a href="#">#13c</a>	Consider use of a flow diagram	n/a
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3	Descriptive data	<a href="#">#14a</a>	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	11 – 13
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19	Main results	<a href="#">#16a</a>	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	16 – 18
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38	<b>Discussion</b>			
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40	Key results	<a href="#">#18</a>	Summarise key results with reference to study objectives	18 – 20
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42	Limitations	<a href="#">#19</a>	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	20
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47	Interpretation	<a href="#">#20</a>	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	21
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53	Generalisability	<a href="#">#21</a>	Discuss the generalisability (external validity) of the study results	20
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1 Funding [#22](#) Give the source of funding and the role of the funders for the 22  
2 present study and, if applicable, for the original study on which  
3 the present article is based  
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# BMJ Open

## Gender-based violence, psychological distress, sexual behaviors, and binge drinking among female entertainment workers in Cambodia: A cross-sectional study

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<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Epidemiology, Mental health, Public health, HIV/AIDS
Keywords:	MENTAL HEALTH, Substance misuse < PSYCHIATRY, EPIDEMIOLOGY

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3 1 **Gender-based violence, psychological distress, sexual behaviors, and binge drinking among female**  
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5 2 **entertainment workers in Cambodia: A cross-sectional study**  
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9 4 Sreymom Oy,<sup>1,2,3</sup> Pheak Chhoun,<sup>4</sup> Sovannary Tuot,<sup>4,5,6</sup> Carinne Brody,<sup>7</sup> Pamina M. Gorbach,<sup>2</sup> Siyan Yi,<sup>1,4,7,\*</sup>  
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3 27 **ABSTRACT**  
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5 28 **Objective** To examine the relationship between gender-based violence, HIV risks, psychological distress,  
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7 29 and binge drinking among female entertainment workers (FEWs) in Cambodia.  
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9 30 **Design** Cross-sectional study.  
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11 31 **Setting** Phnom Penh and three other provinces in Cambodia.  
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13 32 **Participants** We recruited 600 FEWs from entertainment venues using a stratified random sampling  
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15 33 method. Participants were eligible if they were at least 18 years old, working in the selected entertainment  
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17 34 venues, and self-identified as a FEW.  
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19 35 **Primary outcome measure** Binge drinking was defined as drinking more than five units of alcoholic  
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21 36 drinks in 24 hours on at least one occasion in the past three months.  
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24 37 **Results** The prevalence of binge drinking was 76.7%. Adjusted odds of binge drinking were significantly  
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26 38 higher among FEWs who earned >USD250 per month than those who earned ≤USD120 per month  
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28 39 (adjusted odds ratio [AOR] 2.96, 95% CI: 1.40–6.24), had been forced to drink more than once per month  
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30 40 in the past three months than those who had never been forced to drink (AOR 5.66, 95% CI: 2.19–14.65),  
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32 41 worked at karaoke bars than those working at a restaurants/café (AOR 1.85, 95% CI: 1.19–2.88), and  
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34 42 experienced emotional abuse in the past six months than those who did not experience it (AOR 2.71, 95%  
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36 43 CI: 1.22–6.02). The odds of binge drinking were significantly higher among FEWs with lower  
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38 44 psychological distress than those with higher psychological distress (AOR 1.65, 95% CI: 1.09–2.49).  
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41 45 **Conclusions** This study highlights a high prevalence of binge drinking among FEWs and its associations  
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43 46 with working environments, conditions, and contexts. Our findings suggest that individual-based  
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45 47 behavioral intervention may not effectively reduce binge drinking among FEWs. Structural and  
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47 48 occupational health policy interventions may be needed to change the working environment.  
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50 49  
51 50 **Keywords:** Female sex workers, mental health, substance abuse, violence exposure, HIV risk, Asia  
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3 **53 Strengths and limitations of this study**  
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- 5 54 • This is one of the few studies that determine the factors associated with binge drinking among  
6 female entertainment workers in Cambodia.  
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9 56 • We used the validated measures of binge drinking and psychological distress that allowed us to  
10 compare the prevalence of these variables to other studies.  
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13 58 • Binge drinking and other sexual practices data were self-reported; therefore, they may be subject  
14 to social desirability bias.  
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17 60 • The study's cross-sectional design did not allow us to draw a causal inference.  
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## 61 INTRODUCTION

62 Female entertainment workers (FEWs) in Cambodia are disproportionately experienced issues such as  
63 violence, sexual harassment, rights abuses, and lack of access to health services.<sup>1</sup> Many FEWs work in  
64 alcohol-based entertainment venues such as karaoke bars, massage parlors, restaurants, or beer gardens.<sup>2,3</sup>  
65 The FEW populations also include women working as freelance sex workers in public places, including  
66 streets, parks, or on call.<sup>4</sup> Frequently, FEWs are pressured to alcohol drinking during working hours,  
67 especially by their clients and supervisors.<sup>5</sup> Studies have reported high alcohol consumption rates among  
68 women working in the sex and entertainment industry across many countries.<sup>6-11</sup> In the baseline survey of  
69 the Cambodian Integrated HIV and Drug Use Prevention Intervention, 83.4% of FEWs aged  $\geq 18$  with  $\geq$   
70 2 sexual partners or transactional sex within the last month reported binge drinking, defined as having  
71 more than five alcoholic drinks on at least one occasion in the past three months.<sup>12</sup> Moreover, 23.7% of  
72 sex workers aged less than 29-year-old reported being drunk for more than 20 days in the last month.<sup>13</sup> A  
73 similar study found that 33.1% of FEWs had been forced to drink alcohol more than once a month.<sup>14</sup>

74 Excessive drinking is correlated with adverse health and social outcomes among female sex  
75 workers (FSWs) in other countries. Alcohol use may negatively influence the ability of FSWs to negotiate  
76 safer sex with commercial sex partners.<sup>15-18</sup> For instance, a cohort study of Kenyan FSWs found that  
77 hazardous and harmful drinking, as defined by having an Alcohol Use Disorders Identification Test  
78 (AUDIT) score between 8 to 15 for hazardous drinking and having an AUDIT score  $\geq 16$  for harmful  
79 drinking, which includes alcohol dependence,<sup>19</sup> was associated with unprotected sex and a higher number  
80 of sex partners than non-drinkers.<sup>8</sup> A systematic literature review identified the health impacts of alcohol  
81 use among FSWs. The impacts include adverse physical health such as fatigue, sleep problems, acute  
82 intoxication, and chronic alcoholic cirrhosis.<sup>20</sup> Alcohol drinking was also associated with mental health  
83 problems, sexual-violence victimization, condomless sex, HIV, and other sexually transmitted infections  
84 (STIs).<sup>20</sup> Likewise, a study among FSWs in China found that problem drinking (risk drinking, heavy  
85 drinking, and hazardous drinking) was associated with unprotected sex and an STIs history.<sup>21</sup>

1  
2  
3 86 Furthermore, alcohol drinking was associated with illicit drug use and heavy cigarette smoking among  
4  
5 87 FSWs in India and Nigeria.<sup>9,20,22</sup>  
6

7 88 In Cambodia, the FEW populations have grown significantly over the past decade, from  
8  
9 89 approximately 40,000 in 2014 to 70,000 in 2019.<sup>1,14</sup> It is worth noting that most FEWs are migrants from  
10  
11 90 rural low-income families and have to provide regular financial support to their families.<sup>23</sup> The pathway  
12  
13 91 from rural community livelihood to the entertainment sector is common among most FEWs.<sup>14</sup>  
14  
15 92 Transactional sex is also common among FEWs.<sup>4</sup> For example, the proportion of FEWs who reported  
16  
17 93 having sex in exchange for money or gifts with commercial sex partners in the past three months ranged  
18  
19 94 from 22.5% to 28.1%.<sup>3,24,25</sup> The growing number of FEWs means more effort is needed to provide  
20  
21 95 resources and health care for this population.  
22  
23

24 96 FEWs are generally at a greater risk of contracting HIV and other STIs than the general women  
25  
26 97 population due to the nature of their work.<sup>26</sup> In Cambodia, the estimated HIV prevalence among pregnant  
27  
28 98 women attending antenatal care aged 15-49 years was 0.6% in 2016.<sup>27</sup> The prevalence among FEWs was  
29  
30 99 3.2% in the same year.<sup>4</sup> Gender-based violence (GBV) among FEWs is also prevalent.<sup>28</sup> A Cambodian  
31  
32 100 study found that 60.5% of FEWs experienced a form of GBV in their lifetime, and 37.5% experienced it  
33  
34 101 in the past six months.<sup>29</sup> Additional to occupational risks, FEWs suffer from social stigma and  
35  
36 102 discrimination, resulting in various forms of abuse and harassment in workplaces and communities and by  
37  
38 103 law-enforcement authorities because of the illegality of sex work.<sup>30</sup> A study found that 43.2% of FEWs in  
39  
40 104 Cambodia reported having psychological distress, 19.5% having suicidal thoughts, and 7.3% attempting  
41  
42 105 to commit suicide in the past three months.<sup>3</sup>  
43  
44

45 106 Heavy alcohol drinking has been shown to increase the FEWs' risk of contracting HIV and other  
46  
47 107 STIs by limiting FEWs' ability to successfully negotiate and use condoms with partners.<sup>31</sup> Examining  
48  
49 108 factors associated with binge drinking among FEWs is essential to design an effective intervention to  
50  
51 109 reduce the binge drinking prevalence that would, in turn, reduce the incidence of HIV and STIs in this  
52  
53 110 population. A recent qualitative study reported several factors linked to binge drinking among FEWs in  
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55 111 Cambodia, such as experiencing economic shock, sustaining a family income, experiencing psychological  
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3 112 distress, working better, and drinking for social life.<sup>5</sup> No previous quantitative studies have identified  
4  
5 113 factors associated with binge drinking among FEWs in Cambodia. Therefore, this study examined the  
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7 114 associations between socio-demographic characteristics, mental health-related factors, sexual risk  
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9 115 behaviors, GBV, and binge drinking among FEWs in Cambodia.  
10

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12 116

## 13 117 **METHODS**

### 14 118 **Design and study population**

15  
16 119 Data were collected in November 2018 as part of the mid-term survey of the *Mobile Link* trial.<sup>32</sup> The trial  
17  
18 120 was a multisite, single-blinded randomized controlled trial with two arms. Six hundred FEWs were  
19  
20 121 randomly assigned to the arms – 300 for the intervention and 300 for the control arms. FEWs assigned to  
21  
22 122 the intervention arm received either short messages or voice messages, depending on their choices. FEWs  
23  
24 123 in the control arm received the existing standard health care provided by the government and non-  
25  
26 124 governmental organizations (NGOs). Standard health care included access to HIV and sexual and  
27  
28 125 reproductive health services, including free HIV and STIs testing, counseling, and sexual and  
29  
30 126 reproductive health services. The trial was implemented in Phnom Penh and three other provinces:  
31  
32 127 Battambang, Banteay Meanchey, and Siem Reap. Details of the *Mobile Link* trial have been published  
33  
34 128 elsewhere.<sup>32</sup>  
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### 41 130 **Sample and sampling procedures**

42  
43 131 This study employed a stratified random sampling to recruit FEWs from entertainment venues. First, we  
44  
45 132 purposively selected the capital city and three provinces because of their large FEW population sizes and  
46  
47 133 high HIV burdens. Second, two study sites (operational districts) were purposively selected from the  
48  
49 134 capital city and one from each province. Third, entertainment venues were classified by venue types  
50  
51 135 based on a list of all entertainment venues in the study obtained from the geographic information system  
52  
53 136 mapping of HIV key populations in Cambodia.<sup>33</sup> Finally, a probability proportional to size sampling  
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55 137 method was used to randomly select FEWs from the selected venues according to their type and size.  
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3 138 Female interviewers approached the selected FEWs to conduct the interviews. FEWs were eligible for the  
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5 139 study if they (a) were at least 18 years old at the time of the interview, (b) were working in the selected  
6  
7 140 entertainment venues, (c) were able to communicate in Khmer, (d) could provide written informed  
8  
9 141 consent to participate in the study, and (e) agreed to present themselves on the day of the interview.  
10  
11  
12 142

### 13 143 **Data collection training and procedures**

14  
15 144 Female data collectors who previously worked with the research team on studies related to HIV,  
16  
17 145 substance abuse, and GBV among key populations in Cambodia were recruited. The data collection team  
18  
19 146 received one-day training on interview techniques, confidentiality, privacy assurance, and quality control  
20  
21 147 skills. The interview was conducted in a place of their choice and took approximately 30 minutes per  
22  
23 148 participant. The participants received US\$5 as time compensation.  
24  
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26 149

### 27 150 **Questionnaire development**

28  
29  
30 151 A structured questionnaire was developed in English and translated into Khmer, the Cambodian national  
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32 152 language. Back-translation from Khmer to English was conducted to ensure that the contents and meaning  
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34 153 of the original questionnaire were maintained. The Khmer questionnaire was then pretested to ensure that  
35  
36 154 the participants understood the questionnaire and that the contents were culturally appropriate. The Kobo  
37  
38 155 Humanitarian Response platform was used to program the questionnaire, and the questionnaire was  
39  
40 156 downloaded into the KoBoCollect application installed on tablets.  
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43 157

### 44 158 **Outcome variable measure**

45  
46  
47 159 Alcohol drinking was assessed using the AUDIT-Consumption.<sup>34</sup> The participants were first asked how  
48  
49 160 often they drank at least one can or one small bottle of beer or one glass of other alcoholic beverages in  
50  
51 161 the past three months. If the participant responded to any quantity (once a month or less, 2–4 times a  
52  
53 162 month, 2–3 times a week, and  $\geq 4$  times a week), the participants were then asked, “how often did you  
54  
55 163 have more than five units of alcoholic drinks in 24 hours in the past three months.” Binge drinking was  
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3 164 defined as drinking more than five units of alcoholic drinks in 24 hours on at least one occasion in the  
4  
5 165 past three months.  
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7 166

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9 167 **Independent variables measure**

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11 168 The independent variables of interest comprised sociodemographic characteristics, including age groups  
12  
13 169 (18-24, 25-29, 30-35), education levels (primary school, secondary school, high school or above), current  
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15 170 marital status (never married, currently married, widowed/divorced), average monthly income in the past  
16  
17 171 six months ( $\leq$  US\$120, US\$121-250,  $>$ US\$250), place of birth (rural, urban), number of children (0, 1,  
18  
19  $\geq 2$ ), entertainment venue (restaurant/café, karaoke bar, beer garden, massage parlor, freelance), and  
20  
21 172 working duration as an entertainment worker ( $<$ 1 year, 1-2 years,  $>$ 2 years). We also collected  
22  
23 173 information on transactional sex (yes, no), the number of sexual partners (0, 1, 2-3,  $>$ 3), and the frequency  
24  
25 174 of condom use with non-commercial and commercial partners (always, frequently, sometimes, never) in  
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27 175 the past three months.  
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30  
31 177 Regarding GBV, we assessed FEWs' experiences of emotional abuse, forced substance use, physical  
32  
33 178 abuse, and forced sex using three questions for each type of GBV with multiple-choice response options.  
34  
35 179 The questions were (1) "What type of violence, if any, have you ever experienced in your lifetime?"; (2)  
36  
37 180 "What type of violence, if any, have you experienced in the past six months?"; and (3) "Who was the  
38  
39 181 main perpetrator of the violence?" We classified GBV experiences into four categories: (1) emotional  
40  
41 182 abuse (verbal threats or controlling the ability to leave the house by commercial sex partners, non-  
42  
43 183 commercial sex partners, husbands, entertainment establishment owners, or managers), (2) physical abuse  
44  
45 184 (beating, kicking, or hitting by commercial sex partners, non-commercial sex partners, or husbands), (3)  
46  
47 185 forced sex (by commercial sex partners, non-commercial sex partners, or husbands), and (4) forced  
48  
49 186 substance use (alcohol and drugs by commercial sex partners, non-commercial sex partners, or husbands).

50  
51 187 Psychological distress was measured using the 12-item General Health Questionnaire (GHQ-12).<sup>35</sup>  
52  
53 188 The GHQ-12 consists of 12 questions assessed on a four-point Likert scale, ranging from 0 to 3. Scoring  
54  
55 189 was conducted through a method of the '0-0-1-1.' Those who responded 0 or 1 were coded as "0" and  
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3 190 those who responded 2 or 3 were coded as “1.” This method was used to avoid biases resulting from the  
4  
5 191 tendency that participants choose to respond 0 and 3 or 1 and 2.<sup>36</sup> The mean of the total score for the  
6  
7 192 entire sample was used as the cut-off to define lower or higher psychological distress among the  
8  
9 193 respondents. The GHQ-12 score of  $\leq 3$  was defined as “low psychological distress,” and  $\geq 4$  or more was  
10  
11 194 defined as “high psychological distress.”<sup>37</sup> The Cronbach’s alpha for the GHQ-12 among this study’s  
12  
13 195 participants was 0.69.  
14  
15  
16 196

### 17 18 197 **Statistical analyses**

19  
20 198 Data were imported in Excel for editing to ensure accuracy, consistency, and completeness. The data were  
21  
22 199 then imported into STATA 14 (Stata Corporation, Texas, USA). We conducted descriptive statistics to  
23  
24 200 describe the prevalence and characteristics of alcohol drinking among the participants. We used the Chi-  
25  
26 201 square test (or Fisher’s exact test when the sample sizes were smaller than five in one cell) for categorical  
27  
28 202 variables and Student’s *t*-test for continuous variables to compare the sociodemographic characteristics,  
29  
30 203 entertainment work, GBV experiences, psychological distress, and sexual behavior characteristics among  
31  
32 204 binge drinkers and non-binge drinkers.  
33  
34

35 205 We performed bivariate and multiple logistic regression analyses to examine the associated factors  
36  
37 206 of binge drinking in the total sample of 600 FEWs and among a subgroup of 365 FEWs working in  
38  
39 207 karaoke bars. In the multiple logistic regression, we first included age, education, and all variables  
40  
41 208 significantly associated with binge drinking at the *p*-value  $< 0.20$  in the bivariate logistic regression  
42  
43 209 analyses in the model. Then we used the backward elimination method to eliminate variables with the  
44  
45 210 highest *p*-value one-by-one from the multiple logistic regression models. Overall, five multiple logistic  
46  
47 211 regression models were run. The final multiple logistic regression models were evaluated according to the  
48  
49 212 model calibration with Hosmer-Lemeshow goodness-of-fit (*p*-value  $> 0.05$ )<sup>38</sup>. The odds ratios (OR) and  
50  
51 213 adjusted odds ratio (AOR) with their 95% confidence interval (95% CI) were calculated. In addition, we  
52  
53 214 conducted sensitivity analyses, including only FEWs working in karaoke bars, given their large sample  
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215 and nature of their work that may uniquely expose them to binge drinking, GBV, psychological distress,  
216 and sexual risks.

217

### 218 **Ethical considerations**

219 Participation was voluntary, and participants could refuse or discontinue the participation anytime.  
220 Regardless of their literacy, the interviewers verbally briefed all the participants about the study's  
221 objectives and anticipated risks and benefits of their participation. Thereafter, written informed consent  
222 was obtained from all the participants. In case a participant could not sign, the interviewer would sign on  
223 their behalf with their agreement. To ensure the participants' privacy and confidentiality, we conducted  
224 interviews at a private place and assigned personal identification numbers in place of their identifiers.  
225 Participants were offered escorted referrals to peer counselors and required services upon request.

226

### 227 **Patients and public involvement**

228 Representatives of FEWs and community-based organizations were involved in designing, conducting,  
229 and disseminating our research. We invited the key stakeholder representatives to a consultative  
230 workshop to design the study and develop the study protocol and materials. The workshop aimed to  
231 gather the stakeholders' opinions to ensure that our study addressed their critical health issues and  
232 responded to their needs. We also invited them to discuss the questionnaire to receive their feedback on  
233 its contents and wording.

234

## 235 **RESULTS**

### 236 **Drinking prevalence and characteristics**

237 As shown in Table 1, 28.1% of the participants reported drinking 10 or more cans of beer or glasses of  
238 other alcoholic beverages on a typical day in the past three months. The prevalence of binge drinking was  
239 76.7% among all FEWs, 81.4% among FEWs working in karaoke bars, 68.2% among FEWs working in  
240 restaurants/cafés, and 72.6% among FEWs working in other entertainment venues, including beer



241 gardens, massage parlors, and as freelance sex workers. Almost one in five (19.5%) reported having been  
 242 forced to drink at least once a month in the past three months.

243  
 244 **Table 1** Prevalence and characteristics of alcohol drinking among female entertainment workers  
 245 stratified by type of entertainment venues

Alcohol drinking in the past three months	Total (n = 600)	Type of entertainment venues		
		Karaoke bar (n = 365)	Restaurant/café (n = 173)	Other* (n = 62)
Frequency of drinking at least one can of beer or one glass of wine				
Never	20 (3.3)	4 (1.1)	9 (5.2)	7 (11.3)
Once a month or less	35 (5.8)	18 (4.9)	14 (8.1)	3 (4.8)
2–4 times a month	82 (13.7)	53 (14.5)	24 (13.9)	5 (8.1)
2–3 times a week	93 (15.5)	62 (16.9)	29 (16.8)	2 (3.2)
4 or more times a week	370 (61.7)	228 (62.5)	97 (56.1)	45 (72.6)
Number of standard drinks containing alcohol on a typical day				
1 – 2	106 (18.3)	35 (9.7)	63 (38.4)	8 (14.6)
3 – 4	129 (22.2)	76 (21.1)	45 (27.4)	8 (14.6)
5 – 6	129 (22.2)	90 (24.9)	21 (12.8)	18 (32.7)
7 – 9	53 (9.1)	37 (10.3)	11 (6.7)	5 (9.1)
10 or more	163 (28.1)	123 (34.1)	24 (14.6)	16 (29.1)
Frequency of drinking more than five drinks in 24 hours				
Never	120 (20.7)	64 (17.7)	46 (28.1)	10 (18.2)
Less than once a month	39 (6.7)	23 (6.4)	15 (9.2)	1 (1.8)
Once a month	36 (6.2)	18 (4.9)	14 (8.6)	4 (7.3)
1 – 3 times a week	118 (20.3)	81 (22.4)	32 (19.5)	5 (9.1)

≥ 4 times a week	267 (46.0)	175 (48.5)	57 (34.8)	35 (63.6)
Had binge drinking at least once <sup>†</sup>	460 (76.7)	297 (81.4)	118 (68.2)	45 (72.6)
Frequency of forced drinking				
Never	404 (67.3)	245 (67.1)	116 (67.1)	43 (69.4)
≤ 1 time per month	117 (19.5)	75 (20.6)	33 (19.1)	9 (14.5)
> 1 time per month	79 (13.2)	45 (12.3)	24 (13.9)	10 (16.1)

246 Values are numbers (%).

247 \* Other venues included beer gardens, massage parlors, and freelance.

248 † Binge drinking was defined as drinking more than five units of alcoholic drinks in 24 hours on at least  
249 one occasion in the past three months.

250

### 251 Sociodemographic characteristics

252 Table 2 shows that most of the participants (72.5%) were born in rural areas, and their mean age was 24.8  
253 (standard deviation [SD] 4.0) years. More than half of them had six years of formal education or less, and  
254 13% had finished grade 10 or higher. More than 40% of them had never been married, and 29.5% were  
255 currently married or cohabitated. The proportion of participants working in karaoke bars (64.6% vs.  
256 48.6%), having monthly income of more than USD250 (42.0% vs. 29.3%), and having been forced to  
257 drink more than once a month in the past three months (16.1% vs. 3.6%) was significantly higher among  
258 binge drinkers than non-binge drinkers.

259

260 **Table 2** Comparison of sociodemographic characteristics, GBV, and psychological distress among binge  
261 drinkers and non-binge drinkers

Characteristics	Total <i>n</i> = 600	Binge drinking*		P-value <sup>†</sup>
		Yes ( <i>n</i> = 460)	No ( <i>n</i> = 140)	

Type of venue best describes the current job in the entertainment				0.002
Restaurant/café	173 (28.8)	118 (25.7)	55 (39.3)	
Karaoke bar	365 (60.8)	297 (64.6)	68 (48.6)	
Beer garden/massage parlor/freelance	62 (10.3)	45 (9.8)	17 (12.1)	
Age group in years (mean ± SD)	24.8 ± 4.0	24.9 ± 4.0	24.4 ± 4.1	0.19
18–24	280 (46.7)	214 (46.5)	66 (47.1)	0.52
25–29	239 (39.8)	180 (39.1)	59 (42.1)	
30–35	81 (13.5)	66 (14.4)	15 (10.7)	
Education level (in year)				0.15
Primary School (0–6)	309 (51.5)	245 (53.3)	64 (45.7)	
Secondary School (7–9)	213 (35.5)	161 (35.0)	52 (37.1)	
High School or above (≥ 10)	78 (13.0)	54 (11.7)	24 (17.1)	
Current marital status				0.80
Never married	243 (40.5)	183 (39.8)	60 (42.9)	
Currently married	180 (30.0)	139 (30.2)	41 (29.3)	
Widowed/divorced	177 (29.5)	138 (30.0)	39 (27.9)	
Level of monthly income (US\$)				0.002
≤ 120	44 (7.3)	26 (5.7)	18 (12.9)	
121–250	322 (53.7)	241 (52.4)	81 (57.9)	
> 250	234 (39.0)	193 (42.0)	41 (29.3)	
Born in rural area	435 (72.5)	336 (73.0)	99 (70.7)	0.59
Current type of house				0.56
Their own/family house	77 (12.8)	55 (12.0)	22 (15.7)	
Rental house on their own	161 (26.8)	126 (27.4)	35 (25.0)	

Rental house with family	150 (25.0)	112 (24.4)	38 (27.1)	
Rental house with friends	55 (9.2)	41 (8.9)	14 (10.0)	
Dormitory at their workplace	157 (26.2)	126 (27.4)	31 (22.1)	
Number of children				0.36
0	305 (50.8)	229 (49.8)	76 (54.3)	
1	188 (31.3)	151 (32.8)	37 (26.4)	
≥ 2	107 (17.8)	80 (17.4)	27 (19.3)	
Duration of work as entertainment workers				0.62
Less than a year	226 (37.7)	171 (37.2)	55 (39.3)	
1 - 2 years	196 (32.7)	155 (33.7)	41 (29.3)	
More than 2 years	178 (29.7)	134 (29.1)	44 (31.4)	
GBV experiences in the past six months				0.047
Emotional abuse	70 (11.7)	62 (13.5)	8 (5.7)	
Forced substance use	34 (5.7)	25 (5.4)	9 (6.4)	
Physical abuse	28 (4.7)	24 (5.2)	4 (2.9)	
Forced sex	4 (0.7)	4 (0.9)	0 (0.0)	
High psychological distress (≥ 4) <sup>‡</sup>	235 (39.2)	171 (37.2)	64 (45.7)	0.007

262 Abbreviations: GBV, gender-based violence; SD, standard deviation.

263 Values are numbers (%) for continuous variables and mean (SD) for continuous variables.

264 \* Binge drinking was defined as drinking more than five units of alcoholic drinks in 24 hours on at least  
265 one occasion in the past three months.

266 † Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for  
267 categorical variables, and Student's *t*-test was used for continuous variables.

268 ‡ Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The  
269 GHQ-12 score of ≥4 was used to define "high psychological distress."

270

## 271 Prevalence of gender-based violence

272 Table 2 shows that 22.7% of participants reported having experienced GBV in the past six months,  
 273 including emotional abuse (11.7%), forced substance use (5.7%), physical abuse (4.7%), and forced sex  
 274 (0.7%). In the past six months, the proportion of emotional abuse (13.5% vs. 5.7%) and physical abuse  
 275 (5.2% vs. 2.9%) was higher among binge drinkers than non-binge drinkers. Sensitivity analyses,  
 276 including only FEWs working in karaoke bars, showed similar sociodemographic characteristics, GBV  
 277 experiences, and psychological distress. However, a significantly higher proportion of binge drinkers  
 278 were born in rural areas than non-binge drinkers (73.4% vs. 57.4%) (Supplementary Table S1).

## 280 Sexual behaviors and condom use

281 As shown in Table 3, 25.5% of the study participants reported having sex with one or more commercial  
 282 sex partners in the past three months. The proportion of participants who reported having sexual  
 283 intercourse in the past three months (79.1% vs. 58.6%) and always using condoms when having sexual  
 284 intercourse with non-commercial partners (19.2% vs. 14.3%) was significantly higher among binge  
 285 drinkers than non-binge drinkers. Overall, sexual behaviors and condom use of the total participants were  
 286 similar to those of FEWs working in karaoke bars only (Supplementary Table S2).

288 **Table 3** Comparison of sexual behaviors among binge drinkers and non-binge drinkers

Sexual behaviors in the past 3 months	Total (n = 600)	Binge drinking*		P-value†
		Yes (n = 460)	No (n = 140)	
Had sexual intercourse	446 (74.3)	364 (79.1)	82 (58.6)	<0.001
Condoms use in last sex with a non- commercial partner	98 (27.1)	85 (29.1)	13 (18.6)	0.08
Frequency of condom use with non-commercial partners				0.049

Always	66 (18.2)	56 (19.2)	10 (14.3)	
Frequently	8 (2.2)	7 (2.4)	1 (1.4)	
Sometimes	31 (8.6)	30 (10.3)	1 (1.4)	
Never	257 (71.0)	199 (68.2)	58 (82.9)	
Sex with commercial partners	153 (34.3)	130 (35.7)	23 (28.1)	0.19
Frequency of having sex with commercial partners				0.61
Daily/a few times a week/weekly	35 (22.9)	31 (23.9)	4 (17.4)	
Monthly	26 (17.0)	23 (17.7)	3 (13.0)	
Once in a while, when needed to	92 (60.1)	76 (58.5)	16 (69.6)	
Number of commercial sex partners				0.045
0 partner	447 (74.5)	330 (71.7)	117 (83.6)	
1 partner	64 (10.7)	54 (11.7)	10 (7.1)	
2–3 partners	46 (7.7)	40 (8.7)	6 (4.3)	
> 3 partners	43 (7.2)	36 (7.8)	7 (5.0)	
Condoms use in last sex with a commercial partners	142 (92.8)	120 (92.3)	22 (95.7)	0.57
Frequency of condom use with commercial partners				0.32
Always	119 (77.8)	98 (75.4)	21 (91.3)	
Frequently	8 (5.2)	8 (6.2)	0 (0.0)	
Sometimes	19 (12.4)	18 (13.9)	1 (4.4)	
Never	7 (4.6)	6 (4.6)	1 (4.4)	

289 Values are numbers (%).

290 \* Binge drinking was defined as drinking more than five units of alcoholic drinks in 24 hours on at least  
 291 one occasion in the past three months.

292 † Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for  
 293 categorical variables.

294

295 **Factors associated with binge drinking**

296 Table 4 shows the results of bivariate and multiple logistic regression analyses. Bivariate analyses show  
 297 that the odds of binge drinking in the past three months were significantly higher among participants with  
 298 an average monthly income of >US\$250 and US\$121–250 than those with an average income of  
 299 ≤US\$120 (OR 3.26, 95% CI: 1.64–6.49; OR 2.06, 95% CI: 1.07–3.95). We also found that the  
 300 participants who experienced forced drinking more than once per month were 5.68 times more likely to  
 301 experience binge drinking than those who did not experience it in the past three months (OR 5.68, 95%  
 302 CI: 2.24–14.41). Additionally, the odds of binge drinking in the past three months were significantly  
 303 higher among participants working in karaoke bars than those working at restaurants/cafés (OR 2.04, 95%  
 304 CI: 1.34–3.08) and among participants who experienced emotional abuse than those who did not  
 305 experience it in the past six months (OR 2.57, 95% CI: 1.19–5.51).

306

307 **Table 4** Factors associated with binge drinking among female entertainment workers (*n* = 600)

Characteristics	Bivariate logistic regression		Multiple logistic regression*	
	OR (95% CI)	P-value	AOR (95% CI)	P-value
Age (years)	1.03 (0.98–1.08)	0.19	1.02 (0.97–1.07)	0.46
Education level (in years)				
High school or above (≥10)	Reference		Reference	
Secondary school (7–9)	1.38 (0.78–2.44)	0.28	1.19 (0.64–2.20)	0.58
Primary school (0–6)	1.70 (0.98–2.96)	0.06	1.49 (0.82–2.71)	0.19
Average monthly income (US\$)				
≤120	Reference		Reference	
121–250	2.06 (1.07–3.95)	0.03	1.98 (0.98–3.99)	0.06
>250	3.26 (1.64–6.49)	0.001	2.96 (1.40–6.24)	0.004

Level of psychological distress				
Higher (GHQ-12 $\geq 4$ )	Reference		Reference	
Lower (GHQ-12 $\leq 3$ )	1.42 (0.97–2.09)	0.07	1.65 (1.09–2.49)	0.02
Frequency of forced drinking in the past three months				
Never	Reference		Reference	
1 time per month	1.57 (0.95–2.59)	0.08	1.64 (0.96–2.78)	0.07
>1 time per month	5.68 (2.24–14.41)	<0.001	5.66 (2.19–14.65)	<0.001
Type of venue best describes the current job in the entertainment				
Restaurant/café	Reference		Reference	
Karaoke bar	2.04 (1.34–3.08)	0.001	1.85 (1.19–2.88)	0.006
Beer garden/massage parlor/freelance	1.23 (0.65–2.35)	0.52	0.92 (0.46–1.85)	0.82
Experience emotional abuse in the past six months				
No	Reference		Reference	
Yes	2.57 (1.19–5.51)	0.02	2.71 (1.22–6.02)	0.01

308 Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio.

309 \* Adjusted for variables significantly associated with binge drinking at the  $p$ -value  $\leq 0.20$  in the bivariate  
310 logistic regression analyses and those that remained statistically significant in five multiple logistic  
311 regression models using the backward elimination method.

312 † Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The  
313 GHQ-12 score of  $\geq 4$  was used to define “high psychological distress.”

314  
315 After adjustment, the odds of binge drinking remained significantly higher among participants with  
316 an average monthly income of >US\$250 than those with an average income of  $\leq$ USD120 (AOR 2.96,  
317 95% CI: 1.40–6.24). Furthermore, participants who experienced forced drinking more than once per  
318 month were 5.66 times more likely to experience binge drinking than those who did not experience it in



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3 319 the past three months (AOR 5.66, 95% CI: 2.19–14.65). We also found that the participants who worked  
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5 320 in karaoke bars had a significantly higher odds of binge drinking than those working at restaurants/cafés  
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7 321 (AOR 1.85, 95% CI: 1.19–2.88) and among participants who experienced emotional abuse than those  
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9 322 who did not experience it in the past six months (AOR 2.71, 95% CI: 1.22–6.02). Interestingly, the odds  
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11 323 of binge drinking were significantly higher among participants with lower psychological distress than  
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13 324 those with higher psychological distress (AOR 1.65, 95% CI: 1.09–2.49).

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16 325 Among participants who worked at karaoke bars, the odds of binge drinking were significantly  
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18 326 higher among those who were born in rural areas than those who were born in urban areas (AOR 0.51,  
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20 327 95% CI: 0.28–0.92), had sexual intercourse in the past three months than those who did not (AOR 2.94,  
21  
22 328 95% CI: 1.64–5.29), and those with lower psychological distress than those with higher psychological  
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24 329 distress (AOR 2.15, 95% CI: 1.22–3.81) (Supplemental Table S3).

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## 27 28 331 **DISCUSSION**

29  
30 332 This study explored the magnitude of binge drinking and its relationships with GBV, psychological  
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32 333 distress, and sexual behaviors among FEWs in Cambodia, a key population working in an environment  
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34 334 prone to HIV risks and substance abuse. We found an overall prevalence of binge drinking in the past  
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36 335 three months of 76.7% and 81.4% among FEWs working at karaoke bars. A prevalence of binge drinking  
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38 336 of 83.4% has been reported in another study of Cambodian FEWs who were more heavily engaged in  
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40 337 commercial sex (reporting two or more different sexual partners within the last month).<sup>12</sup> In our study,  
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42 338 only 25.5% of participants reported having sex with one or more commercial sex partners in the past three  
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44 339 months, which may explain the difference in the binge-drinking prevalence. Consistent with our findings,  
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46 340 the prevalence of alcohol drinking among FSWs in other countries also appears high, ranging from 67.8%  
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48 341 to 88.5%.<sup>6,9,10,39</sup>

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51 342 We identified a significant relationship between binge drinking among FEWs and higher monthly  
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53 343 income. Evidence suggests that FEWs discuss receiving better tips from commercial sex partners or  
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55 344 monetary incentives from their bosses for drinking.<sup>5</sup> FEWs also discussed how they use alcohol to reduce

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3 345 shyness to perform their job better.<sup>5</sup> These might explain the correlation between binge drinking and  
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5 346 higher monthly income among FEWs in Cambodia. Another plausible explanation for this correlation was  
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7 347 suggested in the literature, as other studies have noted this same pattern. Higher-income was associated  
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9 348 with increases in higher-risk drinking among Kenyan FSWs.<sup>8</sup> As the level of risk for drinking increased,  
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11 349 the median number of commercial sex partners also increased, from three in the past week among non-  
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13 350 drinkers and low-risk drinkers to six partners in the past week among harmful drinkers.<sup>8</sup>

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16 351 Our findings suggest that lower psychological distress was associated with binge drinking. FEWs  
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18 352 with lower psychological distress were 1.7 times more likely to report binge drinking than those who had  
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20 353 higher psychological distress. A literature review shows that alcohol use was correlated with adverse  
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22 354 mental health problems.<sup>20</sup> Therefore, we expected FEWs with higher psychological distress would be  
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24 355 more likely to be binge drinkers. The possible explanation for our finding is that those who thought they  
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26 356 had an issue with mental health might decide not to drink. In a qualitative study in Cambodia, FEWs  
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28 357 expressed feeling shy working in entertainment venues. Alcohol drinking helped them forget those  
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30 358 feelings and perform the job better, resulting in better earnings.<sup>5</sup> Once FEWs earn better, they are less  
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32 359 likely to be distressed, which may explain why those who have lower psychological distress were  
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34 360 associated with binge drinking. This finding emphasizes the social need to support the FEWs in  
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36 361 Cambodia with their health and psychological wellbeing.

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39 362 In our study, FEWs who worked in karaoke bars had a higher propensity to engage in binge  
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41 363 drinking than those who worked in restaurants/cafés, beer gardens, massage parlors, or freelance. This  
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43 364 finding is consistent with previous studies, which have discussed how karaoke bars are not just a place  
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45 365 where clients go for singing but also a place for drinking and entertaining with women.<sup>17,40</sup> In such  
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47 366 settings, FEWs can also be pressured by supervisors and clients to drink.<sup>17,40</sup> Our findings also showed  
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49 367 that FEWs who experienced forced drinking four times or more in the past three months were  
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51 368 significantly more likely to report binge drinking. These findings highlight the need to target karaoke bars  
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53 369 to improve their working conditions and reduce forced alcohol and drug use. Additionally, interventions  
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55 370 that help FEWs transit to other safer occupations, such as hairdressing, should also be an alternative.

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3 371 Binge drinkers reported experiencing more emotional abuse in the past six months than non-binge  
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5 372 drinkers. Emotional abuse is a type of GBV that has received less attention from researchers,  
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7 373 policymakers, and intervention programs. Emotional abuse is associated with several social, economic,  
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9 374 and health problems.<sup>41</sup> In line with this finding, in a qualitative study in Cambodia, FEWs shared their  
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11 375 experience in excessive drinking to cope with the challenges in life and jobs.<sup>5</sup> Similarly, a Tanzanian  
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13 376 study showed that FSWs who reported hazardous or harmful drinking were two times more likely to  
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15 377 experience GBV than those who reported less hazardous or harmful drinking.<sup>38</sup>

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18 378 Alcohol consumption has been associated with the global burden of diseases and substantial health  
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20 379 loss.<sup>42</sup> Alcohol consumption particularly becomes a significant public health concern among FSWs  
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22 380 because hazardous and harmful drinking is correlated with sexual risk behaviors, such as condomless sex  
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24 381 and a higher number of sexual partners, than those who were abstained from alcohol drinking.<sup>8,43</sup> Findings  
25  
26 382 from this study provide critical information for program implementation and policy to reduce the  
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28 383 prevalence of binge drinking among FEWs in Cambodia. For instance, the high binge-drinking  
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30 384 prevalence among Cambodian FEWs implicates the need for occupational health intervention programs to  
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32 385 mitigate alcohol use among FEWs. For instance, the WHO's Brief Intervention for Hazardous and  
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34 386 Harmful Drinking<sup>19</sup> effectively reduced self-reporting alcohol consumption among non-dependent and  
35  
36 387 non-treatment-seeking FSWs in Mombasa, Kenya.<sup>44</sup>

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39 388 Additionally, findings from our study indicate that individual-level interventions would not be  
40  
41 389 sufficient to reduce binge alcohol consumption among FEWs in Cambodia since the risk factors were  
42  
43 390 primarily environmental, occupational, and structural. For instance, we found that binge drinkers were  
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45 391 more likely to make more money, were forced to drink at work, mainly worked in the karaoke bars, and  
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47 392 experienced emotional abuse. An intervention promoting individual health behaviors to FEWs might not  
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49 393 affect these factors. Therefore, it requires interventions addressing the structural and social contexts.<sup>45</sup>

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51 394 This study has several limitations. Firstly, the study's cross-sectional design did not allow us to  
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53 395 draw a causal inference between risk factors and binge drinking. For example, a higher proportion of  
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55 396 binge drinkers reported experiencing emotional abuse in the past six months than non-binge drinkers. Yet,

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3 397 as this finding was based on a cross-sectional association, the temporal relationship between GBV and  
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5 398 binge drinking could not be determined. Future longitudinal studies are required to investigate this  
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7 399 temporal relationship. Alternatively, qualitative studies to explore FEWs' experience of GBV might help  
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9 400 researchers to understand in-depth whether experience GBV might lead to binge drinking. Secondly,  
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11 401 social desirability bias<sup>46</sup> might be present since we asked women about sensitive issues such as GBV,  
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13 402 sexual practices, and substance use. Women might be less likely to report this type of sensitive  
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15 403 information, resulting in underestimating the prevalence of the study variables. Moreover, since half of  
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17 404 the participants received an intervention, they might be more likely to have been exposed to health  
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19 405 education and services than other FEWs who were not. Therefore, the results from this study might not be  
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21 406 generalizable to other FEWs in Cambodia.

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24 407 Additionally, the small sample size in some sub-populations is another limitation of this study. For  
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26 408 instance, FEWs working in beer gardens are likely to be involved in heavy alcohol drinking at work.  
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28 409 However, due to the small sample size, we grouped them with FEWs working in massage parlors and as  
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30 410 freelance sex workers. Finally, we could not include physical and sexual abuse in the multiple logistic  
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32 411 regression, given the small sample size.

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## 36 37 413 **CONCLUSIONS**

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39 414 This study highlights a relatively high prevalence of binge drinking among FEWs in Cambodia. Factors  
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41 415 associated with binge drinking were those linked to working environments and working conditions. Binge  
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43 416 drinking was mainly reported by FEWs working in karaoke bars and those who experienced forced  
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45 417 drinking as part of the job requirement. FEWs who experienced emotional abuse, defined as verbal threats  
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47 418 or having the ability to leave the house not being under their control, were more likely to experience  
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49 419 binge drinking than those who did not experience it. These findings can be used to design interventions to  
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51 420 reduce binge drinking among FEWs by providing safer working environments and addressing work-  
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53 421 related violence, such as emotional abuse by clients and entertainment establishment managers. Our study  
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55 422 suggests that individual-based behavioral interventions may not be sufficient in reducing binge drinking

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3 423 among FEWs unless accompanied by structural and occupational health policy interventions that change  
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5 424 these exploitative working environments.  
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7 425  
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20  
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22  
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24  
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26  
27 435 on the study design, data analyses, and manuscript writing. All authors provided critical comments for  
28  
29 436 revisions and approved the final manuscript. SY confirmed that he has full access to all data and final  
30  
31 437 responsibility for the decision to submit for publication.  
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3 449 **Patient consent for publication** Not required.  
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6  
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8  
9 452 of Health in Cambodia, the Institutional Review Board of Touro University California (No. PH-0117),  
10  
11 453 and the University of California, Los Angeles (No. 20-001053) approved this study.  
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16 455 **Data availability statement:** Data used for this study can be accessed upon request from the Principal  
17  
18 456 Investigator (Dr. Siyan Yi) at [siyan@doctor.com](mailto:siyan@doctor.com).  
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## Supplementary Tables

**Table S1** Comparison of socio-demographic characteristics, GBV, and psychological distress among binge drinkers and non-binge drinkers who worked in karaoke bars

Characteristics	Total ( <i>n</i> = 365)	Binge drinking*		P-value <sup>†</sup>
		Yes ( <i>n</i> = 297)	No ( <i>n</i> = 68)	
Age group in years (mean ± SD)	25.1 ± 4.0	25.2 ± 3.9	24.4 ± 4.2	0.11
18–24	162 (44.4)	127 (42.8)	35 (51.5)	0.42
25–29	144 (39.5)	120 (40.4)	24 (35.3)	
30–35	59 (16.2)	50 (16.8)	9 (13.2)	
Education level (in year)	5.9 ± 2.9	5.9 ± 2.9	6.5 ± 3.2	0.09
Primary School (0–6)	199 (54.5)	168 (56.6)	31 (45.6)	0.18
Secondary School (7–9)	125 (34.3)	99 (33.3)	26 (38.2)	
High School or above (≥ 10)	41 (11.2)	30 (10.1)	11 (16.2)	
Current marital status				0.24
Never married	156 (42.7)	121 (40.7)	35 (51.5)	
Currently married	99 (27.1)	82 (27.6)	17 (25.0)	
Widowed/divorced	110 (30.1)	94 (31.7)	16 (23.5)	
Level of monthly income (USD)				0.86
≤ 120	22 (6.0)	17 (5.7)	5 (7.4)	
121–250	195 (53.4)	160 (53.9)	35 (51.5)	
> 250	148 (40.6)	120 (40.4)	28 (41.2)	
Born in rural area	257 (70.4)	218 (73.4)	39 (57.4)	0.009
Current type of house				0.36
Their own/family house	36 (9.9)	28 (9.4)	8 (11.8)	

Rental house on their own	83 (22.7)	66 (22.2)	17 (25.0)	
Rental house with family	82 (22.5)	63 (21.2)	19 (27.9)	
Rental house with friends	34 (9.3)	27 (9.1)	7 (10.3)	
Dormitory at their workplace	130 (35.6)	113 (38.1)	17 (25.0)	
Number of children				0.16
0	189 (51.8)	148 (49.8)	41 (60.3)	
1	112 (30.7)	92 (30.9)	20 (29.4)	
≥ 2	64 (17.5)	57 (19.2)	7 (10.3)	
Duration of work as entertainment workers				0.72
Less than a year	135 (36.9)	107 (36.0)	28 (41.2)	
1 - 2 years	123 (33.7)	102 (34.3)	21 (30.9)	
More than 2 years	107 (29.3)	88 (29.6)	19 (27.9)	
GBV experiences in the past six months				0.37
Emotional abuse	38 (10.4)	34 (11.5)	4 (5.9)	
Physical abuse	19 (5.2)	16 (5.4)	3 (4.4)	
Forced substance use	15 (4.1)	10 (3.4)	5 (7.4)	
Forced sex	2 (0.6)	2 (0.7)	0 (0.0)	
High psychological distress (≥ 4) <sup>†</sup>	134 (36.7)	100 (33.7)	34 (50.0)	0.01

GBV, gender-based violence; SD, standard deviation.

Values are numbers (%) for categorical variables and mean (SD) for continuous variables.

\* Binge drinking was defined as drinking more than five units of alcoholic drinks in 24 hours on at least one occasion in the past three months.

<sup>†</sup> Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for categorical variables, and Student's *t*-test was used for continuous variables.

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3 ‡ Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The  
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5 GHQ-12 score of  $\geq 4$  was used to define “high psychological distress.”  
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**Table S2** Comparison of sexual behaviors among binge drinkers and non-binge drinkers who worked in karaoke bars

Sexual behaviors in the past 3 months	Total ( <i>n</i> = 365)	Binge drinking*		P-value <sup>†</sup>
		Yes ( <i>n</i> = 297)	No ( <i>n</i> = 68)	
Had sexual intercourse	264 (72.3)	228 (76.8)	36 (52.9)	<0.001
Condoms use in last sex with a non-commercial partner	66 (30.7)	59 (32.2)	7 (21.9)	0.24
Frequency of condom use with non-commercial partners				0.04
Always	45 (20.9)	41 (22.4)	4 (12.5)	
Frequently	8 (3.7)	7 (3.8)	1 (3.1)	
Sometimes	23 (10.7)	23 (12.6)	0 (0.0)	
Never	139 (64.7)	112 (61.2)	27 (84.4)	
Sex with commercial partners	100 (37.9)	90 (39.5)	10 (27.8)	0.18
Frequency of having sex with commercial partners				0.09
Daily/a few times a week/weekly	18 (18.0)	18 (20.0)	0 (0.0)	
Monthly	15 (15.0)	15 (16.7)	0 (0.0)	
Once in a while when needed to	67 (67.0)	57 (63.3)	10 (100)	
Number of commercial sex partners				0.03
0 partner	265 (72.6)	207 (69.7)	58 (85.3)	
1 partner	47 (12.9)	41 (13.8)	6 (8.8)	
2–3 partners	32 (8.8)	28 (9.4)	4 (5.9)	
> 3 partners	21 (5.8)	21 (7.1)	0 (0.0)	
Condoms use in last sex with a	89 (89.0)	80 (88.9)	9 (90.0)	1.00



commercial partner

Frequency of condom use with commercial partners 0.52

Always	77 (77.0)	68 (75.6)	9 (90.0)
Frequently	3 (3.0)	3 (3.3)	0 (0.0)
Sometimes	14 (14.0)	14 (15.6)	0 (0.0)
Never	6 (6.0)	5 (5.6)	1 (10.0)

Values are numbers (%) for categorical variables and mean (SD) for continuous variables.

\* Binge drinking was defined as drinking more than five units of alcoholic drinks in 24 hours on at least one occasion in the past three months.

† Chi-square test or Fisher's exact test (when sample sizes were smaller than five in one cell) was used for categorical variables

**Table S3** Factors associated with binge drinking among Karaoke female entertainment workers ( $n = 365$ )

Characteristics	Bivariate logistic regression		Multiple logistic regression*	
	OR (95% CI)	P-value	AOR (95% CI)	P-value
Age (years)	1.05 (0.99 – 1.13)	0.11	1.01 (0.94 – 1.09)	0.73
Education level (in years)				
High school or above ( $\geq 10$ )	Reference		Reference	
Secondary school (7–9)	1.39 (0.62 – 3.15)	0.42	1.27 (0.53 – 3.05)	0.59
Primary school (0–6)	1.99 (0.90 – 4.38)	0.09	1.62 (0.68 – 3.85)	0.27
Place of birth				
Rural	Reference		Reference	
Urban	0.49 (0.28 – 0.84)	0.01	0.51 (0.28 – 0.92)	0.03
Had sexual intercourse in the past three months				
No	Reference			
Yes	2.94 (1.69 – 5.06)	<0.001	2.94 (1.64 – 5.29)	<0.001
Level of psychological distress				
Higher (GHQ-12 $\geq 4$ )	Reference		Reference	
Lower (GHQ-12 $\leq 3$ )	1.97 (1.16 – 3.36)	0.013	2.15 (1.22 – 3.81)	0.01

AOR, adjusted odds ratio; CI, confidence interval; GHQ, General Health Questionnaire; OR, odds ratio.

\* Adjusted for variables significantly associated with binge drinking at the  $p$ -value  $\leq 0.20$  in the bivariate logistic regression analyses and those that remained statistically significant in six multiple logistic regression models using the backward elimination method.

† Psychological distress was assessed using the 12-item General Health Questionnaire (GHQ-12). The GHQ-12 score of  $\geq 4$  was used to define “high psychological distress.”

# Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

## Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

Your article may not currently address all the items on the checklist. Please modify your text to include the missing information. If you are certain that an item does not apply, please write "n/a" and provide a short explanation.

Upload your completed checklist as an extra file when you submit to a journal.

In your methods section, say that you used the STROBE cross sectional reporting guidelines, and cite them as:

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	Reporting Item	Page Number
<b>Title and abstract</b>		
Title	<a href="#">#1a</a> Indicate the study's design with a commonly used term in the title or the abstract	1
Abstract	<a href="#">#1b</a> Provide in the abstract an informative and balanced summary of what was done and what was found	2
<b>Introduction</b>		
Background / rationale	<a href="#">#2</a> Explain the scientific background and rationale for the investigation being reported	4 – 6
Objectives	<a href="#">#3</a> State specific objectives, including any prespecified hypotheses	6
<b>Methods</b>		
Study design	<a href="#">#4</a> Present key elements of study design early in the paper	6
Setting	<a href="#">#5</a> Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6

1	Eligibility criteria	<a href="#">#6a</a>	Give the eligibility criteria, and the sources and methods of selection of participants.	7
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5		<a href="#">#7</a>	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7 – 8
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10	Data sources / measurement	<a href="#">#8</a>	For each variable of interest give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group. Give information separately for for exposed and unexposed groups if applicable.	7 – 8
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18	Bias	<a href="#">#9</a>	Describe any efforts to address potential sources of bias	7
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20	Study size	<a href="#">#10</a>	Explain how the study size was arrived at	6 – 7
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23	Quantitative variables	<a href="#">#11</a>	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	9
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27	Statistical methods	<a href="#">#12a</a>	Describe all statistical methods, including those used to control for confounding	9
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31	Statistical methods	<a href="#">#12b</a>	Describe any methods used to examine subgroups and interactions	n/a (small sample size)
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35	Statistical methods	<a href="#">#12c</a>	Explain how missing data were addressed	n/a (no missing data)
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39	Statistical methods	<a href="#">#12d</a>	If applicable, describe analytical methods taking account of sampling strategy	n/a
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43	Statistical methods	<a href="#">#12e</a>	Describe any sensitivity analyses	n/a
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46	<b>Results</b>			
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48	Participants	<a href="#">#13a</a>	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information separately for for exposed and unexposed groups if applicable.	n/a (already mentioned in method)
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57	Participants	<a href="#">#13b</a>	Give reasons for non-participation at each stage	n/a
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1	Participants	<a href="#">#13c</a>	Consider use of a flow diagram	n/a
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3	Descriptive data	<a href="#">#14a</a>	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	11 – 13
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10	Descriptive data	<a href="#">#14b</a>	Indicate number of participants with missing data for each variable of interest	n/a
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14	Outcome data	<a href="#">#15</a>	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	16 – 18
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19	Main results	<a href="#">#16a</a>	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included	16 – 18
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26	Main results	<a href="#">#16b</a>	Report category boundaries when continuous variables were categorized	16 – 17
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30	Main results	<a href="#">#16c</a>	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
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34	Other analyses	<a href="#">#17</a>	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	n/a
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38	<b>Discussion</b>			
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40	Key results	<a href="#">#18</a>	Summarise key results with reference to study objectives	18 – 20
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42	Limitations	<a href="#">#19</a>	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	20
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47	Interpretation	<a href="#">#20</a>	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	21
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53	Generalisability	<a href="#">#21</a>	Discuss the generalisability (external validity) of the study results	20
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57	<b>Other</b>			
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1 Funding [#22](#) Give the source of funding and the role of the funders for the 22  
2 present study and, if applicable, for the original study on which  
3 the present article is based  
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