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Analysis of the prevalence and characteristics of alcohol consumption among the adult population of Kazakhstan

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Original Research

Analysis of the prevalence and characteristics of alcohol consumption among the adult population of Kazakhstan

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Running head: Alcohol consumption among the adult population of Kazakhstan

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Abstract

Objective: Globally, alcohol consumption poses significant health risks, with 6.43 liters of pure alcohol consumed per adult in 2015. This study aims to explore alcohol consumption patterns and their influencing factors in Kazakhstan, where per capita consumption significantly exceeds the global average.

Design/methods: A cross-sectional study was conducted from October 2021 to May 2022.

Setting and participants: Th study, involving 6720 adults aged 18-69 from all 17 regions of Kazakhstan. Data were collected using the WHO STEPwise approach.

Results: Among participants, 54.1% had ever consumed alcohol, 42.5% in the past 12 months, and 23.7% in the past month. Men had higher odds of recent alcohol consumption (adjusted OR 1.573) and heavy episodic drinking (HED) (adjusted OR 1.800) compared to women. Younger adults (18-24 years) showed lower odds of alcohol consumption (adjusted OR 0.610) and HED (adjusted OR 0.587). Ethnic Russians and Ukrainians had higher odds of alcohol use and HED. Significant regional differences were noted, with higher consumption in northern regions and major cities. Smokers had significantly higher odds of both alcohol consumption (adjusted OR 3.075) and HED (adjusted OR 3.722). Education, occupation, and marital status were not primary determinants of alcohol use, although private sector employees and entrepreneurs reported higher alcohol consumption.

Conclusions: This study highlights the complexity of alcohol consumption in Kazakhstan, emphasizing the need for targeted public health interventions. Future research should focus on evaluating the effectiveness of these interventions in reducing alcohol-related harm.

Keywords: alcohol consumption; heavy episodic drinking; Kazakhstan; risk factors; sociodemographic factors

Strengths and limitations of this study

-The results of this study provide a comprehensive overview of alcohol consumption patterns and their influencing factors in Kazakhstan.

-The data reveal significant variations in alcohol consumption and HED across different demographic groups and regions, highlighting the complexity of alcohol-related behavior in the country.

-This study provides valuable insights into the complex landscape of alcohol consumption in Kazakhstan. By highlighting the key demographic, social, and regional factors associated with alcohol use, it sets the stage for more informed public health policies and interventions.

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Background

Globally, in 2015, the consumption of pure alcohol per adult (\geq 15 years old) was 6.43 liters ¹. One in five adults reported at least one episode of binge drinking in the past month, increasing the risk of serious harm such as injury. Central, Eastern, and Western Europe have higher per capita consumption (11.64, 11.55, and 11.13 liters respectively) and higher percentages of alcohol abuse (49.5%, 46.9%, and 40.2% respectively). In North Africa and the Middle East, the lowest per capita alcohol consumption (0.90 liters of pure alcohol) and the lowest percentage of alcohol consumers reporting abuse (15.4%) were registered. In Sub-Saharan Central Africa, the highest proportion of heavy drinking (78.9%) was noted despite relatively low per capita consumption (4.14 liters) ².

Alcohol dependence is the most common form of addiction. In 2015, 63.5 million cases were registered. Alcohol-related mortality rates were 33.0 deaths per 100,000 people. Alcohol consumption ranked 7th in the significance of risk factors for early death and disability ³. The Global Status Report on Alcohol and Health by the World Health Organization ¹ for 2018 established that in 2016, harmful alcohol consumption caused approximately 3 million deaths (or 5.3% of all deaths), which is more than hypertension and diabetes combined. It is estimated that in 2016, 2.3 billion people currently consumed alcohol, and 283 million people aged 15+ had alcohol use disorders (5.1% of adults).

In 2002, the global economic burden associated with alcohol ranged from \$210 billion to \$665 billion ⁴. When assessing the economic impact of alcohol in 12 countries, it was found to account for 0.45-5.44% of Gross Domestic Product (GDP) ⁵.

Among Central Asian countries, Kazakhstan leads in alcohol consumption levels. Compared to Uzbekistan, where per capita alcohol consumption is 2.7 liters, in Kazakhstan, this figure is 7.7 liters, significantly exceeding the global average of 6.4 liters ¹. According to official data, in 2021, the incidence of alcohol-related mental disorders in Kazakhstan was 58.1 per 100,000 population, with the highest incidence recorded in Pavlodar region (174.5) and the lowest in Turkestan region (16.0) ⁶.

In 2010, according to official data, 1.43% of Kazakhstan's population consumed alcohol at a dependence level, while WHO data indicated this figure was 5.2%⁷. This fact underscores the need for objective studies on the prevalence of alcohol consumption in Kazakhstan.

Existing studies, such as those by ⁸ and ⁹, indicate significant differences in alcohol-related mortality rates and alcohol and tobacco consumption among different ethnic groups in Kazakhstan. These studies reveal important trends, such as higher mortality rates among Slavic men and women and higher levels of alcohol and tobacco consumption among ethnic Russians. Cockerham W.C. et al. confirm that non-Russians and non-Muslims in Kazakhstan consume alcohol less frequently

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than Russians and Muslims¹⁰. However, these studies cover limited samples and do not reflect the complete picture of Kazakhstan's population. A comprehensive study considering various demographic and social factors is necessary to determine the predictors of alcohol consumption.

Methods

Ethical issues

The S.D. Asfendiyarov Kazakh National Medical University Local Ethics Committee approved the study, as documented in Protocol No. 12 (118) (September 28, 2021). Additionally, this research was registered at ClinicalTrials.gov under the identifier NCT05122832. All methods were performed in accordance with the relevant guidelines. Informed consent was obtained from all subjects and for uneducated participants, informed consent was obtained from their guardian/legally authorized representative. Research had been performed in accordance with the Declaration of Helsinki.

Study design and sample

Our study employed a cross-sectional design and focused on the adult population of Kazakhstan from October 2021 to May 2022. This was a nationally representative survey. A total of 6720 individuals aged between 18 and 69 were voluntarily recruited across all 17 regions of the country, including the cities of Almaty, Astana, and Shymkent. Participants recruited from October 2021 and May 2022.

Study context

Kazakhstan, located in Central Asia, is administratively subdivided into 14 regions, three cities of republican significance (Astana, Almaty, and Shymkent), and 177 districts. The majority of the country's 20 million inhabitants live in urban areas, despite its low population density of 6 people per square theroscl. ¹¹.

Sampling

In this study, we employed a weighted multistage cluster sampling approach, segregating participants into eight cohorts, further bifurcated into four age brackets: 18–29 years, 30–44 years, 45–59 years, and 60–69 years. This stratification was also conducted by gender, ensuring representation of both males and females within each age cohort. The sample size was ascertained using the World Health Organization's designated STEPS tool in the format of an Excel-based sample size calculator. The parameters utilized were:

Confidence interval of 95% with a Z-score of 1.96;

Hypothesized prevalence of risk factors at 0.5;

Standard error of 0.05;

Design effect coefficient of 1.5;

Projected response rate at 70%.

 Subsequent computations yielded a requisite sample size of n = 6585.

The employed multistage cluster sampling encompassed three tiers, with clusters established at every stage. Initially, primary sampling units were delineated, encompassing districts and urban centers. These units were proportionally selected from all economic regions, sourcing data from the Bureau of National Statistics and the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan.

In the secondary stage, Primary Health Care (PHC) facilities serving the local populace were identified as the secondary sampling units (SSUs). Data for this selection was procured from the Republican Centre for Healthcare Development, a subsidiary of the Ministry of Health of the Republic of Kazakhstan. The register of PHCs was accessed, revealing the patient population of each facility. The SSUs were selected via a random sampling procedure, proportionate to the patient population of each PHC.

For the tertiary stage, households and individual respondents were the focal sampling units. The household quota per PHC was derived using the equation:

Household per PHC = $6585/240 \approx 28$.

Subsequent calculations yielded a final aggregate sample size of 6720. To curate the household sample, a roster of households under the purview of the selected PHCs was compiled. Households were chosen randomly from each facility utilizing the Randhold.xls tool for study inclusion. The final respondent selection, comprising individuals aged 18–69 from the chosen households, was executed employing the Kish methodology. This technique encompassed a stratified random selection based on the gender and age demographics of eligible household members.

The research noted a commendable participation rate of 95%. This elevated engagement can be ascribed to comprehensive participant awareness regarding the research objectives and its inherent importance. The incorporation of trusted local laboratories potentially augmented this rate.

Based on the presented tables, the covariates in this study included age, sex, geographical location (region), and ethnicity.

Survey contents

A standardized questionnaire, the WHO STEPwise approach to surveillance was employed ¹². The survey criteria used were as follows; gender, age, place of residence, ethnicity, educational status, marital status, occupation, smoking status, frequency of alcohol consumption, amount of

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alcohol consumed, maximum amount of alcohol consumed in a day, and the presence or absence of any harm due to problematic alcohol use by others.

Statistical Analysis

All collected data were initially entered into a Microsoft Excel spreadsheet for preliminary organization and validation. Subsequently, the data were transferred to SPSS software (version 24.0 for Windows) for detailed statistical analysis. To determine the appropriateness of parametric tests, the distribution type of the dataset was assessed using the Kolmogorov-Smirnov test, which confirmed that the data were normally distributed. For the analysis of differences between the means of two groups, the Student's t-test was employed. For categorical data, frequencies and percentages were calculated to describe the distribution of variables. To assess the statistical significance of differences in frequencies across categories, Pearson's chi-square (χ^2) test was utilized. A p-value of less than 0.05 was considered to indicate statistical significance, guiding the interpretation of all test results within the context of this research.

A binary logistic regression model was used to assess the possible relationship between independent and dependent variables. A p-value of less than 0.05 in the final model was considered to evaluate the presence of a relationship between the dependent and independent variables.

To visualize the prevalence of alcohol consumption in various regions of Kazakhstan, a map was created based on survey data using Datawrapper free tool.

Alcohol consumption status

A standard unit of alcoholic beverage was defined as 10 g of pure ethanol (using showcards and examples), and questions included: "Have you ever consumed any alcohol such as beer, wine, spirits, etc.?" (yes, no); "Have you consumed any alcohol within the past 12 months?" (yes, no); "Have you stopped drinking due to health reasons, such as a negative impact on your health or on the advice of your doctor or other health workers?" (yes, no); "Have you consumed any alcohol within the past 30 days?" (yes, no); "During the past 30 days, how many times did you have six or more standard drinks in a single drinking occasion?" (number of times); past-week alcohol consumption was measured with seven questions on the drinks consumed on each day of the week (number); "During the past 7 days, did you consume any homebrewed alcohol, any alcohol brought over the border/from another country, any alcohol not intended for drinking or other untaxed alcohol?" (yes, no); "During the past 12 months, have you had family problems or problems with your partner due to someone else's drinking?" (1 = yes: > monthly to 4 = once or twice).

Heavy episodic drinking (HED) is defined as "drinking at least 60 g or more of pure alcohol on at least one occasion in the past 30 days" (WHO). The variable was created from the question that queried the number of drinks consumed by respondents in the past 30 days. Those reporting six drinks or more were categorized as having engaged in HED, per standard WHO definition ¹.

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Socio-demographic factor questions included age (in years), sex (male, female), highest level of education completed (1 = no formal school to 7 = postgraduate degree), and ethnicity (Kazakh, Russian, etc.)

The health risk behavior variables included past and current smoking, consumption of fruit and vegetables per day, and "based on the "Global Physical Activity Questionnaire," sedentary behavior (\geq 7 h/day), and low, moderate, or high physical activity. Body mass index was measured: "<18.5 kg/m² underweight, 18.5–24.4 kg/m² normal weight, 25–29.9 kg/m² overweight, and \geq 30 kg/m² obesity". One question was asked about a past-12-month healthcare provider visit.

Results

The sample included 6,720 individuals aged 18 to 69 years (mean age = 40.78 ± 13.9 years, median = 39 years); 3,365 (50.1%) men and 3,355 (49.9%) women; 64.2% had higher and postgraduate education; 65.1% were Kazakhs and 23.1% were Russians by nationality. 12.0% were former smokers, and 19.1% were current smokers. Additionally, 58.8% consumed 0–1 servings of fruits and vegetables per day, 49.8% had high levels of physical activity, 12.4% led a sedentary lifestyle, 29.9% were obese, and 59.4% had visited medical facilities in the past 12 months.

Among the 6,720 participants, more than half (54.1%, or 3,633) had ever consumed alcohol, 42.5% (2,855) had consumed alcohol in the past 12 months, and 23.7% (1,592) had consumed alcohol in the past month (Table 1). These data show a gradual decrease in alcohol consumption from the broader time frame (ever) to the narrower one (past 30 days). In all three categories of alcohol consumption (ever, past 12 months, past 30 days), men demonstrated a higher percentage of consumption compared to women, with 38.8% of men and 53.1% of women never having consumed alcohol.

In the 18-24 age group, there were significantly more non-drinkers than drinkers; in other age groups, the distribution was more even. The analysis also revealed differences in alcohol consumption among various ethnic groups. The highest number of drinkers was observed among Russians and Ukrainians across all time periods, while Uzbeks had the lowest levels of alcohol consumption. Private sector employees and entrepreneurs were more likely to have ever consumed alcohol and to have consumed it in the past 12 months. The lowest proportion was among students and unemployed individuals unable to work (Table 1).

There is a significant correlation between smoking and alcohol consumption. Smokers were significantly more likely to consume alcohol ever, in the past 12 months, and in the past 30 days compared to non-smokers. Among divorced and widowed individuals, the proportion of drinkers was higher than among non-drinkers. Conversely, among single and married individuals, there was a slight predominance of non-drinkers. People in civil unions were more likely to

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consume alcohol compared to other groups. Interestingly, the question of alcohol consumption in the past 30 days did not show significant statistical significance (p = 0.78), indicating a more even distribution of short-term alcohol consumption among different groups. Level of education did not differ significantly depending on alcohol consumption.

These results highlight the importance of considering various demographic and social factors when assessing alcohol consumption patterns in Kazakhstan.

When analyzing place of residence, four groups were formed based on alcohol consumption levels: regions with high, medium, low, and very low alcohol consumption (Figure 1). The first group includes Akmola region, Astana, Karaganda region, Kostanay region, Pavlodar region, and North Kazakhstan region. In these regions, 76.5% to 85.7% of respondents had ever consumed alcohol. The medium level of alcohol consumption was noted in Almaty, West Kazakhstan, Zhambyl, and East Kazakhstan regions. Low alcohol consumption levels were characteristic of Mangystau, Aktobe, Almaty, Kyzylorda, and Turkestan regions. Very low alcohol consumption was noted in Atyrau region and the city of Shymkent, where 24.7% and 12.7% of respondents, respectively, had ever tried alcohol. The level of alcohol consumption in the past 12 months was highest in Aktobe (88.2%) and Almaty (88%) regions, while the highest consumption in the past 30 days was observed in Akmola (69.9%) and Kostanay (66.7%) regions.

These findings demonstrate significant regional differences in alcohol consumption patterns within Kazakhstan.

HED was reported by 8.2% of all respondents, with infrequent episodic heavy drinking (1-2 days) accounting for 5.8% and frequent HED (more than 3 days) accounting for 2.4% (Table 2). Alcohol consumption increased towards the end of the week, peaking on weekends (Friday, Saturday, Sunday), with the highest average level recorded on Saturday (2.99 standard drinks). Among participants who consumed alcohol in the past 30 days, 17.7% reported consuming unregistered alcohol.

Family problems related to alcohol in the past 12 months were rare among respondents, regardless of gender. Most respondents did not encounter such problems, and the frequency of their occurrence did not show statistically significant differences between men and women. Among those who did experience such problems, the highest proportion (4.2%) indicated that it occurred 1 or 2 times in the past 12 months.

These results highlight the patterns of alcohol consumption and related issues among the population, emphasizing the significance of weekends in drinking behavior and the presence of unregistered alcohol consumption.

The results, presented in Table 3, provide both unadjusted and adjusted odds ratios (ORs), allowing us to discern the independent impact of each variable after controlling for other factors.

The adjusted odds of men consuming alcohol in the past 30 days are 1.573 times higher than women (p < 0.0001). The 18-24 age group has a significantly lower likelihood of alcohol consumption compared to older groups, with an adjusted OR of 0.610 (p = 0.002). While the unadjusted odds for the 25-34 and 35-44 age groups initially suggested higher consumption, these differences were not statistically significant after adjustment, indicating that age alone does not drive consumption patterns without considering other variables. In terms of ethnicity, Russians and Ukrainians had significantly higher adjusted odds of consuming at least one standard drink in the past 30 days. Geographically, the likelihood of consuming at least one standard drink in the past 30 days was significantly higher in major cities such as Astana and Almaty, as well as in the northern regions (Akmola, Karaganda, Pavlodar, and North Kazakhstan regions). Conversely, the lowest likelihood was observed in Atyrau and the southern regions. Smokers have substantially higher odds of consuming alcohol, with an adjusted OR of 3.075 (p < 0.0001). Occupation, education and marital status do not show significant differences in the likelihood of alcohol consumption.

Men are significantly more likely to engage in HED compared to women, with adjusted odds ratio (OR) of 1,800 (Table 4). The youngest age group (18-24 years) showed a decreased likelihood of HED, with an adjusted OR of 0,587, indicating they are less likely to engage in HED compared to older groups. Other age groups did not show significant differences after adjustment, though the unadjusted ORs suggested some variability. Russians and Ukrainians showed higher unadjusted odds for HED, but these differences were not statistically significant after adjustment, indicating other factors may mediate this relationship. Significant regional differences were noted, with residents in Akmola showing the highest adjusted odds for HED (adjusted OR 3,453), indicating that location is a strong predictor of drinking behavior. Smokers had significantly higher odds of HED compared to non-smokers, with an adjusted OR of 3,722, reflecting the strong association between smoking and risky drinking behaviors.

Discussion

 The results of this study provide a comprehensive overview of alcohol consumption patterns and their influencing factors in Kazakhstan. The data reveal significant variations in alcohol consumption and HED across different demographic groups and regions, highlighting the complexity of alcohol-related behavior in the country.

One of the most notable findings is the gender disparity in alcohol consumption and HED. Men were significantly more likely to have consumed alcohol in the past 30 days and to engage in HED compared to women. This aligns with global trends where men generally exhibit higher levels of alcohol consumption and related behaviors than women ¹³ ¹⁴. Cultural and social norms

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in Kazakhstan, which often tolerate or even encourage alcohol consumption among men, contribute to this disparity.

Age also plays a crucial role in the structure of alcohol consumption. The youngest age group (18–24 years) demonstrated lower odds of both alcohol consumption and HED. This can be attributed to several factors, including increased health awareness among young people, educational campaigns, and legal restrictions on alcohol purchase for younger populations ^{15 16}. However, the relatively lower consumption in this age group contrasts with trends observed in some Western countries, where young people often exhibit higher levels of binge drinking ^{17 18}.

Ethnicity emerged as an important predictor of alcohol consumption. Russians and Ukrainians showed higher odds of alcohol consumption and HED, consistent with the historical and cultural context where alcohol plays a more prominent role in social settings ⁸⁻¹⁰. Conversely, ethnic groups such as Uzbeks exhibited lower levels of alcohol consumption. These findings underscore the need for culturally tailored interventions to address alcohol abuse in different ethnic communities.

The study identified significant regional differences in alcohol consumption. Higher consumption rates were observed in major cities like Astana and Almaty and northern regions such as Akmola, Karaganda, Pavlodar, and North Kazakhstan. In the northern regions of Kazakhstan, Russians make up about 30-35% of the population, while Kazakhs predominate in the southern regions, where the proportion of Russians is 2-6% ¹¹. According to the 2021 census, in urban areas, Muslims constitute 64.45% on average, with significant regional differences: 93.91% in Kyzylorda and 91.82% in Turkestan regions, compared to 34.74% and 35.72% in the cities of North Kazakhstan and Kostanay regions, respectively. The highest percentage of Christians in urban areas is recorded in these last two regions (59.83% and 44.86%, respectively), while the average share of Christians in Kazakhstani cities is only 20.59% ¹⁹. These factors may explain the high alcohol consumption in the northern regions and the lower rates in the south.

A strong association was found between smoking and alcohol consumption: smokers had significantly higher odds of both alcohol consumption and HED. This finding is supported by other studies that have established a link between these dependencies, showing that 80% of people with alcohol dependence are smokers ^{20 21}. This conclusion highlights the interconnectedness of various risky behaviors and suggests that comprehensive public health measures targeting both smoking and alcohol consumption could be more effective.

Our results indicate that in the context of Kazakhstan, demographic and social factors such as education level, occupation, and marital status are not primary determinants of alcohol consumption. However, private sector employees and entrepreneurs were more likely to have ever consumed alcohol and to have consumed it in the past 12 months. This suggests that occupational stress and social dynamics within these professions may influence drinking behavior.

The findings of this study have important implications for public health strategies in Kazakhstan. The significant gender, age, ethnic, and regional differences in alcohol consumption and HED suggest that a one-size-fits-all policy is unlikely to be effective. Instead, tailored interventions that account for these demographic and cultural nuances are necessary. Public health campaigns should specifically target high-risk groups such as men, certain ethnic minorities, smokers, and residents of northern regions and major cities.

Moreover, the close link between smoking and alcohol consumption suggests that concurrent measures addressing both behaviors may lead to better health outcomes. Efforts to reduce alcohol consumption in Kazakhstan should also consider the socio-economic and educational determinants of health to find more comprehensive and sustainable solutions.

Conclusions

This study provides valuable insights into the complex landscape of alcohol consumption in Kazakhstan. By highlighting the key demographic, social, and regional factors associated with alcohol use, it sets the stage for more informed public health policies and interventions. Future research should continue to explore these relationships and assess the effectiveness of targeted intervention strategies in reducing alcohol-related harm in Kazakhstan.

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Contributors

IF, AI, MS drafted the manuscript, IF, AI, MS, and BT the analyses, IF supervised the work, IF, AI, MS, and ST designed and conducted the data collection. All authors read, revised and approved the final manuscript.

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to occurrent on the terms on the one

Table 1 Alcohol Consumption Status

Variable	Have ye consume in you (n, %) 1	ou ever d alcohol r life? n=6720	χ ² (p)	Have cons alcoho last 12 (n, %)	e you umed I in the months? n=3664	χ ² (p)	Have const alcoho last 30 (n, %)	e you umed l in the days? n=2858	χ ² (p)
	Yes	No		Yes	No		Yes	No	
Gender		1				1			
Men	2059 61.2	1306 38.8	137,8 (0.0001)	1664 80.3	408 19.7	15,8 (0.0001)	986 59.1	682 40.9	18,9 (0.0001)
Women	1574	1781		1191	401		606	584	
A go groups	40,9	55,1		/4,0	23,2		50,9	49,1	
Age groups	228	501	170.7	227	00	19.6	120	110	0.8
10-24	320	64.3	(0.0001)	237	29.5	48,0	50.2	119	9,8
25-34	851	790	(0,0001)	689	167	(0,0001)	30,2	201	(0,0001)
25-54	51.9	48.1		80.5	19.5		57.8	42.2	
35-44	902	623		757	150		439	319	
55 11	59.1	40.9		83.5	16.5		57.9	42.1	
45-54	789	479	-	623	174	-	321	299	
	62,2	37,8		78,2	21,8		51,8	48,2	
55+	763	604		549	219		313	238	
	55,8	44,2		71,5	28,5		56,8	43,2	
Ethnicity					•				
Varalth	2028	2346	460,3	1550	499	15,5	804	744	28,9
Kazakii	46,4	53,6	(0,0001)	75,6	24,4	(0,0001)	51,9	48,1	(0,0001
Dussion	1147	403		937	215		583	359	
Kussiali	74,0	26,0		81,3	18,7	_	61,9	38,1	
Uzbek	57	145		46	13		20	24	
OZOCK	28,2	71,8		78,0	22,0	-	45,5	54,5	
Ukrainian	88	22		72	16		48	25	
	80,0	20,0		81,8	18,2	-	65,8	34,2	
Uyghur	24	25.1		19	6		9	10	
	04,9	20	-	/0,0	24,0	-	47,4	32,0	
Tatar	67.5	22 5		78.8	21.2		53 547	15.3	
	210	120		168	13	-	02	43,5	
Other	63.6	36.7		79.6	204		55.4	44.6	
Education lev	vel	50,7	I	17,0	20,1		55,1	11,0	
No formal	19	53	63 198	15	4	20 722	10	5	6.8
education	26,4	73.6	(0,0001)	78,9	21.1	(0,004)	66,7	33.3	(0,455)
Completed	6	5		5	1		2	3	
primary	54,5	45,5		83,3	16,7		40,0	60,0	
education (4									
grades)						_			
Completed	209	1849		150	59		90	60	
secondary	50,2	42,8		71,8	28,2		60,0	40,0	
education (9									
grades)	000	0.00		(75	015	-	204	202	
Completed	882	909		675	215		384	293	
secondary	49,2	50,8		/5,8	24,2		56,7	45,5	
(11 grades)									
Higher	1765	1307		1441	340	-	709	642	
education	57.5	42.5		80.9	191		55 <u>4</u>	44.6	
Master's/Ph	702	542	•	530	178	-	291	241	
D/Doctorate	56.4	43.6		74 9	25.1		54 7	453	
	50	64	1	39	12	-	17	22	
No answer	43,9	56,1		76,5	23,5		43,6	56,4	
Occupation									

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Government	432	421	257,8	356	78	62,5	187	170	15.6
employee	50,6	49,4	(0,0001)	82,0	18,0	(0,0001)	52,4	47,6	(0,112)
Private	1641	943		1325	326		755	570	
sector	63,5	36,5		80.3	19.7		57.0	43.0	
employee	,	,		,	,		,	,	
Budget	389	431		296	96		172	122	
employee	47.4	52.6		75.5	24.5		58.5	41.5	
	336	216	-	278	62		166	112	-
Entrepreneur	60.9	39.1		81.8	18.2		59.7	40.3	
Agriculture	22	28	-	20	2		8	12	-
worker	44.0	56.0		90.9	91		40 0	60.0	
	105	186	-	69	39		28	41	-
Student	36.1	63.9		63.9	361		40.6	59.4	
	186	315	-	136	53		74	62	-
Housewife	37.1	62.9		72.0	28.0		54.4	45.6	
	351	297		246	108		130	110	-
Pensioner	54.2	45.8		69.5	30.5		52.2	47.8	
Unemployed	140	10/	-	112	20	-	64	47,0	-
(able to	41.9	58.1		79.4	20.6		56.6	43 4	
(able to work)	41,9	56,1		/ / /,+	20,0		50,0	+3,4	
Unamployed	15	12	-	7	10	-	2	1	-
(upable to	25.0	74.1		412	58.8		42.0	571	
(unable to	23,9	/4,1		41,2	50,0		42,9	57,1	
work)	16	12	-	10	6	-	5	5	-
No answer	55.2	110		62.5	37.5		50.0	50.0	
Smoking stati	<u></u>	44,0		02,5	57,5		50,0	50,0	
~ 5	1045	239	477.1	911	135	71.6	608	307	62.9
Smokers	81.4	18.6	(0,0001)	87.1	12.9	(0,0001)	66.4	33.6	(0,0001)
Non-	2588	2848		1944	674	(0,0001)	984	959	(0,0001)
smokers	47.6	52.4		74 3	25.7		50.6	49.4	
Marital status	S	,-			,,		,-	,.	
a: 1	781	746	101.5	598	195	39,4	341	257	3.2
Single	51,1	48,9	(0,0001)	75,4	24,6	(0,0001)	57.0	43.0	(0,78)
	2339	2108		1873	483		1043	831	
Married	52,6	47,4		79.5	20,5		55.7	44.3	
Married but	25	29	-	16	9		6	10	-
living	46.3	53 7		64.0	36.0		37.5	62.5	
separately	,0	00,1		0.,0	00,0		01,0	0_,0	
	281	105	1	226	56		124	102	1
Divorced	72.8	27.2		80.1	19.9		54.9	45.1	
	138	<u>_</u> 87	1	84	55		46	39	1
Widowed	61.3	38.7		60.4	39.6		54.1	45.9	
Civil	62	10	1	54	8		30	24	-
marriage	861	13.9		871	12.9		55.6	44.4	
Refused to	7	2	1	4	3		2	3	-
answer	77 8	222		571	42.9		40^{-0}	60.0	
u110 11 01	3633	3087		2855	809		1592	1266	
Total	54 1	45 9		77 9	22 1		557	44.3	
	J 4 ,1	чЈ,2		11,7	<u> </u>		55,1	++ ,J	

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Variable		Sex		
variable	Men	Women	Both	р
Heavy episodic drinking in the	e past 30 days			
0 days	2979 (88.5%)	3189 (95.1%)	6168 (91.8%)	
1 day	180 (5.3%)	89 (2.7%)	269 (4%)	0.0001
2 days	84 (2.5%)	37 (1.1%)	121 (1.8%)	0.0001
3 or more days	122 (3.6%)	40 (1.2%)	162 (2.4%)	
Average consumption of one o	r more standard drin	ks among current dr	inkers	
Monday	2.32±1.5	2.41±2.9	2.37±2.4	≥ 0.05
Tuesday	2.47±2	1.93±1.6	2.34±1.9	≥ 0.05
Wednesday	2.31±2.6	1.72 ± 1.1	2.16±2.4	≥ 0.05
Thursday	2.52±2.1	1.77±1	2.43±1.9	≥ 0.05
Friday	3.05±2.4	2.59±2.8	2.92±2.5	≥ 0.05
Saturday	3.13±2.4	2.66±2.9	2.99±2.6	≥ 0.05
Sunday	3.24±2.8	1.8±1.5	2.72±2.5	0.0001*
Consumed unregistered alcohol among participants who consumed alcohol in the last 30 days	92 (9.3%)	47 (7.8%)	139 (17.7%)	≥ 0.05
Family problems related to alc	cohol in the last 12 mo	onths		
Yes, more than once a month	11 (0.5%)	15 (0.9%)	26 (0.7%)	
Yes, monthly	10 (0.5%)	8 (0.5%)	18 (0.5%)	
Yes, several times, but less than once a month	21 (1.0%)	18 (1.1%)	39 (1.1%)	χ2=2,598 (p=0,627)
Yes, 1 or 2 times	84 (4.1%)	70 (4.4%)	154 (4.2%)	
Never	1946 (93.9%)	1107 (93%)	3427 (93.5%)	

Table 2 Characteristics and patterns of alcohol consumption in Kazakhstan

P-value

P-value

Adjusted OR

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Variable	Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Gender			()5/0 (01)	
Men	1 870 (1 666-2 099)	0.0001	1 573 (1 365-1 813)	0.0001
Women	1	0,0001	1	0,0001
Age groups	1		1	
18-24	0 502 (0 399-0 632)	0.0001	0.610 (0.448-0.831)	0.002
25-34	1 061 (0 895-1 257)	0.495	0.888 (0.712-1.107)	0.291
35-44	1 361 (1 151-1 610)	0.0001	1 158 (0 932-1 439)	0.185
45-54	1,140 (0,954-1,364)	0.150	1.022 (0.818-1.277)	0.851
55+	1	0,100	1	0,001
Ethnicity				
Kazakh	0.592 (0.459-0.764)	0.0001	0.841 (0.632-1.119)	0.235
Russian	1.608 (1.236-2.092)	0.0001	1.480 (1.106-1.980)	0.008
Uzbek	0.293 (0.174-0.494)	0.0001	0.819 (0.456-1.472)	0.505
Ukrainian	2.065 (1.319-3.231)	0.0001	1.852 (1.138-3.013)	0.013
Uvghur	0.857 (0.389-1.887)	0.702	0.804 (0.341-1.896)	0.618
Tatar	1.233 (0.779-1.951)	0.370	0.804 (0.341-1.896)	0.471
Other	1		1	
Education level		1	L.	1
No formal education	0,526 (0,266-1,039)	0,064	1,623 (0,778-3,382)	0,197
Completed primary		0,286		0.087
education (4 grades)	0,326 (0,042-2,558)	,	0,155 (0,018-1,312)	,
Completed secondary	0.865 (0.660 1.122)	0,292	0 (11 (0 1(7 0 999)	0,007
education (9 grades)	0,803 (0,000-1,133)		0,644 (0,467-0,888)	
Completed secondary	0.885 (0.744 1.052)	0,167	0.821 (0.660 1.022)	0,078
education (11 grades)	0,883 (0,744-1,052)		0,821 (0,000-1,022)	
Higher education	1,134 (0,972-1,323)	0,110	1,094 (0,910-1,316)	0,338
Master's/PhD/Doctor	1		1	
ate	1		1	
Occupation	1			
Government	2,384 (0,714-7,963)	0,158	2 212 (0 595-8 223)	0.236
employee			2,212 (0,575 0,225)	0,250
Private sector	3,580 (1,080-11,862)	0,037	2 508 (0 685-9 182)	0.165
employee			_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0,100
Budget employee	2,240 (0,670-7,490)	0,190	2,205 (0,592-8,213)	0,239
Entrepreneur	3,705 (1,106-12,410)	0,034	2,476 (0,664-9,231)	0,177
Agriculture worker	1,651 (0,401-6,790)	0,487	1,411 (0,302-6,584)	0,662
Student	0,959 (0,273-3,365)	0,948	1,201 (0,304-4,748)	0,794
Housewife	1,505 (0,444-5,101)	0,511	2,092 (0,552-7,921)	0,299
Pensioner	2,179 (0,650-7,311)	0,207	1,719 (0,456-6,483)	0,424
Unemployed (able to	1,975 (0,579-6,735)	0,277	2 227 (0 585-8 475)	0 240
work)				
Unemployed (unable	1		1	
to work)			-	
Marital status				
Married	1,007 (0,892-1,135)	0,915	0,979 (0,846-1,133)	0,774
Not married				
Place of residence				
Astana city	0,968 (0,525-1,785)	0,916	5,246 (3,268-8,419)	0,0001
Almaty city	1,060 (0,581-1,935)	0,848	5,437 (3,416-8,654)	0,0001
Akmola	2,234 (1,179-4,234)	0,014	8,177 (5,056-13,224)	0,0001
	1	1	1	1

Table 3 Predictors of alcohol consumption in the past 30 days

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1,107 (0,609-2,011)

1,740 (1,050-2,882)

0,886 (0,469-1,674)

0,739

0,032

0,710

0,273 (0,133-0,557)

0,528 (0,278-1,005)

0,761 (0,348-1,666)

West Kazakhstan	1,817 (0,881-3,746)	0,106	4,745 (2,796-8,053)	0,0001
Zhambyl	1,311 (0,699-2,458)	0,398	4,247 (2,634-6,847)	0,0001
Karaganda	1,685 (0,916-3,096)	0,093	7,699 (4,808-12,328)	0,0001
Kostanay	1,920 (1,027-3,590)	0,041	10,919 (6,763-17,630)	0,0001
Kyzylorda	1,493 (0,713-3,130)	0,288	2,067 (1,214-3,521)	0,007
Mangystau	1,560 (0,802-3,035)	0,190	4,066 (2,461-6,717)	0,0001
Turkestan	0,603 (0,310-1,172)	0,136	1,354 (0,807-2,273)	0,251
Pavlodar	1,798 (0,964-3,354)	,065	8,915 (5,475-14,517)	0,0001
North Kazakhstan	1,329 (0,684-2,582)	0,401	6,533 (3,868-11,035)	0,0001
East Kazakhstan	1,277 (0,691-2,360)	0,435	5,659 (3,539-9,050)	0,0001
Shymkent city	1		1	
Smoking status		·	·	•
Smokers	3,992 (3,506-4,544)	0,0001	3,075 (2,651-3,566)	0,0001
Non-smokers	1		1	

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Table 4 Predictors of HED in the past 30 days

Variable	Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Gender		1	()0)00)	
Men	2.520 (2.085-3.045)	0.0001	1.800 (1.444-2.244)	0.0001
Women	1		1	
Age groups		1	1 -	1
18-24	1.304 (0.962-1.768)	0.087	0.587 (0.368-0.935)	0.025
25-34	0.959 (0.765-1.203)	0.718	0.840 (0.612-1.155)	0.284
35-44	0,956 (0,766-1,193)	0,688	1,079 (0,793-1,468)	0,630
45-54	1,225 (0,973-1,543)	0,085	0,956 (0,691-1,322)	0,786
55+	1		1	
Ethnicity				
Kazakh	0,871 (0,633-1,200)	0,400	1,026 (0,656-1,604)	0,910
Russian	1,310 (0,940-1,824)	0,111	1,485 (0,945-2,336)	0,087
Uzbek	0,672 (0,345-1,309)	0,243	1,200 (0,572-2,519)	0,630
Ukrainian	1,548 (0,875-2,741)	0,134	1,506 (0,720-3,151)	0,277
Uyghur	0,726 (0,281-1,878)	0,509	0,502 (0,062-4,041)	0.517
Tatar	0,973 (0,546-1,736)	0,927	1,502 (0,698-3,232)	0,298
Other	1		1	
Education level				•
No formal education	0,696 (0,248-1,947)	0,489	0,796 (0,270-2,350)	0,680
Completed primary education (4 grades)	1,182 (0,150-9,334)	0,874	1,147 (0,129-10,209)	0,902
Completed secondary education (9 grades)	0,886 (0,576-1,363)	0,582	0,847 (0,525-1,367)	0,497
Completed secondary education (11 grades)	0,918 (0,698-1,207)	0,539	1,002 (0,725-1,384)	0,992
education (11 grades)		0.004		0.051
Higher education	1,228 (0,966-1,561)	0,094	1,306 (0,999-1,707)	0,051
Higher education Master's/PhD/Doctorate	1,228 (0,966-1,561)	0,094	1,306 (0,999-1,707)	0,051
Higher education Master's/PhD/Doctorate Occupation	1,228 (0,966-1,561)	0,094	1,306 (0,999-1,707)	0,051
Higher education Master's/PhD/Doctorate Occupation Government employee	1,228 (0,966-1,561) 1 0,692 (0,204-2,349)	0,094	1,306 (0,999-1,707) 1 0,548 (0,147-2,042)	0,051
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349)	0,555	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344)	0,031
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0.575 (0,168-1.963)	0,094 0,555 0,991 0.377	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1.831)	0,051 0,370 0,504 0,288
Higher educationMaster's/PhD/DoctorateOccupationGovernment employeePrivate sector employeeBudget employeeEntrepreneur	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200)	0,555 0,991 0,377 0,732	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931)	0,051 0,370 0,504 0,288 0,722
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631)	0,555 0,991 0,377 0,732 0,724	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0 454 (0 086-2 400)	0,051 0,370 0,504 0,288 0,722 0,352
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631) 0 182 (0.043-0.772)	0,555 0,991 0,377 0,732 0,724 0,021	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281)	0,051 0,370 0,504 0,288 0,722 0,352 0,100
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631) 0,182 (0,043-0,772) 0,418 (0,118-1,482)	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0 150-2 292)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443
Higher educationMaster's/PhD/DoctorateOccupationGovernment employeePrivate sector employeeBudget employeeEntrepreneurAgriculture workerStudentHousewifePensioner	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631) 0,182 (0,043-0,772) 0,418 (0,118-1,482) 0,480 (0,138-1,665)	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work)	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631) 0,182 (0,043-0,772) 0,418 (0,118-1,482) 0,480 (0,138-1,665) 0,762 (0,217-2,682)	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (unable to work)	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631) 0,182 (0,043-0,772) 0,418 (0,118-1,482) 0,480 (0,138-1,665) 0,762 (0,217-2,682) 1	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (unable to work) Marital status	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631) 0,182 (0,043-0,772) 0,418 (0,118-1,482) 0,480 (0,138-1,665) 0,762 (0,217-2,682) 1	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564
Higher educationMaster's/PhD/DoctorateOccupationGovernment employeePrivate sector employeeBudget employeeBudget employeeEntrepreneurAgriculture workerStudentHousewifePensionerUnemployed (able to work)Unemployed (unable to work)Marrial statusMarrial status	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631) 0,182 (0,043-0,772) 0,418 (0,118-1,482) 0,480 (0,138-1,665) 0,762 (0,217-2,682) 1	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631) 0,182 (0,043-0,772) 0,418 (0,118-1,482) 0,480 (0,138-1,665) 0,762 (0,217-2,682) 1	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married	1,228 (0,966-1,561) 1 0,692 (0,204-2,349) 1,007 (0,303-3,349) 0,575 (0,168-1,963) 1,238 (0,365-4,200) 0,754 (0,156-3,631) 0,182 (0,043-0,772) 0,418 (0,118-1,482) 0,480 (0,138-1,665) 0,762 (0,217-2,682) 1 1,296 (1,067-1,574) 1	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383
Higher educationMaster's/PhD/DoctorateOccupationGovernment employeePrivate sector employeeBudget employeeBudget employeeEntrepreneurAgriculture workerStudentHousewifePensionerUnemployed (able to work)Unemployed (unable to work)Marital statusMarriedNot marriedPlace of residence	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,009	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383 0,701
Higher educationMaster's/PhD/DoctorateOccupationGovernment employeePrivate sector employeeBudget employeeEntrepreneurAgriculture workerStudentHousewifePensionerUnemployed (able to work)Unemployed (unable to work)Marital statusMarriedNot marriedPlace of residenceAstana city	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,672 0,009 0,009	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1 1,129 (0,608-2,095) 0,951 (0,516-1,552)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383 0,701 0,701 0,071
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married Place of residence Astana city	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,672 0,009 0,109 0,291 0,0021	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1 1,129 (0,608-2,095) 0,951 (0,516-1,750) 2,452 (1,645,450)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383 0,701 0,871 0,0501
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married Place of residence Astana city Almaty city Akmola	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,672 0,009 0,109 0,291 0,0001 0,255	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1 1,129 (0,608-2,095) 0,951 (0,516-1,750) 3,453 (1,943-6,139)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383 0,701 0,871 0,0001
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married Place of residence Astana city Almaty city Akmola Aktobe	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,672 0,009 0,109 0,291 0,0001 0,959	$\begin{array}{c} 1,306\ (0,999\text{-}1,707) \\ 1 \\ \hline \\ 0,548\ (0,147\text{-}2,042) \\ 0,643\ (0,177\text{-}2,344) \\ 0,488\ (0,130\text{-}1,831) \\ 0,788\ (0,212\text{-}2,931) \\ 0,454\ (0,086\text{-}2,400) \\ 0,271\ (0,057\text{-}1,281) \\ 0,586\ (0,150\text{-}2,292) \\ 0,376\ (0,097\text{-}1,458) \\ 0,672\ (0,174\text{-}2,591) \\ 1 \\ \hline \\ 1,103\ (0,885\text{-}1,375) \\ \hline \\ 1 \\ 1,129\ (0,608\text{-}2,095) \\ 0,951\ (0,516\text{-}1,750) \\ 3,453\ (1,943\text{-}6,139) \\ 0,895\ (0,434\text{-}1,849) \\ 0,546\ (0,150\text{-}1,281) \\ 0,546\ (0,150\text{-}1,281) \\ 0,546\ (0,150\text{-}1,281) \\ 0,572\ (0,174\text{-}2,591) \\ 1 \\ \hline \end{array}$	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383 0,701 0,871 0.0001 0,765
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married Place of residence Astana city Almaty city Akmola Aktobe Almaty	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,672 0,009 0,109 0,291 0,0001 0,959 0,128	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1 1,129 (0,608-2,095) 0,951 (0,516-1,750) 3,453 (1,943-6,139) 0,895 (0,434-1,849) 1,554 (0,867-2,788)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383 0,383 0,701 0,871 0,0001 0,765 0,139
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married Place of residence Astana city Almaty city Akmola Aktobe Almaty	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,672 0,009 0,009 0,109 0,291 0,0001 0,959 0,128 0,879	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1 1,129 (0,608-2,095) 0,951 (0,516-1,750) 3,453 (1,943-6,139) 0,895 (0,434-1,849) 1,554 (0,867-2,788) 1,032 (0,507-2,101)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383 0,383 0,701 0,871 0,0001 0,765 0,139 0,930
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married Place of residence Astana city Almaty city Akmola Aktobe Almaty Atyrau West Kazakhstan	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,672 0,009 0,009 0,109 0,291 0,0001 0,959 0,128 0,879 0,028	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1 1,129 (0,608-2,095) 0,951 (0,516-1,750) 3,453 (1,943-6,139) 0,895 (0,434-1,849) 1,554 (0,867-2,788) 1,032 (0,507-2,101) 1,885 (0,947-3,752)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,383 0,383 0,701 0,871 0,0001 0,765 0,139 0,930 0,071
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married Place of residence Astana city Almaty city Akmola Aktobe Almaty Atyrau West Kazakhstan Zhambyl	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,672 0,009 0,109 0,291 0,0001 0,959 0,128 0,879 0,028 0,036	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1 1,129 (0,608-2,095) 0,951 (0,516-1,750) 3,453 (1,943-6,139) 0,895 (0,434-1,849) 1,554 (0,867-2,788) 1,032 (0,507-2,101) 1,885 (0,947-3,752) 1,276 (0,698-2,332)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,564 0,701 0,871 0,0001 0,765 0,139 0,930 0,071 0,428
Higher education Master's/PhD/Doctorate Occupation Government employee Private sector employee Budget employee Entrepreneur Agriculture worker Student Housewife Pensioner Unemployed (able to work) Unemployed (able to work) Unemployed (unable to work) Marital status Married Not married Place of residence Astana city Almaty city Akmola Aktobe Almaty Atyrau West Kazakhstan Zhambyl Karaganda	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0,094 0,555 0,991 0,377 0,732 0,724 0,021 0,177 0,247 0,672 0,672 0,009 0,109 0,291 0,0001 0,959 0,128 0,879 0,028 0,036 0,0001	1,306 (0,999-1,707) 1 0,548 (0,147-2,042) 0,643 (0,177-2,344) 0,488 (0,130-1,831) 0,788 (0,212-2,931) 0,454 (0,086-2,400) 0,271 (0,057-1,281) 0,586 (0,150-2,292) 0,376 (0,097-1,458) 0,672 (0,174-2,591) 1 1 1,103 (0,885-1,375) 1 1,129 (0,608-2,095) 0,951 (0,516-1,750) 3,453 (1,943-6,139) 0,895 (0,434-1,849) 1,554 (0,867-2,788) 1,032 (0,507-2,101) 1,885 (0,947-3,752) 1,276 (0,698-2,332)	0,051 0,370 0,504 0,288 0,722 0,352 0,100 0,443 0,157 0,564 0,564 0,701 0,871 0,0001 0,765 0,139 0,930 0,071 0,428 0,019

Kyzylorda	1,894 (1,030-3,483)	0,040	1,628 (0,866-3,061)	0,130
Mangystau	1,505 (0,796-2,847)	0,209	1,172 (0,601-2,285)	0,641
Turkestan	1,784 (1,020-3,119)	0,042	1,523 (0,850-2,729)	0,154
Pavlodar	3,051 (1,733-5,373)	0,0001	1,807 (0,987-3,311)	0,055
North Kazakhstan	1,854 (0,944-3,642)	0,073	1,262 (0,603-2,641)	0,538
East Kazakhstan	2,214 (1,261-3,886)	0,006	1,563 (0,867-2,820)	0,138
Shymkent city	1		1	
Smoking status				
Yes	4,785 (3,997-5,729)	0,0001	3,722 (3,052-4,540)	0,0001
No	1		1	

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Figure 1 Distribution of respondents who have ever drunk alcohol by regions of Kazakhstan

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Association between Socio-Demographic Factors and Alcohol Consumption among Adults Aged 18–69 Years in Kazakhstan: A Cross-Sectional Study

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Original Research

Association between Socio-Demographic Factors and Alcohol Consumption among Adults Aged 18-69 Years in Kazakhstan: A Cross-Sectional Study

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Running head: Alcohol consumption among the adult population of Kazakhstan

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Abstract

Objective: The aim of this study is to analyze the prevalence and characteristics of alcohol consumption including the patterns of heavy episodic drinking, among the adult population of Kazakhstan (18–69 years old) and identify key socio-demographic and regional factors influencing alcohol use.

Design/methods: A cross-sectional, population-based study was conducted from October 2021 to May 2022. Data were collected via face-to-face interviews using the standardized WHO STEPwise approach.

Setting and participants: The sample included 6,720 adults aged 18–69 years from all 17 regions of Kazakhstan.

Results: Among participants, 54.1% had ever consumed alcohol, 42.5% in the past 12 months, and 23.7% in the past month. Men had higher adjusted odds of alcohol consumption in the past 30 days (adjusted OR 1.57; 95% CI: 1.37–1.81) and heavy episodic drinking (adjusted OR 1.80; 95% CI: 1.44–2.24) compared to women. Younger adults (18–24 years) had lower odds of alcohol consumption (adjusted OR 0.61; 95% CI: 0.45–0.83) and heavy episodic drinking (adjusted OR 0.59; 95% CI: 0.37–0.94). Russians and Ukrainians had significantly higher adjusted odds of alcohol consumption (adjusted OR 1.48; 95% CI: 1.11–1.98 and OR 1.85; 95% CI: 1.14–3.01, respectively). Significant regional differences were found, with higher alcohol use in the northern regions and major cities. Smoking was strongly associated with alcohol consumption (adjusted OR 3.08; 95% CI: 2.65–3.57) and heavy episodic drinking (adjusted OR 3.72; 95% CI: 3.05–4.54). Education, occupation, and marital status were not significant determinants.

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Conclusions: The findings highlight the complexity of alcohol consumption patterns in Kazakhstan and the need for targeted public health interventions tailored to gender, age, ethnicity, and region.

Keywords: alcohol consumption; heavy episodic drinking; Kazakhstan; risk factors; sociodemographic factors

Strengths and limitations of this study

•A nationally representative multistage, stratified, cluster sampling method was used to ensure the representativeness of the sample across all 17 regions of Kazakhstan.

•A large sample size (n=6,720) covering diverse population groups, including urban and rural residents and multiple ethnic groups, strengthens the reliability of the findings.

•The standardized WHO STEPwise methodology was applied, allowing for comparability with international studies.

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•The cross-sectional design limits causal inference, and the associations observed should be interpreted as correlational rather than causal; additionally, selection bias is possible due to non-participation of individuals with potentially different alcohol consumption patterns.

•The study was conducted during the COVID-19 pandemic (2021–2022), which may have influenced alcohol consumption behaviors, healthcare access, and survey participation.

Background

Globally, alcohol consumption remains a major public health concern. In 2016, the average annual consumption of pure alcohol per adult (\geq 15 years old) was 6.4 liters, and by 2019 this figure slightly decreased to 5.5 liters, according to the WHO Global Status Report on Alcohol and Health ^{1 2}. One in five adults reported at least one episode of binge drinking in the past month, increasing the risk of serious harm such as injury. Central, Eastern, and Western Europe have higher per capita consumption (11.64, 11.55, and 11.13 liters respectively) and higher percentages of alcohol abuse (49.5%, 46.9%, and 40.2% respectively). In North Africa and the Middle East, the lowest per capita alcohol consumption (0.90 liters of pure alcohol) and the lowest percentage of alcohol consumers reporting abuse (15.4%) were registered. In Sub-Saharan Central Africa, the highest proportion of heavy drinking (78.9%) was noted despite relatively low per capita consumption (4.14 liters)².

Alcohol dependence is the most common form of addiction. In 2015, an estimated 63.5 million cases of alcohol dependence were recorded worldwide. The global alcohol-related mortality rate was 33.0 deaths per 100,000 people per year. Alcohol consumption was ranked 7th among risk factors contributing to early death and disability globally³. The Global Status Report on Alcohol and Health by the World Health Organization ¹ for 2018 established that in 2016, harmful alcohol consumption caused approximately 3 million deaths (or 5.3% of all deaths), which is more than hypertension and diabetes combined. It is estimated that in 2016, 2.3 billion people currently consumed alcohol, and 283 million people aged 15+ had alcohol use disorders (5.1% of adults).

In 2002, the global economic burden associated with alcohol ranged from \$210 billion to \$665 billion ⁴. When assessing the economic impact of alcohol in 12 countries, it was found to account for 0.45-5.44% of Gross Domestic Product (GDP) ⁵.

Among Central Asian countries, Kazakhstan leads in alcohol consumption levels. According to the 2018 WHO report, per capita alcohol consumption in Kazakhstan was 7.7 liters, significantly exceeding the global average of 6.4 liters and the levels observed in neighboring countries, such as Uzbekistan (2.7 liters). However, the latest WHO report from 2024 recorded a decrease in alcohol consumption in Kazakhstan to 4.5 liters per capita ^{1 2}. To address this public

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health issue, Kazakhstan has implemented a series of alcohol control policies. The national alcohol policy includes licensing restrictions that limit alcohol sales to licensed businesses, a minimum legal drinking age of 21 years, time restrictions on alcohol sales (prohibiting sales after 23:00), and a complete ban on alcohol advertising since 2004. Moreover, Kazakhstan introduced minimum pricing for alcoholic beverages to reduce affordability. In addition, the country has adopted the National Program for 2020–2025, which focuses on preventing alcohol-related harm through evidence-based measures and promoting healthy lifestyles ⁷.

Despite these regulatory efforts, the incidence of alcohol-related mental disorders remains high. In 2021, the rate was 58.1 per 100,000 population, with the highest rates observed in the Pavlodar region (174.5) and the lowest in the Turkestan region (16.0) ⁸. In 2010, 1.43% of Kazakhstan's population was diagnosed with alcohol dependence according to official data, whereas the WHO estimated the prevalence at 5.2% ⁹, indicating the need for more objective and large-scale research on alcohol consumption in Kazakhstan.

Previous studies ^{10 11} have reported significant differences in alcohol-related mortality rates and alcohol and tobacco consumption among different ethnic groups in Kazakhstan. These studies reveal important trends, such as higher mortality rates among Slavic men and women and higher levels of alcohol and tobacco consumption among ethnic Russians. Cockerham W.C. et al. confirm that non-Russians and non-Muslims in Kazakhstan consume alcohol less frequently than Russians and Muslims ¹². However, these studies cover limited samples and do not reflect the complete picture of Kazakhstan's population. A comprehensive study considering various demographic and social factors is necessary to determine the predictors of alcohol consumption.

The aim of this study is to analyze the prevalence and characteristics of alcohol consumption including the patterns of HED, among the adult population of Kazakhstan (18–69 years old) and identify key socio-demographic and regional factors influencing alcohol use.

Methods

Ethical issues

The study protocol was approved by the Local Ethics Committee of S.D. Asfendiyarov Kazakh National Medical University (Protocol No. 12 (118), September 28, 2021). The study was also registered at ClinicalTrials.gov (NCT05122832). All methods were carried out following the relevant guidelines and regulations, including the Declaration of Helsinki (https://www.wma.net/policies-post/wma-declaration-of-helsinki/). Informed consent was obtained from all participants; for illiterate participants, consent was obtained from their legally authorized representatives.

Study design and sample

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This cross-sectional, nationally representative study was conducted among the adult population of Kazakhstan between October 2021 and May 2022. A total of 6720 individuals aged 18–69 years were recruited from all 17 regions of the country, including the cities of Astana, Almaty, and Shymkent. The primary hypothesis of this study was that socio-demographic characteristics (age, sex, marital status, education level, and smoking status) are significantly associated with alcohol consumption patterns and HED among adults in Kazakhstan.

Study context

Kazakhstan is administratively divided into 14 regions, three cities of republican significance (Astana, Almaty, and Shymkent), and 177 districts. The country's population of approximately 20 million people is predominantly urban, despite its low population density (6 people per square kilometer)¹³.

Sampling

A multistage, stratified, and cluster sampling method was employed in accordance with WHO STEPS methodology ¹⁴. The target population consisted of adults aged 18–69 years, stratified into four age groups: 18–29, 30–44, 45–59, and 60–69 years. The sample size was calculated using the WHO STEPS sample size calculator, assuming a hypothesized prevalence of 50%, a standard error of 5%, a design effect of 1.5, and an expected response rate of 70%, resulting in a minimum required sample size of 6585 participants.

Sampling steps:

1 - Selection of the primary sampling units (PSU) – districts and cities.

PSUs (clusters) were proportionally selected across all economic regions of Kazakhstan. Information about districts and cities was obtained from the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, Bureau of National Statistics. Using STEPSsampling.xls, we sampled 60 PSUs out of 266 cities and districts.

2 - Selection of the secondary sampling unit (SSU) - Primary Health Care facilities (PHC).

In each of the 60 selected PSUs, we aimed for 4 PHC facilities, totaling 240 SSUs. Data were taken from The Republican State Enterprise on the Right of Economic Management "Republican Center for Healthcare Development" under the Ministry of Health of the Republic of Kazakhstan. A register of PHC facilities was obtained, including the population served by each. From each selected PSU, using STEPSsampling.xls, 4 SSUs (PHC facilities) were randomly chosen with probability proportional to the population served.

3 - Selection of the tertiary sampling unit (TSU) - households and respondents. Households served as the TSUs. The number of households per PHC facility was calculated as follows:

Household size per PHC facility = $6585 / 240 \approx 28$

Then we calculated final total sample size:

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Total Sample Size = $240 \times 28 = 6720$

A list of households served by the 240 selected PHC facilities was obtained, and households were randomly selected using Randhold.xls. Within each selected household, respondents aged 18–69 were chosen via the Kish methodology, which employs a stratified random selection based on the gender and age of eligible household members.

Data collection

Data collection teams received prior training following WHO STEPS protocols. After obtaining informed consent, face-to-face interviews and physical/biochemical measurements were performed on the same day.

Data variables

The data collection instrument was a standardized WHO STEPS questionnaire ¹⁴ (https://www.who.int/publications/m/item/standard-steps-instrument). Data collection included three components. In the first stage, information on socio-demographic and behavioral risk factors was obtained, including age, sex, ethnicity, place of residence (urban/rural), education, occupation, marital status, tobacco use, alcohol consumption, physical activity, and dietary habits (fruit and vegetable intake). In the second stage, physical measurements were performed, including weight, height, waist and hip circumference, blood pressure, and heart rate. The third stage involved biochemical assessments based on venous blood samples to determine fasting blood glucose and total cholesterol levels.

Assessment of Alcohol Consumption

Alcohol consumption patterns were assessed using the alcohol module of the WHO STEPS instrument. A standard drink was defined as containing 10 grams of pure ethanol. Participants were asked about lifetime alcohol use, alcohol consumption in the past 12 months, cessation of alcohol use due to health reasons, alcohol consumption within the past 30 days, and the frequency of heavy drinking occasions during the past month. Additionally, past-week alcohol consumption was assessed using a 7-day recall of daily intake. The survey also included questions on unrecorded alcohol consumption (homebrewed or smuggled alcohol, or alcohol not intended for drinking) and alcohol-related family problems in the past 12 months.

Dependent Variables

Two main dependent variables were analyzed in this study:

Alcohol consumption in the past 30 days — defined as self-reported consumption of any alcoholic beverages during the past 30 days (yes/no).

HED — defined according to the WHO criteria as the consumption of six or more standard drinks (equivalent to ≥ 60 grams of pure ethanol) on at least one occasion within the past 30 days ¹. Participants reporting such consumption were classified as engaging in HED.

Independent Variables

 Independent variables included socio-demographic and behavioral factors: age, sex, ethnicity, geographical location, marital status, education level, occupation, and smoking status.

Statistical Analysis

Data were pre-processed in Microsoft Excel and analyzed using SPSS 24.0 for Windows. The Kolmogorov-Smirnov test was used to assess the normality of continuous variables. To evaluate differences in continuous variables between two groups, the Student's t-test was applied. For categorical variables, descriptive statistics, including frequencies and percentages, were computed to characterize the distribution of the data. The Pearson chi-square (χ^2) test was employed to assess the statistical significance of differences across categorical variables. Statistical significance was determined at a two-sided p-value threshold of <0.05. This criterion was consistently applied to guide the interpretation of all statistical analyses conducted in this study.

To assess the associations between independent variables and two dependent variables — alcohol consumption in the past 30 days and HED — binary logistic regression analysis was conducted. Both unadjusted (crude) and adjusted models were estimated. The adjusted binary logistic regression model included all independent variables as covariates to control for potential confounding. These variables were: age, sex, ethnicity, geographical location, marital status, education level, occupation, and smoking status. The results are presented as odds ratios (ORs) with 95% confidence intervals (CIs), allowing for the interpretation of both crude and adjusted associations.

Handling of Missing Data

Missing responses were classified as "No answer" and were reported separately in the descriptive analyses to ensure transparency. For the logistic regression models, cases with missing responses in independent variables were excluded using listwise deletion. The proportion of missing data was low, accounting for 1.70% in education, 0.43% in occupation, and 0.13% in marital status. Given the minimal percentage of missing values, their exclusion was not expected to affect the representativeness of the sample or the validity of the findings.

To visualize the prevalence of alcohol consumption in various regions of Kazakhstan, a map was created based on survey data using Datawrapper free tool.

Results

The study sample consisted of 6,720 participants aged 18–69 years (mean age = 40.8 ± 13.9 years; median = 39 years), of whom 3,365 (50.1%) were men and 3,355 (49.9%) were women.

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The majority were Kazakhs (65.1%) and Russians (23.1%). Among participants, 64.2% had higher or postgraduate education, 19.1% were current smokers, and 12.0% were former smokers.

In total, 54.1% (95% CI: 53.0–55.3) of participants reported having ever consumed alcohol, 42.5% (95% CI: 41.2–43.7) reported alcohol use within the past 12 months, and 23.7% (95% CI: 22.7–24.7) reported alcohol consumption within the past 30 days (Supplementary Table S1).

Men reported significantly higher alcohol consumption across all indicators. Ever alcohol consumption was reported by 61.2% of men and 46.9% of women ($\chi^2(1, N=6720) = 137.8, p < 0.001$). In the past 30 days, 59.1% of men and 50.9% of women consumed alcohol ($\chi^2(1, N=2858) = 31.6, p < 0.001$).

In the 18–24 age group, non-drinkers prevailed (64.3% [95% CI: 61.2–67.3]), while higher drinking rates were observed in older groups ($\chi^2(4, N=6720) = 179.7, p < 0.001$). Ethnic differences were evident: Russians and Ukrainians exhibited the highest prevalence of alcohol consumption (74.0% [95% CI: 71.8–76.1] and 80.0% [95% CI: 71.6–86.4], respectively), while Uzbeks had the lowest (28.2% [95% CI: 22.5–34.8]). Private sector employees and entrepreneurs were more likely to have ever consumed alcohol and to have consumed it in the past 12 months. The lowest proportion was among students and unemployed individuals unable to work.

Smoking was significantly associated with alcohol consumption. Among smokers, 81.4% (95% CI: 79.8–83.0) had ever consumed alcohol versus 47.6% (95% CI: 46.0–49.2) of nonsmokers ($\chi^2(1, N=6720) = 477.1$, p < 0.001). Similar patterns were observed for consumption in the past 12 months and 30 days. Divorced, widowed, and participants in civil unions also demonstrated higher alcohol consumption rates ($\chi^2(6, N=6720) = 212.4$, p < 0.001). Educational level did not show significant differences in alcohol consumption prevalence ($\chi^2(6, N=6720) = 3.3$, p = 0.19).

Regional analysis revealed significant geographical differences ($\chi^2(16, N=6720) = 563.2$, p < 0.001). The highest rates of ever drinking were observed in Akmola, Astana, Karaganda, Kostanay, Pavlodar, and North Kazakhstan regions (76.5–85.7%). In contrast, Atyrau and Shymkent reported the lowest rates (24.7% and 12.7%, respectively) (figure 1).

Regarding drinking patterns, 8.2% of respondents reported engaging in HED, with 5.8% reporting infrequent (1–2 episodes) and 2.4% frequent HED (>3 episodes) (Table 1). Alcohol consumption peaked towards the weekend, with Saturday showing the highest average intake (2.99 standard drinks). Among past-month drinkers, 17.7% reported consuming unregistered alcohol.

Family problems related to alcohol were rare and did not differ significantly by gender $(\chi^2(4, N=3664) = 2.1, p = 0.15)$. Among those who reported such problems, 4.2% experienced them 1–2 times in the past 12 months.

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In the adjusted regression analysis (Table 2), the odds of alcohol consumption in the past 30 days were 1.573 times higher among men compared to women (p < 0.001). Participants aged 18–24 had significantly lower odds (OR = 0.61, 95% CI: 0.45–0.83, p = 0.002) compared to older groups. Ethnic minorities such as Russians and Ukrainians had higher adjusted odds compared to Kazakhs (adjusted OR = 1.48, 95% CI: 1.11–1.98, and OR = 1.85, 95% CI: 1.14–3.01, respectively). Regionally, the highest odds were observed in Akmola, Karaganda, Pavlodar, and North Kazakhstan regions, while the lowest were in Atyrau and southern regions. Smoking remained a strong predictor of alcohol consumption (adjusted OR = 3.08, 95% CI: 2.65–3.57, p < 0.001).

For HED, men (adjusted OR = 1.80, 95% CI: 1.44–2.24, p < 0.001) and smokers (adjusted OR = 3.72, 95% CI: 3.05–4.54, p < 0.001) had higher odds. Younger participants (18–24 years) were less likely to engage in HED (adjusted OR = 0.587, 95% CI: 0.37–0.94, p = 0.02). Regionally, Akmola residents demonstrated the highest adjusted odds of HED (adjusted OR = 3.45, 95% CI: 1.94–6.14, p < 0.001). Education, occupation, and marital status were not significantly associated with HED (Table 3).

Discussion

The results of this study provide a comprehensive overview of alcohol consumption patterns and the factors influencing them in Kazakhstan. The data show significant differences in the levels of alcohol consumption and HED across various demographic groups and regions, highlighting the complexity of alcohol-related behavior in the country.

One of the most notable findings is the pronounced gender disparity in alcohol consumption and HED. Men were significantly more likely to have consumed alcohol in the past 30 days and to report episodes of HED compared to women, which is consistent with international studies showing that men generally exhibit higher levels of alcohol consumption and a greater prevalence of related behaviors ^{15 16}. These differences are driven by both biological and socio-cultural factors. Women are more sensitive to the toxic effects of alcohol due to physiological characteristics such as differences in metabolism, hormonal profiles, and a lower percentage of body water ¹⁵.

Socio-cultural characteristics of Kazakhstani society also play a crucial role, where elements of patriarchy and traditional perceptions of gender roles persist. Alcohol consumption by men is often perceived as socially acceptable or even expected behavior, while for women it may be condemned, especially in the context of excessive or public drinking. Women are more likely to perform traditional family and household roles, which reduces their involvement in alcohol-related practices.

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Age plays an important role in the pattern of alcohol consumption. In our study, youth aged 18–24 years had significantly lower odds of alcohol use and HED, which is consistent with modern research showing a decline in alcohol consumption among young people in several countries ^{17 18}. In Kazakhstan, this trend may be explained by a combination of factors, including the persistence of strong family-oriented and religious values, especially in the southern and rural regions, where young people often continue living with their parents and adhere to traditional behavioral norms. Additionally, the growing religiosity among youth contributes to limiting their involvement in alcohol-related practices. Socio-economic barriers also play an important role, as limited income among young people, combined with the high cost of alcoholic beverages, may reduce alcohol accessibility.

It is important to note that these findings contrast with trends documented in several Western countries, where youth continue to exhibit or even increase rates of high-intensity and binge drinking (High-Intensity Drinking, HID)^{19 20}.

Ethnicity was found to be a significant predictor of alcohol consumption. Individuals of Russian and Ukrainian ethnic groups demonstrated significantly higher odds of both alcohol use and participation in HED. These findings are consistent with existing evidence indicating that alcohol has traditionally played a more prominent role in the culture and social practices of the Russian-speaking population of Kazakhstan ¹⁰ ¹¹. Sharygin and Guillot ¹⁰ noted that processes of urbanization, migration, and Russification during the Soviet and post-Soviet periods contributed to the preservation of behavioral patterns typical of Slavic countries, including a more liberal attitude towards alcohol consumption, which is further reinforced by cultural norms related to social interaction, leisure, and celebrations.

In contrast, Kazakhs, Uzbeks, and other Turkic ethnic groups generally display more restrained patterns of alcohol consumption. This is largely explained by the dominant influence of Islam, which imposes restrictions on the consumption of alcoholic beverages, as well as traditional behavioral norms within families and communities. Davletov et al. ¹¹ emphasized that these differences may partially account for the ethnic disparities observed in Kazakhstan in terms of mortality and morbidity rates, including alcohol-related mortality.

The study identified significant regional differences in alcohol consumption. Higher consumption rates were observed in major cities like Astana and Almaty and northern regions such as Akmola, Karaganda, Pavlodar, and North Kazakhstan. In the northern regions of Kazakhstan, Russians make up about 30-35% of the population, while Kazakhs predominate in the southern regions, where the proportion of Russians is 2-6% ¹³. According to the 2021 census, in urban areas, Muslims constitute 64.45% on average, with significant regional differences: 93.91% in Kyzylorda and 91.82% in Turkestan regions, compared to 34.74% and 35.72% in the cities of North

 Kazakhstan and Kostanay regions, respectively. The highest percentage of Christians in urban areas is recorded in these last two regions (59.83% and 44.86%, respectively), while the average share of Christians in Kazakhstani cities is only 20.59% ²¹. These factors may explain the high alcohol consumption in the northern regions and the lower rates in the south.

A strong association was also found between smoking and alcohol consumption: smokers had significantly higher odds of both alcohol use and participation in HED. This finding is consistent with previous studies consistently identifying a close link between these two risk behaviors. According to Romberger and Grant ²², approximately 80% of individuals with alcohol dependence are also smokers, and the co-use of alcohol and tobacco often reinforces both behaviors through both behavioral and biochemical mechanisms. The interaction between these substances involves shared neurobiological pathways contributing to dependence, as well as social and behavioral factors, such as the common habit of consuming alcohol and tobacco together in various social settings.

Moreover, studies show that smokers tend to engage in higher and more regular alcohol consumption. For example, Britton et al. ²³ demonstrated that among daily smokers, the likelihood of alcohol use and participation in HED is significantly higher compared to non-smokers, and that the greater the intensity of smoking, the higher the probability of consuming large amounts of alcohol. This supports the hypothesis of a synergistic effect between smoking and alcohol consumption.

Despite its strengths, several methodological limitations should be considered. The crosssectional design does not allow for establishing causality between alcohol consumption and its associated factors, limiting interpretation to associations only. Although the sampling was representative, selection bias is possible due to non-participation of certain subgroups, potentially affecting prevalence estimates. Self-reported alcohol use may also be underestimated, especially in social or ethnic groups where alcohol consumption is stigmatized. Moreover, the study was conducted during the COVID-19 pandemic, which may have temporarily influenced drinking patterns and participation rates. These limitations should be considered when applying the findings to policy and intervention planning.

Overall, this study provides one of the first nationally representative assessments of alcohol consumption patterns in Kazakhstan, simultaneously addressing both general alcohol use and HED and their associations with key demographic, social, and regional factors. The results reveal a complex and multifaceted picture of alcohol consumption influenced by gender, age, ethnicity, region, and smoking behavior. These findings contribute important new evidence to the limited data available on alcohol use patterns in Kazakhstan. The identified disparities highlight the urgent need for comprehensive, culturally and socially tailored prevention strategies. Effective public

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health interventions should consider the biological and socio-cultural characteristics of different population groups and integrate combined approaches to reducing both alcohol and tobacco use. Such targeted and culturally sensitive strategies are essential to reduce the prevalence and adverse health consequences of alcohol consumption in Kazakhstan.

Conclusions

This study provides valuable insights into the complex landscape of alcohol consumption in Kazakhstan. By highlighting the key demographic, social, and regional factors associated with alcohol use, it sets the stage for more informed public health policies and interventions. Future research should continue to explore these relationships and assess the effectiveness of targeted intervention strategies in reducing alcohol-related harm in Kazakhstan.

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Men e past 30 days (n=672	Women	Both	$\chi^{-}(al, N), p$
e past 30 days (n=672	0)		
	U)		
88.5 (87.5-89.6)	95.1 (94.3–95.8)	91.8 (91.1–92.4)	χ²(3,
5.3 (4.6-6.1)	2.7 (2.1–3.2)	4.0 (3.5–4.5)	N=6720) =
2.5 (2.0-3.0)	1.1 (0.7–1.5)	1.8 (1.5–2.1)	179.7, p <
3.6 (3.0–4.3)	1.2 (0.8–1.6)	2.4 (2.0-2.8)	0.001
or more standard drin	ks among current dr	inkers, mean ± SD	
2.32±1.5	2.41±2.9	2.37±2.4	≥ 0.05
2.47±2	1.93±1.6	2.34±1.9	≥ 0.05
2.31±2.6	1.72±1.1	2.16±2.4	≥ 0.05
2.52±2.1	1.77±1	2.43±1.9	≥ 0.05
3.05±2.4	2.59±2.8	2.92±2.5	≥ 0.05
3.13±2.4	2.66±2.9	2.99±2.6	≥ 0.05
3.24±2.8	1.8±1.5	2.72±2.5	0.0001*
			2/1
			$\chi^{2}(1,$
9.3 (7.5–11.1)	7.8 (5.7–10.0)	8.7 (7.3–10.1)	N=1592) =
			2.5, $p \ge 0.05$
cohol in the last 12 m	onths (n=3664)		
0.5 (0.2–0.8)	0.9 (0.5–1.4)	0.7 (0.4–1.0)	
0.5 (0.2–0.8)	0.5 (0.2–0.8)	0.5 (0.3–0.7)	
1.0 (0.6–1.4)	1.1 (0.6–1.7)	1.1 (0.7–1.4)	$\chi^2(4,$
		· · · · ·	N=3664) =
4.1 (3.2-4.9)	4.4 (3.4–5.4)	4.2 (3.6–4.9)	2.6, $p = 0.63$
93.9 (92.9–94.9)	92.9 (91.6–94.2)	93.5 (92.7–94.3)	
	$\begin{array}{c} \textbf{5.3} (4.6-6.1) \\ \hline 5.3 (4.6-6.1) \\ \hline 2.5 (2.0-3.0) \\ \hline 3.6 (3.0-4.3) \\ \textbf{or more standard drin} \\ \hline 2.32\pm1.5 \\ \hline 2.47\pm2 \\ \hline 2.31\pm2.6 \\ \hline 2.52\pm2.1 \\ \hline 3.05\pm2.4 \\ \hline 3.13\pm2.4 \\ \hline 3.24\pm2.8 \\ \hline 9.3 (7.5-11.1) \\ \hline \textbf{cohol in the last 12 model} \\ \hline 0.5 (0.2-0.8) \\ \hline 0.5 (0.2-0.8) \\ \hline 1.0 (0.6-1.4) \\ \hline 4.1 (3.2-4.9) \\ \hline 93.9 (92.9-94.9) \\ \hline \end{array}$	$5.3 (4.6-6.1)$ $2.7 (2.1-3.2)$ $2.5 (2.0-3.0)$ $1.1 (0.7-1.5)$ $3.6 (3.0-4.3)$ $1.2 (0.8-1.6)$ or more standard drinks among current dr 2.32 ± 1.5 2.41 ± 2.9 2.47 ± 2 1.93 ± 1.6 2.31 ± 2.6 1.72 ± 1.1 2.52 ± 2.1 1.77 ± 1 3.05 ± 2.4 2.59 ± 2.8 3.13 ± 2.4 2.66 ± 2.9 3.24 ± 2.8 1.8 ± 1.5 $9.3 (7.5-11.1)$ $7.8 (5.7-10.0)$ Icohol in the last 12 months (n=3664) $0.5 (0.2-0.8)$ $0.5 (0.2-0.8)$ $0.9 (0.5-1.4)$ $0.5 (0.2-0.8)$ $0.5 (0.2-0.8)$ $1.0 (0.6-1.4)$ $1.1 (0.6-1.7)$ $4.1 (3.2-4.9)$ $4.4 (3.4-5.4)$ $93.9 (92.9-94.9)$ $92.9 (91.6-94.2)$	bits Derive Deriver Derive Deriver Derive Deriver Derive Deriver Derive Deriver Deri

Table 1 Characteristics and patterns of alcohol consumption in Kazakhstan

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Table 2 Predictors	of alcohol consu	mption in th	e past 30	davs
	of alcohol consul	mption in th	e puse e o	uuys

Variable	Unadjusted OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Gender	-		-	
Men	1,870 (1,666-2,099)	0,0001	1,573 (1,365-1,813)	0,0001
Women	1		1	
Age groups		Т		1
18-24	0,502 (0,399-0,632)	0,0001	0,610 (0,448-0,831)	0,002
25-34	1,061 (0,895-1,257)	0,495	0,888 (0,712-1,107)	0,291
35-44	1,361 (1,151-1,610)	0,0001	1,158 (0,932-1,439)	0,185
45-54	1,140 (0,954-1,364)	0,150	1,022 (0,818-1,277)	0,851
55+	1		1	
Ethnicity	1	1	1	
Kazakh	0,592 (0,459-0,764)	0,0001	0,841 (0,632-1,119)	0,235
Russian	1,608 (1,236-2,092)	0,0001	1,480 (1,106-1,980)	0,008
Uzbek	0,293 (0,174-0,494)	0,0001	0,819 (0,456-1,472)	0,505
Ukrainian	2,065 (1,319-3,231)	0,0001	1,852 (1,138-3,013)	0,013
Uyghur	0,857 (0,389-1,887)	0,702	0,804 (0,341-1,896)	0,618
Tatar	1,233 (0,779-1,951)	0,370	0,804 (0,341-1,896)	0,471
Other	1		1	
Education level				
No formal education	0,526 (0,266-1,039)	0,064	1,623 (0,778-3,382)	0,197
Completed primary	0.326 (0.042.2.558)	0,286	0 155 (0 018 1 212)	0,087
education (4 grades)	0,320 (0,042-2,338)		0,133 (0,018-1,312)	
Completed secondary	0 865 (0 660-1 133)	0,292	0 644 (0 467-0 888)	0,007
education (9 grades)	0,000 (0,000 1,155)			
Completed secondary	0,885 (0,744-1,052)	0,167	0,821 (0,660-1,022)	0,078
Higher education	1,134 (0,972-1,323)	0,110	1,094 (0,910-1,316)	0,338
Master's/PhD/Doctor	1	Í	1	
ate				
Occupation				
Government	2,384 (0,714-7,963)	0,158	2 212 (0 505 8 222)	0.226
employee			2,212 (0,393-8,223)	0,230
Private sector	3,580 (1,080-11,862)	0,037	2 508 (0 685 0 182)	0.165
employee			2,508 (0,085-9,182)	0,105
Budget employee	2,240 (0,670-7,490)	0,190	2,205 (0,592-8,213)	0,239
Entrepreneur	3,705 (1,106-12,410)	0,034	2,476 (0,664-9,231)	0,177
Agriculture worker	1,651 (0,401-6,790)	0,487	1,411 (0,302-6,584)	0,662
Student	0,959 (0,273-3,365)	0,948	1,201 (0,304-4,748)	0,794
Housewife	1,505 (0,444-5,101)	0,511	2,092 (0,552-7,921)	0,299
Pensioner	2,179 (0,650-7,311)	0,207	1,719 (0,456-6,483)	0,424
Unemployed (able to work)	1,975 (0,579-6,735)	0,277	2,227 (0,585-8,475)	0,240
Unemployed (unable	1			
to work)	1		1	
Marital status				
Married	1 007 (0 892-1 135)	0.915	0 979 (0 846-1 133)	0 774
Not married	1	0,715	0,577 (0,040 1,155)	0,774
Place of residence	1			
Astona city	0.068 (0.525 1.785)	0.016	5 246 (3 268 8 410)	0.0001
Almaty oity	1 060 (0 521 1 025)	0.910	5,270 (3,200-0,417)	0,0001
	2 234 (1 170 4 224)	0.014	8 177 (5 056 12 224)	0,0001
Akmola	2,234 (1,1/9-4,234)	0,014	0,177 (0,000-10,224)	0,0001
Aktobe	0,273 (0,133-0,557)	0,0001	1,107 (0,609-2,011)	0,739
Almaty	0,528 (0,278-1,005)	0,052	1,740 (1,050-2,882)	0,032
Atyrau	0,761 (0,348-1,666)	0,495	0,886 (0,469-1,674)	0,710
West Kazakhstan	1,817 (0,881-3,746)	0,106	4,745 (2,796-8,053)	0,0001
		1		

Zhambyl	1,311 (0,699-2,458)	0,398	4,247 (2,634-6,847)	0,0001
Karaganda	1,685 (0,916-3,096)	0,093	7,699 (4,808-12,328)	0,0001
Kostanay	1,920 (1,027-3,590)	0.041	10,919 (6,763-17,630)	0,0001
Kyzylorda	1,493 (0,713-3,130)	0,288	2,067 (1,214-3,521)	0,007
Mangystau	1,560 (0,802-3,035)	0,190	4,066 (2,461-6,717)	0,0001
Turkestan	0,603 (0,310-1,172)	0,136	1,354 (0,807-2,273)	0,251
Pavlodar	1,798 (0,964-3,354)	,065	8,915 (5,475-14,517)	0,0001
North Kazakhstan	1,329 (0,684-2,582)	0,401	6,533 (3,868-11,035)	0,0001
East Kazakhstan	1,277 (0,691-2,360)	0,435	5,659 (3,539-9,050)	0,0001
Shymkent city	1		1	
Smoking status				
Smokers	3,992 (3,506-4,544)	0,0001	3,075 (2,651-3,566)	0,0001
Non-smokers	1		1	

P-value

Adjusted OR

P-value

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Zhambyl

Variable	Unadjusted OR (95% CI)		(95% CI)	
Gender		1		
Men	2,520 (2,085-3,045)	0.0001	1,800 (1,444-2,244)	0,0001
Women			1	
Age groups	-			
18-24	1,304 (0,962-1,768)	0,087	0,587 (0,368-0,935)	0,025
25-34	0,959 (0,765-1,203)	0,718	0,840 (0,612-1,155)	0,284
35-44	0,956 (0,766-1,193)	0,688	1,079 (0,793-1,468)	0,630
45-54	1,225 (0,973-1,543)	0,085	0,956 (0,691-1,322)	0,786
55+	1		1	
Ethnicity		•		
Kazakh	0,871 (0,633-1,200)	0,400	1,026 (0,656-1,604)	0,910
Russian	1,310 (0,940-1,824)	0,111	1,485 (0,945-2,336)	0,087
Uzbek	0,672 (0,345-1,309)	0,243	1,200 (0,572-2,519)	0,630
Ukrainian	1,548 (0,875-2,741)	0,134	1,506 (0,720-3,151)	0,277
Uyghur	0,726 (0,281-1,878)	0,509	0,502 (0,062-4,041)	0.517
Tatar	0,973 (0,546-1,736)	0,927	1,502 (0,698-3,232)	0,298
Other	1		1	
Education level		•	·	
No formal education	0,696 (0,248-1,947)	0,489	0,796 (0,270-2,350)	0,680
Completed primary education (4 grades)	1,182 (0,150-9,334)	0,874	1,147 (0,129-10,209)	0,902
Completed secondary education (9 grades)	0,886 (0,576-1,363)	0,582	0,847 (0,525-1,367)	0,497
Completed secondary education (11 grades)	0,918 (0,698-1,207)	0,539	1,002 (0,725-1,384)	0,992
Higher education	1 228 (0 966-1 561)	0.094	1 306 (0 999-1 707)	0.051
Master's/PhD/Doctorate	1	0,02	1	0,001
Occupation			-	1
Government employee	0,692 (0,204-2,349)	0,555	0,548 (0,147-2,042)	0,370
Private sector employee	1,007 (0,303-3,349)	0,991	0,643 (0,177-2,344)	0,504
Budget employee	0,575 (0,168-1,963)	0,377	0,488 (0,130-1,831)	0,288
Entrepreneur	1,238 (0,365-4,200)	0,732	0,788 (0,212-2,931)	0,722
Agriculture worker	0,754 (0,156-3,631)	0,724	0,454 (0,086-2,400)	0,352
Student	0,182 (0,043-0,772)	0,021	0,271 (0,057-1,281)	0,100
Housewife	0,418 (0,118-1,482)	0,177	0,586 (0,150-2,292)	0,443
Pensioner	0,480 (0,138-1,665)	0,247	0,376 (0,097-1,458)	0,157
Unemployed (able to work)	0,762 (0,217-2,682)	0,672	0,672 (0,174-2,591)	0,564
Unemployed (unable to work)	1		1	
Marital status				
Married	1.296 (1.067-1.574)	0.009	1.103 (0.885-1.375)	0.383
Not married	1		1	
Place of residence			_	
Astana city	1,620 (0,898-2.924)	0,109	1,129 (0,608-2.095)	0,701
Almaty city	1,368 (0,765-2.448)	0,291	0,951 (0,516-1.750)	0,871
Akmola	4,516 (2,627-7.762)	0,0001	3,453 (1,943-6.139)	0.0001
Aktobe	0,982 (0,485-1,987)	0,959	0,895 (0,434-1.849)	0.765
Almaty	1,557 (0,880-2,754)	0,128	1,554 (0,867-2,788)	0,139
Atyrau	1,055 (0,528-2,108)	0,879	1,032 (0,507-2,101)	0,930
West Kazakhstan	2,093 (1,085-4,038)	0,028	1,885 (0,947-3,752)	0,071

Table 3 Predictors of HED in the past 30 days

Variable

Unadjusted OR (95% CI)

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0,036

1,276 (0,698-2,332)

0,428

1,854 (1,041-3,303)

Karaganda	1,854 (1,041-3,303)	0,0001	1,276 (0,698-2,332)	0,019
Kostanay	4,324 (2,510-7,449)	0,0001	3,631 (2,040-6,462)	0,0001
Kyzylorda	1,894 (1,030-3,483)	0,040	1,628 (0,866-3,061)	0,130
Mangystau	1,505 (0,796-2,847)	0,209	1,172 (0,601-2,285)	0,641
Turkestan	1,784 (1,020-3,119)	0,042	1,523 (0,850-2,729)	0,154
Pavlodar	3,051 (1,733-5,373)	0,0001	1,807 (0,987-3,311)	0,055
North Kazakhstan	1,854 (0,944-3,642)	0,073	1,262 (0,603-2,641)	0,538
East Kazakhstan	2,214 (1,261-3,886)	0,006	1,563 (0,867-2,820)	0,138
Shymkent city	1		1	
Smoking status				
Yes	4,785 (3,997-5,729)	0,0001	3,722 (3,052-4,540)	0,0001
No	1		1	

to occurrence on the second

5	Biotuibution of monondonts who have ever downly clocked by we first of War-	l.h.~4 -
rigure i	Distribution of respondents who have ever drunk alcohol by regions of Kaza	KNSU

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Figure 1 $\,$ Distribution of respondents who have ever drunk alcohol by regions of Kazakhstan $\,$

204x136mm (96 x 96 DPI)

Supplementary Table S1 Alcohol Consumption Status

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Variable	Have you ever consumed alcohol in your life? % (95% CI) n=6720		<mark>χ²(df, N)</mark> (p)	Have you consumed alcohol in the last 12 months? % (95% CI) n=3664 X ² (df, N) (p)		<mark>χ²(df, N)</mark> (p)	Have cons alcoho last 30 % (95 n=2	e you umed I in the I days? 5% CI) 2858	<mark>χ²(df, N)</mark> (p)
	Yes	No	-	Yes	No	-	Yes	No	-
Gender									
Men	61.2	38.8	χ²(1,	80.3	19.7	χ²(1,	59.1	40.9	χ²(1,
	(59.5–	(37.2-	N=6720)	(78.5–	(18.0-	N=3664)	(56.7–	(38.6-	N=2858)
	62.8)	40.5)	= 137.8,	82.0)	21.5)	= 15.8, p	61.4)	43.3)	= 18.9, p
Women	46.9	53.1	-p < 0.001	74.8	25.2	- < 0.001	50.9	49.1	- < 0.001
	(45.2–	(51.4–		(72.6–	(23.1–		(48.1–	(46.2–	
	48.6)	54.8)		76.9)	27.4)		53.8)	51.9)	
Age groups	1			1	1		1	1	1
18–24	35.7	64.3	χ ² (4,	70.5	29.5	χ²(4,	50.2	49.8	χ²(4,
	(32.7–	(61.2-	N=6720)	(65.5-	(24.8-	N=3664)	(43.9-	(43.5-	N=2858)
	38.8)	67.3)	= 179.7,	75.2)	34.5)	= 48.6, p	56.5)	56.1)	= 9.8, p < 0.001
25-34	51.9	48.1	- p < 0.001	80.5	19.5	- < 0.001	57.8	42.2	0.001
	(49.4–	(45.7–		(77.7-	(17.0-		(54.1-	(38.5-	
	54.3)	50.6)		83.0)	22.3)		61.5)	45.9)	
35–44	59.1	40.9		83.5	16.5	-	57.9	42.1	1
	(56.7–	(38.4–		(80.9-	(14.3-		(54.4-	(38.6-	
	61.6)	43.3)		85.7)	19.1)		61.4)	45.6)	
45-54	62.2	37.	_	78.2	21.8	-	51.8	48.2	
	(59.5–	(35.1–		(75.2-	(19.1-		(47.8-	(44.3-	
	64.9)	40.5)		80.9)	24.8)		55.7)	52.2)	
55+	55.8	44.2	-	71.5	28.5		56.8	43.2	
	(53.2–	(41.6–		(68.2-	(25.4-		(52.6-	(39.1-	
	58.4)	46.8)		74.6)	31.8)		60.9)	47.4)	
Ethnicity				1					•
	46.4	53.6	χ²(6,	75.6	24.4	χ²(6,	51.9	48.1	χ²(6,
Kazakh	(44.9-	(52.2-	N=6720)	(73.7-	(22.5-	N=3664)	(49.4-	(45.6-	N=2858)
	47.8)	55.1)	= 460.3,	77.5)	26.3)	= 15.5, p	54.4)	50.6)	= 28.9, p
	74.0	26.0	- p < 0.001	81.3	18.7	- < 0.001	61.9	38.1	- < 0.001
Russian	(71.8-	(23.9-		(79.0-	(16.5-		(58.7-	(35.1-	
	76.1)	28.2)		83.5)	21.0)		64.9)	41.3)	
	28.2	71.8	1	78.0	22.0	1	45.5	54.5	1
Uzbek	(22.5-	(65.2-		(65.9-	(13.4-		(31.7-	(40.1-	
	34.8)	77.5)		86.6)	34.1)		59.9)	68.3)	
	80.0	20.0	1	81.8	18.2	1	65.8	34.2	1
Ukrainian	(71.6-	(13.6-		(72.5-	(11.5-		(54.3-	(24.4-	
	86.4)	28.4)		88.5)	27.5)		75.6)	45.7)	1

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	64.9	35.1		76.0	24.0		47.4	52.6	
Uyghur	(48.8-	(21.8-		(56.6-	(11.5-		(27.3-	(31.7-	
	/8.2)	51.2)		88.5)	43.4)		68.3)	12.1)	
	67.5	32.5	-	78.8	21.2]	54.7	45.3	-
Tatar	(58.6-	(24.7-		(68.6-	(13.7-		(42.6-	(33.7-	
	75.3)	41.4)		86.3)	31.4)		66.3)	57.4)	
	63.6	36.4	-	79.6	20.4	-	55.4	44.6	-
Other	(58.3-	(31.4-		(73.7-	(15.5-		(47.8-	(37.2-	
	68.6)	41.7)		84.5)	26.3)		62.8)	52.2)	
Education leve	el							<u> </u>	
No formal	26.4	73.6	χ²(6,	78.9	21.1	χ²(6,	66.7	33.3	χ²(6,
education	(17.6-	(62.4-	N=6720)	(56.7	(8.5-	N=3664)	(41.7	(15.2	N=2858)
	37.6)	82.4)	= 63.2, p	-	43.3)	= 20.7, p	-	-	= 6.8, p =
			< 0.001	91.5)		= 0.004	84.8)	58.3)	0.455
Completed	54.5	45.5	1	83.3	16.7	1	40.0	60.0	-
primary	(28.0-	(21.3-		(43.6	(3.0-		(11.8	(23.1	
education (4	78.7)	72.0)		-	56.4)		-	-	
grades)				97.0)			76.9)	88.2)	
Completed	10.2	89.8		71.8	28.2		60.0	40.0	-
secondary	(8.9-	(88.5-		(65.3	(22.6		(52.0	(32.5	
education (9	11.5)	91.1)	\mathbf{n}	-	-		-	-	
grades)				77.4)	34.7)		67.5)	48.0)	
Completed	49.2	50.8		75.8	24.2	-	56.7	43.3	-
secondary	(46.9-	(48.4-		(72.9	(21.5		(53.0	(39.6	
education	51.6)	53.1)			-		-	-	
(11 grades)	ŕ	,		78.5)	27.1)		60.4)	47.0)	
Higher	57.5	42.5	-	80.9	19.1	-	55.4	44.6	-
education	(55.7-	(40.8-		(79.0	(17.3		(52.8	(42.0	
	59.2)	44.3)		<u> </u>	-		-	-	
	ŕ			82.7)	21.0)		58.0)	47.2)	
Master's/Ph	56.4	43.6	-	74.9	25.1	-	54.7	45.3	_
D/Doctorate	(53.7-	(40.8-		(71.5	(22.1		(50.5	(41.1	
	59.2)	46.3)		-	-		-	-	
				77.9)	28.5)		58.9)	49.5)	
	43.9	56.1	-	76.5	23.5		43.6	56.4	-
No answer	(35.1-	(47.0-		(63.2-	(14.0-		(29.3-	(41.0-	
	53.0)	64.9)		86.0)	36.8)		59.0)	70.7)	
Occupation			<u> </u>	<u> </u>	I	<u> </u>	<u> </u>	<u>I</u>	1
Government	50.6	49.4	χ²(9,	82.0	18.0	χ²(9,	52.4	47.6	χ²(9,
employee	(46.6-	(45.4-	N=6720)	(77.9-	(14.3-	N=3664)	(47.2-	(42.5-	N=2858)
empioyee	54.6)	53.4)	= 257.8,	85.7)	22.1)	= 62.5, p	57.5)	52.8)	= 15.6, p
Private	63.5	36.5	p < 0.001	80.3	19.7	< 0.001	57.0	43.0	= 0.112
sector	(60.9-	(33.9-		(77.9-	(17.4-		(54.3-	(40.4-	
employee	66.1)	39.1)		82.6)	22.1)		59.6)	45.7)	
Dudat	47.4	52.6	-	75.5	24.5	-	58.5	41.5	-
Hudgot		(10.1	1	(71.1	(20.4		(52.0	000	1
omploses	(42.9-	(48.1-		(/1.1-	(20.4-		(52.8-	(36.0-	

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F (60.9	39.1		81.8	18.2		59.7	40.3	
Entrepreneur	(55.6-	(33.9-		(77.1-	(14.1-		(53.9- 65 3)	(34.7-	
	00.1)				22.7)	-	05.5)	+0.1)	
Agriculture	44.0	56.0		90.9	9.1		40.0	60.0	
worker	(29.8-	(41.3-		(78.3-	(2.5-		(21.9-	(38.7-	
	58.7)	70.2)		97.5)	21.7)		61.3)	78.1)	
	36.1	63.9		63.9	36.1	-	40.6	59.4	
Student	(30.0-	(57.6-		(55.8-	(28.6-		(29.8-	(47.6-	
	42.4)	70.0)		71.4)	44.2)		52.4)	70.2)	
	37.1	62.9		72.0	28.0	-	54.4	45.6	
Housewife	(31.1-	(56.6-		(65.7-	(22.2-		(46.0-	(37.5-	
	43.4)	68.9)		77.8)	34.3)		62.5)	54.0)	
	54.2	45.8		69.5	30.5	-	52.2	47.8	
Pensioner	(48.4-	(40.1-		(63.6-	(25.0-		(46.0-	(41.7-	
	59.9)	51.6)		75.0)	36.4)		58.3)	54.0)	
Unemployed	41.9	58.1		79.4	20.6	-	56.6	43.4	
(able to	(36.0-	(52.0-		(72.9-	(15.2-		(47.4-	(34.6-	
work)	48.0)	64.0)		84.8)	27.1)		65.4)	52.6)	
Unemploved	25.9	74.1		41.2	58.8	-	42.9	57.1	
(unable to	(15.8-	(61.8-		(24.7-	(40.7-		(15.8-	(25.0-	
work)	38.2)	84.2)	\mathbf{O}	59.3)	75.3)		75.0)	84.2)	
	55.2	44.8		62.5	37.5	-	50.0	50.0	
No answer	(36.0-	(26.4-		(40.6-	(18.8-		(23.7-	(23.7-	
	73.6)	64.0)		81.2)	59.4)		76.3)	76.3)	
Smoking stat	us	1		L					
G 1	81.4	18.6	$\chi^{2}(1, (720))$	87.1	12.9	$\chi^2(1,$	66.4	33.6	$\chi^{2}(1,$
Smokers	(79.8-	(16.4-	N=6/20)	(85.4-	(11.4-	N=3664)	(64.4-	(31.7-	N=2858)
	83.0)	20.9)	= 4/7.1, n < 0.001	88.0)	14.0)	= /1.0, p < 0.001	08.3)	33.0)	= 62.9, p < 0.001
Non	47.6	52.4	p < 0.001	74.3	25.7	< 0.001	50.6	49.4	< 0.001
smokers	(46.0-	(50.8-		(72.8-	(24.3-		(49.1-	(47.8-	
SHICKCIS	49.2)	54.0)		75.7)	27.2)		52.2)	50.9)	
Marital statu	S	<u> </u>	I	I		0,		I	I
a. 1	51.1%(4	48.9	χ²(6,	75.4	24.6	χ²(6,	57.0	43.0	χ²(6,
Single	8.6 -	(46.3 -	N=6720)	(72.4 -	(21.6 -	N=3664)	(53.0-	(39.1-	N=2858)
	53.7)	51.4)	= 101.5, n < 0.001	78.4)	27.6)	= 39.4, p	60.9)	47.0)	= 3.2, p = 0.780
	52.6	47.4	p < 0.001	79.5	20.5	~ 0.001	55.7	44.3	0.780
Married	(51.1 -	(45.9 -		(77.9 -	(18.9 -		(53.4-	(42.1-	
	54.1)	48.9)		81.1)	22.1)		57.9)	46.6)	
Married but	46.3	53.7	1	64.0	36.0	1	37.5	62.5	
living	(33.0 -	(40.4 -		(45.2 -	(17.2 -		(18.5-	(38.6-	
separately	59.6)	67.0)		82.8)	54.8)		61.4)	81.5)	
	72.8	27.2	1	80.1	19.9	1	54.9	45.1	
Divorced	(68.4 -	(22.8 -		(75.5 -	(15.2 -		(48.4-	(38.8-	
	77.2)	31.6)		84.8)	24.5)		61.2)	51.6)	
	61.3	38.7		60.4	39.6	1	54.1	45.9	
Widowed	(55.0 -	(32.3 -		(52.3 -	(31.4 -		(43.6-	(35.7-	
	67.7)	45.0)		68.6)	47.7)		64.3)	56.4)	

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Civil marriage	86.1 (78.1 - 94.1)	13.9 (5.9 - 21.9)		87.1 (78.8 - 95.4)	12.9 (4.6 - 21.2)	55.6 (42.4- 68.0)	44.4 (32.0- 57.6)	
Refused to answer	77.8 (50.6 - 104.9)	22.2 (- 4.9 - 49.4)	-	57.1 (20.5 - 93.8)	42.9 (6.2 - 79.5)	40.0 (11.8- 76.9)	60.0 (23.1- 88.2)	
Total	3633 54,1	3087 45,9		2855 77,9	809 22,1	57.0 (53.0- 60.9)	43.0 (39.1- 47.0)	

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