

# IMPACT OF ADVERSE CHILDHOOD EXPERIENCES ON ALCOHOL USE IN EMERGING ADULTS IN MONTENEGRO AND ROMANIA

## VPLIV NEUGODNIH IZKUŠENJ V OTROŠTVU NA UŽIVANJE ALKOHOLA PRI MLADIH IZ ČRNE GORE IN RUMUNIJE NA PREHODU IZ MLADOSTNIŠTVA V ODRASLOST

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### ABSTRACT

#### Keywords:

adverse childhood experiences, alcohol use, prevention, South Eastern Europe

**Background:** Aiming at generating evidence for formulating targeted and cost-effective public health interventions for the effective control of alcohol use (AU) in emerging adults in South Eastern Europe. The study's objective was to assess if alcohol users experience adverse childhood experiences (ACE) more often than non-users, and to identify which ACE victims are the most vulnerable to AU.

**Methods:** The data was collected in 2010-2012 in two cross-sectional studies conducted in university settings in Montenegro and Romania (overall response rate 89.1%). In the present study, 3,283 students were included. The international ACE Study Questionnaires were used as a base for study instruments for collecting information on ACEs, health behaviours, and socio-economic factors. The association between AU and individual ACEs, adjusted to background factors, was assessed by using logistic regression.

**Results:** From the child maltreatment group, three ACEs were included in the final model as statistically significantly associated with AU, all of them from physical neglect/abuse types: frequently being hit so hard to have marks or being injured (OR=1.68; p=0.012), frequently being spanked (OR=1.38; p=0.012), and frequently having no person to take to the doctor if necessary (OR=0.58; p=0.031). From the household dysfunction group, two ACEs were included in the final model: exposure to mental health problems in the household (OR=2.85; p<0.001), and living with a problematic drinker/alcoholic (OR=1.51; p=0.019).

**Conclusions:** The effect of exposure to ACEs on AU persists into emerging adulthood. This should be considered when developing cost-effective response to AU burden through targeted interventions, in particular in settings with scarce resources.

### IZVLEČEK

#### Ključne besede:

neugodne izkušnje v otroštvu, uživanje alkohola, preventiva, jugovzhodna Evropa

**Ozadje:** Z namenom priskrbeti dokaze za oblikovanje ciljanih stroškovno učinkovitih javnozdravstvenih ukrepov za nadzor nad uživanjem alkohola (UA) pri mladih na prehodu iz mladostništva v odraslost v jugovzhodni Evropi je bil cilj študije ugotoviti, katere žrtve neugodnih izkušenj v otroštvu (NIVO) so najbolj ranljive za UA.

**Metode:** Podatki so bili zbrani v letih 2010-2012 v dveh presečnih študijah, ki sta se izvajali v univerzitetnih okoljih v Črni gori in Romuniji. V študijo je bilo vključenih 3.283 študentov. Kot orodje sta bila uporabljena vprašalnika, temelječa na mednarodni raziskavi o NIVO. Z njima so bili zbrani podatki o NIVO, tveganjih vedenjih in socio-ekonomskih dejavnikih. Stopnja povezanosti med UA in posameznimi NIVO je bila ob upoštevanju dejavnikov ozadja ocenjena z logistično regresijo.

**Rezultati:** V končni model so bile kot statistično pomembne vključene tri NIVO iz skupine trpinčenja otrok, vse iz skupine telesnega zanemarjanja/zlorabe: otrok je bil pogosto udarjen tako močno, da so bile vidne modrice/poškodbe (OR = 1,68; p = 0,012), pogosto šeskan (OR = 1,38; p = 0,012) in pogosto ni bilo osebe, ki bi ga odpeljala k zdravniku, če je bilo potrebno (OR = 0,58; p = 0,031). Vključeni sta bili tudi dve NIVO iz skupine disfunkcije gospodinjstva: izpostavljenost duševnim motnjam v gospodinjstvu (OR = 2,85; p < 0,001) in skupno bivanje z alkoholikom/osebo, ki je pogosto uživala alcohol (OR = 1,51; p = 0,019).

**Zaključki:** UA v obdobju prehoda iz mladostništva v obdobje odraslosti je očitno povezano z izpostavljenostjo NIVO. To je treba upoštevati pri razvoju stroškovno učinkovitega odziva na breme UA s ciljanimi ukrepi, zlasti v tistih okoljih, v katerih so viri omejeni.

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## 1 INTRODUCTION

Alcohol has been identified as a leading and one of the most harmful risk factors for global disease burden (1-3). Until recently, research has been focused on harmful alcohol use/abuse or early initiation of alcohol use/abuse. However, the recent work of the Global Burden of Disease (GBD) 2016 Alcohol Collaborators' Group has shown that use of alcohol at relatively low levels is not beneficial and, in fact, may be harmful even at levels considered today as moderate. Consequently, any alcohol use (AU) should be considered as harmful (4). Especially vulnerable to AU are adolescents and young people in transition to adulthood (5, 6).

Factors associated with AU are numerous and among them are included adverse childhood experiences (ACEs) (7-10). Evidence shows that AU is a common coping strategy adopted by ACEs victims to deal with the trauma (11), or to gain control over the negative experience (12).

In a special developmental stage, situated between late adolescence and adulthood (13) (young people aged 18-29), AU is frequently observed (14). The reason for this lies in the fact that, while addressing many development tasks, emerging adults tend to engage in risk-taking behaviours due to underdeveloped coping mechanisms, with AU being among them (13, 15). While a vulnerability to AU can be increased additionally in those with ACEs (16).

The biggest burden of AU is recorded in the European Region (3, 17). Within this region, in all the South Eastern Europe (SEE) countries with available data (Albania, Bosnia, Bulgaria, Croatia, Montenegro, Northern Macedonia, Romania, Serbia and Slovenia) alcohol per capita consumption (APC) in litres of pure alcohol (2015-2017 average, adjusted for tourist consumption) in males is well above the average APC in Europe as a whole (9.8 litres) (3). In Bulgaria, Romania, Serbia and Slovenia the APC is also above the European region average in terms of total population.

According to our knowledge, there were no studies yet to investigate the association between AU and ACEs in emerging adults in SEE countries in details yet. A better understanding of the ACEs underlying the risk for AU is critical for developing more effective prevention and early intervention measures in this part of Europe.

Aiming at generating evidence for formulating targeted and cost-effective public-health interventions for effective control of AU in emerging adults in the SEE region, the study objective was to assess if alcohol users experienced ACEs more often than non-users.

## 2 METHODS

### 2.1 Study Design, Study Population/Sampling, Timeframe

The data were collected in 2010-2012 from two cross-sectional studies conducted in Montenegro and Romania, as a result of their collaboration with the World Health Organization. In Montenegro 1600 (18) and in Romania 2500 (19) university students were invited to participate in the study, altogether 4100 students. In Montenegro, the sample was designed as a two-stage stratified sample. The units of the first stage were faculties, selected proportionate to the number of students enrolled in the first year in the academic year. The sample frame included 22 faculties of the University of Montenegro, two faculties of Mediterranean University and one of the Donja Gorica University. In total, 12 faculties were selected from the University of Montenegro, and all faculties from other two universities. The second-stage units were the first year students. The survey took into account gender structure of the participants (18). In Romania, the study sample was stratified according to development region and city type. The number of participants in each stratum was on the basis of the number of recorded students from the institutions from a specific city in a specific region. For each stratum, 1-2 institutions were selected. In the final sample four universities from North-West region, three from Bucharest, the Central, and North-East regions, two from West region, and one university from South-East and South-West regions were included. At each institution afterwards a random sample of bachelor and master programs participants was selected. The sample structure was compared to target population structure from national statistics (19). In the present study, only students belonging to the emerging adult population group were included.

### 2.2 Study Instrument

The international ACE Study Questionnaires (Family Health History Questionnaire, Health Appraisal Questionnaire) (20) were used as a base for study instruments (18, 19). Some variations have been introduced to the surveys to investigate more objectively the national contexts (18, 19), e.g. in Montenegro a special set of questions about the injury students might have had by the age of 18, disabling them from performing their usual activities, was added. The questionnaires contained separate questions for males and females. A piloting of the self-administered questionnaire was conducted to check whether respondents understood questions consistently, including their ability to provide meaningful answers (18, 19).

### 2.3 Observed Outcome

In Montenegro, the use of alcohol was assessed through a question "Have you ever drunk any alcohol in your life (other than a few sips)?" Answers were dichotomous (0=no, 1=yes). In Romania a question "Never drank alcohol?" was offered. For the purpose of analysis, all respondents who replied that they "never drank alcohol" were coded with 0=no, while all others with 1=yes. This resulted in a common observed outcome variable AU (0=no, 1=yes) in both countries.

### 2.4 Explanatory and Confounding Factors

As explanatory factors, different ACEs were considered. The child maltreatment group included five ACE types: physical neglect, physical abuse, emotional neglect, emotional abuse, sexual abuse, and within them thirteen ACEs. In the vast majority of them, frequent experience (very often or often) was of interest. The household dysfunction group also included five ACE types: experience of substances abuse in the household, experience of mental problems in the household, experience of violence against mother, held an incomplete family status in comparison to those coming from a complete family, experienced some kind of criminal behaviour in the household, and within them eleven ACEs. In the majority of them, only existence of experience was observed.

As confounders country, participants' gender and age group, and participants' parents' education level and employment status were considered.

### 2.5 Methods of Analysis

In both, univariate and multivariate analysis of association between AU and individual ACEs binary logistic regression was used: the direct method in univariate analysis and the stepwise method in multivariate analysis (Forward Selection Likelihood Ratio method - method with entry testing based on the significance of the score statistic, and removal testing based on the probability of a likelihood-ratio statistic based on the maximum partial likelihood estimates [21]). As confounders country (0=Romania, 1=Montenegro), participants' gender (0=males, 1=females) and age group (in years: 0=18-19, 1=20-21, 2=22-23, 3=24-29) and participants' parents' education level (0=no school or elementary/some high school, 1=completed high school, 2=some college or high school/university or more) and employment status (0=employed, 1=unemployed) were included. The dummy variables were created for categorical explanatory/confounding factors with more than two categories (the simple method was applied). A p-value  $\leq 0.05$  was considered significant in all statistical tests. The SPSS statistical software for Windows (Version 21.0; IBM Corp.; Armonk, NY, USA) (Licence: University of Ljubljana, Slovenia) was used as a tool for analysis.

## 3 RESULTS

### 3.1 Study Group Description

The overall response rate was 89.1% (3,653/4,100). It was higher in Montenegro (1,565/1,600; 97.8%) than in Romania (2,088/2,500; 83.5%). Among respondents, 3,283 (89.9%) were aged 18-29 years. In Table 1 their characteristics are presented.

The prevalence of an individual ACE is also presented in Table 1. In summary, in the child maltreatment group, the largest share of respondents (34.6%) reported physical abuse as they were frequently spanked. In the household dysfunction group, the largest number of respondents (17.2%) reported substance abuse in the household as they lived with a problematic drinker. A further extraction revealed that only 971/2,575 (37.7%) of participants didn't experience any ACE type during their childhood, while 62.3% experienced at least one in total (one ACE type: 29.4%; two ACE types: 15.8%; three ACE types: 8.4%; four or more ACE types: 8.7%).

**Table 1.** Selected socio-economic factors and adverse childhood experiences in students from Romania and Montenegro (n=3,283).

Factor group/factor	Category	N(%)
<b>SOCIO-ECONOMIC FACTORS</b>		
<b>Gender</b>	Females	1,899(57.8%)
	Males	1,384(42.2%)
<b>Age (years)</b>	18-19	1,167(35.5%)
	20-21	1,084(33.0%)
	22-23	666(20.3%)
	24-29	366(11.1%)
<b>Mother's education</b>	No school/elementary/some high school	620(19.0%)
	Completed high school	1,539(47.2%)
	Some college/high school/university or more	1,102(33.8%)
<b>Father's education</b>	No school/elementary/some high school	653(20.0%)
	Completed high school	1,362(41.8%)
	Some college/high school/university or more	1,246(38.2%)
<b>Mother's employment status</b>	Employed	2,363(73.2%)
	Unemployed	865(26.8%)
<b>Father's employment status</b>	Employed	2,688(85.5%)
	Unemployed	457(14.5%)
<b>ADVERSE CHILDHOOD EXPERIENCES</b>		
<b>• CHILD MALTREATMENT GROUP EXPERIENCES</b>		
<b>Physical neglect experiences</b>		
Frequently* didn't have enough to eat	Yes	99(3.1%)
Frequently had to wear dirty clothes	Yes	50(1.5%)
Frequently no person to take to the doctor if necessary	Yes	172(5.4%)
<b>Physical abuse experiences</b>		
Frequently being pushed, grabbed, etc., by somebody	Yes	104(3.4%)
Frequently being hit so hard to have marks or being injured	Yes	419(13.7%)
Frequently being spanked	Yes	1,120(34.6%)
<b>Emotional neglect experiences</b>		
Frequently felt not loved	Yes	163(5.1%)
Frequently parents wished had never been born	Yes	120(3.7%)
Frequently being hated by someone in the family	Yes	271(8.4%)
<b>Emotional abuse experiences</b>		
Frequently being sworn at, insulted, or put down	Yes	180(5.8%)
Frequently being afraid that might be physically hurt	Yes	114(3.7%)
Frequently being called "lazy" or "ugly"	Yes	280(8.7%)
<b>Sexual abuse experiences</b>		
Experienced an attempt of or actual sexual intercourse	Yes	128(4.4%)
<b>• HOUSEHOLD DYSFUNCTION GROUP EXPERIENCES</b>		
<b>Substance abuse by household member experiences</b>		
Lived with a problematic drinker or alcoholic	Yes	556(17.2%)
Lived with someone who used street drugs	Yes	93(2.9%)
<b>Mental health problems of household member experiences</b>		
Lived with somebody depressed or mentally ill	Yes	257(7.9%)
Experienced a suicide attempt in the household	Yes	133(4.1%)
<b>Violence against mother experiences</b>		
Frequently experienced pushing, grabbing, slapping mother, etc.	Yes	111(3.4%)
Frequently experienced kicking, biting, hitting mother	Yes	192(6.0%)
Frequently experienced repeated hitting of mother	Yes	236(7.4%)
Frequently experienced threatening mother	Yes	119(3.7%)
<b>Family separation experiences</b>		
Family status	Primary family complete	2,763(85.6%)
	Parents divorced, no new partners	286(8.9%)
	Parents divorced, stepfather	118(3.7%)
	Parents divorced, stepmother	26(0.8%)
	Parents divorced, stepfather and stepmother	14(0.4%)
	Foster family	20(0.6%)
<b>Criminal behaviour by household member experiences</b>		
Experienced an incarceration of household member	Yes	154(4.7%)
Experienced a commitment of a crime by household member	Yes	82(2.5%)

Legend: \*=very often or often

**Table 2.** Prevalence of alcohol use (as %), in students from Romania and Montenegro (n=3,283), along with results of univariate analysis of relationship between alcohol use and risk factors.

Factor	Category	Prevalence	OR (95% CI limits for OR)	p
<b>ADVERSE CHILDHOOD EXPERIENCES</b>				
<b>• CHILD MALTREATMENT GROUP</b>				
<b>Physical neglect experiences</b>				
Frequently* did not have enough to eat	No (RC)	78.9%		
	Yes	80.6%	1.12(0.67-1.85)	0.675
Frequently had to wear dirty clothes	No (RC)	78.7%		
	Yes	84.0%	1.42(0.66-3.04)	0.364
Frequently not present to take to the doctor if necessary	No (RC)	79.0%		
	Yes	76.0%	0.84(0.59-1.21)	0.350
<b>Physical abuse experiences</b>				
Frequently being pushed, grabbed, etc., by somebody	No (RC)	79.2%		
	Yes	90.2%	2.42(1.25-4.67)	0.009
Frequently being hit so hard to have marks or being injured	No (RC)	78.6%		
	Yes	86.0%	1.67(1.25-2.24)	0.001
Frequently being spanked	No (RC)	75.9%		
	Yes	84.3%	1.71(1.42-2.07)	<0.001
<b>Emotional neglect experiences</b>				
Frequently felt not loved	No (RC)	78.5%		
	Yes	83.2%	1.36(0.89-2.07)	0.157
Frequently parents wished had never been born	No (RC)	78.6%		
	Yes	82.4%	1.27(0.79-2.05)	0.326
Frequently being hated by someone in the family	No (RC)	78.1%		
	Yes	85.3%	1.63(1.15-2.32)	0.006
<b>Emotional abuse experiences</b>				
Frequently being sworn at, insulted, or put down	No (RC)	78.9%		
	Yes	88.1%	1.99(1.25-3.16)	0.004
Frequently being afraid that might be physically hurt	No (RC)	79.2%		
	Yes	90.2%	2.41(1.29-4.52)	0.006
Frequently being called "lazy" or "ugly"	No (RC)	78.3%		
	Yes	83.8%	1.43(1.03-1.99)	0.035
<b>Sexual abuse experiences</b>				
Experienced an attempt of or actual sexual intercourse	No (RC)	78.7%		
	Yes	85.0%	1.56(0.95-2.56)	0.080
<b>• HOUSEHOLD DYSFUNCTION GROUP</b>				
<b>Substance abuse by household member</b>				
Lived with a problematic drinker or alcoholic	No (RC)	77.2%		
	Yes	87.5%	2.06(1.57-2.69)	<0.001
Lived with someone who used street drugs	No (RC)	78.5%		
	Yes	88.0%	2.01(1.07-3.78)	0.031
<b>Mental health problems of household member</b>				
Lived with somebody depressed or mentally ill	No (RC)	77.9%		
	Yes	88.6%	2.21(1.48-3.28)	<0.001
Experienced a suicide attempt in the household	No (RC)	78.4%		
	Yes	87.0%	1.85(1.10-3.10)	0.020
<b>Violence against mother</b>				
Frequently experienced pushing, grabbing, slapping mother, etc.	No (RC)	78.4%		
	Yes	86.9%	1.83(1.04-3.23)	0.038
Frequently experienced kicking, biting, hitting mother	No (RC)	78.0%		
	Yes	88.7%	2.22(1.40-3.52)	0.001
Frequently experienced repeated hitting of mother	No (RC)	78.1%		
	Yes	85.3%	1.63(1.12-2.36)	0.011
Frequently experienced threatening mother	No (RC)	78.4%		
	Yes	88.8%	2.18(1.22-3.91)	0.009

Factor	Category	Prevalence	OR (95% CI limits for OR)	p
<b>Family separation</b>	Primary family complete (RC)	77.3%		
Family status	Parents divorced, no new partners	86.6%	1.91(1.34-2.71)	<0.001
	Parents divorced, stepfather	90.5%	2.81(1.50-5.26)	0.001
	Parents divorced, stepmother	84.0%	1.52(0.53-4.52)	0.427
	Parents divorced, stepfather and stepmother	85.7%	1.77(0.39-7.91)	0.458
	Foster family	75.0%	0.88(0.32-2.44)	0.810
<b>Criminal behaviour by household member</b>				
Experienced an incarceration of a household member	No (RC)	78.5%		
	Yes	84.2%	1.46(0.94-2.28)	0.094
Experienced a commitment of a crime by a household member	No (RC)	78.4%		
	Yes	91.4%	2.91(1.33-6.34)	0.007
<b>CONFOUNDING FACTORS</b>				
<b>Country</b>	Romania (RC)	86.6%		
	Montenegro	69.6%	0.35(0.30-0.42)	<0.001
<b>Gender</b>	Female (RC)	71.8%		
	Male	88.4%	2.98(2.45-3.62)	<0.001
<b>Age (years)</b>	18-19 (RC)	68.9%		
	20-21	83.1%	2.00(1.25-3.20)	0.004
	22-23	84.6%	2.10(1.26-3.52)	0.004
	24-29	87.2%	1.25(0.61-2.53)	0.541
<b>Mother's education</b>	No school or elementary/some high school (RC)	77.7%		
	Completed high school	76.9%	0.76(0.59-0.97)	0.029
	Some college or high school/university or more	82.1%	0.72(0.60-0.88)	0.001
<b>Father's education</b>	No school or elementary/some high school (RC)	79.2%		
	Completed high school	76.5%	0.90(0.71-1.14)	0.369
	Some college or high school/university or more	80.9%	0.77(0.63-0.93)	0.006
<b>Mother's employment status</b>	Employed (RC)	81.3%		
	Unemployed	72.1%	0.59(0.50-0.71)	<0.001
<b>Father's employment status</b>	Employed (RC)	78.7%		
	Unemployed	81.4%	1.19(0.92-1.53)	0.191

Legend: OR=odds ratio; CI=confidence interval; \*=very often or often; RC=reference category

**Table 3.** Results of multiple stepwise logistic regression (Forward Selection Likelihood Ratio method) of relationship between use of alcohol and adverse childhood experiences adjusted to confounding factors in a sample of students from Romania and Montenegro (n=2,437).

Factor	Category	OR (95% CI limits for OR)	p
<b>ADVERSE CHILDHOOD EXPERIENCES</b>			
<b>• CHILD MALTREATMENT GROUP</b>			
Frequently no person to take to the doctor if necessary	No (RC)		
	Yes	0.58(0.35-0.95)	0.031
Frequently being hit so hard to have marks or being injured	No (RC)		
	Yes	1.68(1.12-2.52)	0.012
Frequently being spanked	No (RC)		
	Yes	1.38(1.07-1.77)	0.012
<b>• HOUSEHOLD DYSFUNCTION GROUP</b>			
Lived with a problematic drinker/alcoholic	No (RC)		
	Yes	1.51(1.07-2.13)	0.019
Lived with somebody depressed or mentally ill	No (RC)		
	Yes	2.85(1.59-5.10)	<0.001
<b>CONFOUNDING FACTORS</b>			
Country	Romania (RC)		
	Montenegro	0.25(0.20-0.32)	<0.001
Gender	Males (RC)		
	Females	0.28(0.22-0.36)	<0.001
Mother's education	No school/elementary/some high school (RC)		
	Completed high school	0.58(0.38-0.87)	0.009
	Some college/high school/university or more	0.74(0.56-0.99)	0.043
Father's education	No school/elementary/some high school (RC)		
	Completed high school	0.61(0.41-0.91)	0.015
	Some college/high school/university or more	0.87(0.66-1.15)	0.338
Mother's employment status	Employed (RC)		
	Unemployed	0.70(0.55-0.89)	0.003

Legend: OR=odds ratio; CI=confidence interval; \*=very often or often; RC=reference category

### 3.2 Results of Univariate Analysis

The data on alcohol consumption was available from 3,221/3,283 (98.1%) respondents. Among them, 2,538 (78.7%) reported on AU. In ACEs victims, the prevalence of AU ranged from 75.0-91.4% (Table 2).

In the child maltreatment group of ACEs, the results of univariate analysis revealed the strongest association in terms of odds ratio (OR) in respondents frequently pushed, grabbed, etc., by somebody (OR=2.42[95% CI: 1.25-4.67]), almost the same as in those frequently being afraid that they might be physically hurt (OR=2.41[95% CI: 1.29-4.52]). In the household dysfunction group, OR was the highest in respondents living with a household member who committed a crime (OR=2.91[95% CI: 1.33-6.34]). Among confounders, the highest OR was observed between male and female respondents (OR=2.98[95% CI: 2.45-3.62]). All other results are presented in Table 2.

### 3.3 Results of Multivariate Analysis

All data necessary to perform multiple logistic regression analysis was present in 2,437/3,283 participants (74.2%). From the child maltreatment group, three ACEs were included in the final model, all of them from physical neglect/abuse types. The strongest association was recorded in respondents reporting no person to take to the doctor if necessary (OR=0.58[95% CI: 0.35-0.95]). Very similar was the OR in respondents frequently hit so hard to have marks or being injured (OR=1.68[95% CI: 1.12-2.52]). From the household dysfunction group, two ACEs were included. The strongest association was recorded in respondents who were living with somebody depressed or mentally ill (OR=2.85[95% CI: 1.59-5.10]). All other results are presented in Table 3.

#### 4 DISCUSSION

The results of the present study show that among emerging adults in the observed countries the prevalence of key phenomena, AU and experiencing at least one ACE type during childhood, are both very common. The deeper insight into the relationship between them suggests that physical type of ACEs is more strongly associated with AU patterns than emotional type, since no ACE of emotional type were included in the multivariate model. Among household dysfunction factors, growing up in a home with alcohol abuse or mentally ill household members proved to be the only significant predictor of AU patterns.

A comparison of the results of our study to older research, which has only focused on harmful or early use of alcohol, was not easy. Nevertheless, we were able to make some comparisons. Finding that physical abuse is associated with AU is consistent with the study of Kauhanen et al., which stated that a punishing parenting style increased the risk of early AU as early as adolescence (8). Results from a US community survey indicated that physical punishment in teenage years significantly increased AU in adulthood (22). Shin et al. reported that physical abuse victims adopt maladaptive coping styles, including AU, when peer and social environments provide drinking opportunities for young victims who are poorly equipped over time to handle a variety of developmental challenges. Additionally, they claim that reduced social control and adoption of "adult" roles, both common in emerging adults, have the potential to increase AU problems (23). Surprisingly, frequent experience of no person to take to the doctor, if necessary, was included in the final model and even more, as a protective factor. This could be related to sense of coherence, the core construct of the Antonovsky's salutogenic model (24, 25). Children growing up in unfavourable environments, as long as the experiences are not heavily traumatizing, can also develop intrinsic coping mechanisms, strengthening their ability to resist some unhealthy behaviours, including AU. This hypothesis is supported by the results of studies in the past (25), as well as some newer studies, e.g. the study of Mendes Moutinho et al. (26).

As suggested by others, children's environments determine the development of health behaviours (27). As reported by Chartier et al., parents demonstrating negative role models are promoting poor health habits in their children (28). Greater susceptibility to AU in respondents who grow up with an alcoholic, is consistent with evidence on familial alcoholism as a strong risk factor for alcohol dependence (9, 29). It was reported by Bennett et al. that children of alcoholics are four- to five-times more likely to become alcoholics than other children, while biological children of alcoholics who are adopted to other homes have a two- to nine-fold increased risk of developing

alcoholism (30). Consequently, it should not be neglected that genetics may also play its role in the observed association (8, 9). However, some evidence suggests that a strong effect of early adversity on the risk of AU was independent of family history (31).

Among other important results, there are two key findings. Our finding that AU is more common among male ACE victims compared to females, which echoes evidence from previous research on gender differences in adult drinking patterns related to ACE exposure (32). However, the findings on the impact of gender on association between ACEs and AU seem to be inconsistent. One of the most rigorous longitudinal studies of ACEs (33) found that maltreatment during childhood was unrelated to men's alcohol use in early/middle adulthood, while female ACE victims were at significantly higher risk compared to non-victims. Other studies report that there were no gender differences in the effects of early child abuse on AU (34, 35). As suggested by Strine et al., it is possible that gender stereotypes describing men/boys as being resilient contributed to having much of the research to date examining the association between ACEs and problem drinking in females (32). Another important result of our study suggests that mother's unemployment could be a protective factor. It seems that unemployed mothers have better prospects for continuous parental monitoring, better opportunities to promote family attachment and/or prosocial involvement as a guard against externalizing problem behaviours (32).

The study has some potential limitations. First, only students were included in the study, which could mean that findings are hardly representative of the general population, but the similarity of the study findings to those of population-based studies suggests that findings are applicable in other settings as well (10, 36). However, one needs to be careful when interpreting them. On the other hand, the very carefully conducted process of sample selection in both countries allows for generalizing the findings to the overall student population in Montenegro and Romania, while very high response rates minimize different kinds of biases, including information bias (18, 19). It is not expected that a slight difference in sampling procedures and response rates between both countries would have any major influence on the conclusions. Next, the different cultural backgrounds of respondents - coming from one country historically belonging to the former USSR influence zone and the other being a former Yugoslav country - might be seen as a potential cause for differential reporting between the respondents. However, shared contemporary EU perspectives and the values of both countries relativize the potential of biased reporting in this regard. Next, respondents may have certain difficulty recalling ACEs, leading to an underestimate of their actual occurrence. However, the

young age of our respondents makes problems of recall bias less likely. Finally, while having similarities with a study recently published by Bellis et al. (37), we used a different methodology (individual ACEs and not only the number of ACEs were considered). The methodology could be additionally improved by the inclusion of potential interactions between countries and the other background variables; however, this extension of analysis was out of the scope of this study and should be addressed in further research.

On the other hand, the study has several strengths that draw important public health implications. The most important is that the present study builds on the latest evidence that any alcohol use is harmful (4). This sets a new perspective on public health measures for alcohol harm reduction - measures focused on decreasing population-level consumption through tackling the affordability and availability of alcohol should be prioritized. Next, the study provides a special message that some phenomena regarded as nearly ubiquitous (here AU) may partly be a result of other very common phenomena (here ACEs). This means that, e.g. by targeting healthcare professionals' attitudes toward domestic violence (38), the burden of ACEs could be reduced and, consequently, partly also the burden of AU. Thus, the presented evidence suggests that strategies for AU prevention and control should integrate interventions for managing early adversities, which is true not only for Montenegro and Romania, but also for other countries in transition with similar socio-economic and cultural conditions. As evidence from countries neighbouring Montenegro and Romania shows, a holistic approach is needed in addressing unhealthy behaviour in young people (39). On this basis, we can conclude that the study findings could be effectively used to orient policymakers in designing evidence-based responses to child maltreatment, targeting the population subgroups prone to harmful use of alcohol while ensuring the efficient use of scarce resources for prevention.

Further research in the field is needed. First, the extension of the present study in terms of assessing potential interactions between the two countries and the other key background variables would be necessary. Next, it would be interesting also to identify the high-risk-for-AU profiles, which would be targeted with focused and consequently more cost-effective prevention interventions. A similar approach has already been suggested in addressing suicidal behaviour (40). However, both extensions of analysis were out of the scope of this study. Finally, a similar study in the non-student part of the population of emerging adults would be of great importance, broadening the knowledge about the problem in this subgroup, although more difficult to reach than the student population (41).

## 5 CONCLUSION

It can be concluded that the effect of exposure to childhood adversities on AU persists into emerging adulthood. Along with the most recent views on the problem that AU, even at moderate levels, may be harmful, this should be considered when planning preventive measures for the reduction of AU in younger age groups. Keeping in mind these facts, the study provides guidance for developing a cost-effective response to the AU burden through targeted interventions, in particular in scarce resources settings.

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## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

## ETHICAL APPROVAL

The study protocol was approved by the Ethical Committees of the respective countries (18, 19).

## REFERENCES

1. Rehm J. The risks associated with alcohol use and alcoholism. *Alcohol Res Health*. 2011;34:135-43.
2. Anderson P, Moller L, Galea G, editors. *Alcohol in the European Union: consumption, harm and policy approaches*. Copenhagen: WHO Regional Office for Europe, 2012.
3. WHO. *Global status report on alcohol and health 2018*. Geneva: WHO, 2018.
4. GBD 2016 Alcohol Collaborators. Alcohol use and burden for 195 countries and territories, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet*. 2018;392:1015-1035. doi: 10.1016/S0140-6736(18)31310-2.
5. Windle M. Alcohol use among adolescents and young adults. *Alcohol Res Health*. 2003;27:79-85.
6. Carvajal F, Manuel Lerma-Cabrera JM. Alcohol consumption among adolescents - implications for public health. In: Claborn D, ed. *Topics in public health*. London: IntechOpen, 2015.
7. American Academy of Pediatrics. *Adverse childhood experiences and the lifelong consequences of trauma*. Washington, DC: AAP, 2014. Accessed October 9, 2018 at: [https://www.aap.org/en-us/Documents/ttb\\_aces\\_consequences.pdf](https://www.aap.org/en-us/Documents/ttb_aces_consequences.pdf).

8. Kauhanen L, Leino J, Lakka HM, Lynch JW, Kauhanen J. Adverse childhood experiences and risk of binge drinking and drunkenness in middle-aged Finnish men. *Adv Prev Med.* 2011;2011(ID 478741):12. doi: 10.4061/2011/478741
9. Pilowsky DJ, Keyes KM, Hasin DS. Adverse childhood events and lifetime alcohol dependence. *Am J Public Health.* 2009;99:258-63. doi: 10.2105/AJPH.2008.139006.
10. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *Am J Prev Med.* 1998;14:245-58.
11. Hamburger ME, Leeb RT, Swahn MH. Childhood maltreatment and early alcohol use among high-risk adolescents. *J Stud Alcohol Drugs.* 2008;69:291-5.
12. Widom C, Ireland T, Glynn P. Alcohol abuse in abuse and neglected children followed-up: are they at increased risk?. *J Stud Alcohol.* 1995;56:207-17.
13. Arnett JJ. Emerging adulthood: A theory of development from the late teens through the twenties. *Am Psychol.* 2000;55:469-80. doi: 10.1037/0003-066X.55.5.469.
14. Lanctot J, Poulin. Emerging adulthood features and adjustment: a person-centered approach. *Emerging Adulthood.* 2017;6:91-103. doi: 10.1177/2167696817706024
15. Arnett JJ. *Adolescence and emerging adulthood: a cultural approach*, 3rd ed. Upper Saddle River, New Jersey: Pearson Education, 2007.
16. Allem JP, Soto DW, Baezconde-Garbanati L, Unger JB. Adverse childhood experiences and substance use among Hispanic emerging adults in Southern California. *Addict Behav.* 2015;50:199-204. doi: 10.1016/j.addbeh.2015.06.038.
17. WHO. *European action plan to reduce the harmful use of alcohol 2012-2020*. Copenhagen: WHO Regional Office for Europe, 2013.
18. IPHM. *Survey on adverse childhood experiences in Montenegro*. Copenhagen: WHO Regional Office for Europe and IPHM, 2013.
19. Baban A, Cosma A, Balazsi R, Sethi D, Olsavszky V. *Survey of adverse childhood experiences among Romanian university students: study report from the 2012 survey*. Copenhagen: WHO Regional Office for Europe, 2013.
20. CDC. *About the CDC-Kaiser ACE study*. Accessed October 9, 2018 at: <https://www.cdc.gov/violenceprevention/acestudy/about.html>.
21. IBM Corp. *IBM SPSS Regression 21*. Armonk, NY: IBM Corp, 2012.
22. Afifi TO, Mota NP, Dasiewicz P, MacMillan HL, Sareen J. Physical punishment and mental disorders: results from a nationally representative US sample. *Pediatrics.* 2012;130:184-92. doi: 10.1542/peds.2011-2947.
23. Shin SH, Miller DP, Teicher MH. Exposure to childhood neglect and physical abuse and developmental trajectories of heavy episodic drinking from early adolescence into young adulthood. *Drug Alcohol Depend.* 2013;127:31-8. doi: 10.1016/j.drugalcdep.2012.06.005
24. Antonovsky A. *Unraveling the mystery of health: how people manage stress and stay well*. San Francisco, CA: Jossey-Bass, 1987.
25. Mittelmark MB, Sagy S, Eriksson M, Bauer GF, Pelikan JM, Lindstrom B, Espnes GA, eds. *The handbook of salutogenesis*. Heidelberg: Springer, 2017.
26. Mendes Moutinho LS, Oliveira Cruz Mendes AM, Lopes MJ. Alcohol consumption and the sense of coherence in young people in educational training. *SMAD.* 2015;11:208-16. doi: 10.11606/issn.1806-6976.v11i4p208-216.
27. Kuh D, Power C, Blane D, Bartley M. Social pathways between childhood and adult health. In: Kuh D, Ben-Shlomo Y, eds. *A life course approach to chronic disease epidemiology*. New York, NY: Oxford University Press, 1997:169-99.
28. Chartier MJ, Walker JR, Naimark B. Health risk behaviors and mental health problems as mediators of the relationship between childhood abuse and adult health. *Am J Public Health.* 2009;99:847-54. doi: 10.2105/AJPH.2007.122408.
29. Anda RF, Whitfield CL, Felitti VJ, Chapman D, Edwards VJ, Dube SR, et al. Adverse childhood experiences, alcoholic parents, and later risk of alcoholism and depression. *Psychiatr Serv.* 2002;53:1001-9. doi: 10.1176/appi.ps.53.8.1001.
30. Bennett EM, Kemper KJ. Is abuse during childhood a risk factor for developing substance abuse problems as an adult? *J Dev Behav Pediatr.* 1994;15:426-9.
31. Dube SR, Anda RF, Felitti VJ, Edwards VJ, Croft JB. Adverse childhood experiences and personal alcohol abuse as an adult. *Addict Behav.* 2002;27:713-25.
32. Strine TW, Dube SR, Edwards VJ, Prehn AW, Rasmussen S, Wagenfeld M, et al. Associations between adverse childhood experiences, psychological distress, and adult alcohol problems. *Am J Health Behav.* 2012;36:408-23. doi: 10.5993/AJHB.36.3.11.
33. Widom CS, White HR. Problem behaviors in abused and neglected children grown-up: prevalence and co-occurrence of substance abuse, crime, and violence. *Criminal Behav Mental Health.* 1997;7:287-310.
34. Lansford JE, Dodge KA, Pettit GS, Bates JE. Does physical abuse in early childhood predict substance use in adolescence and early adulthood? *Child Maltreat.* 2010;15:190-4. doi: 10.1177/1077559509352359.
35. Thompson MP, Kingree JB, Desai S. Gender differences in long-term health consequences of physical abuse of children: data from a nationally representative survey. *Am J Public Health.* 2004;94:599-604.
36. Duke NN, Pettingell SL, McMorris BJ, Borowsky IW. Adolescent violence perpetration: associations with multiple types of adverse childhood experiences. *Pediatrics.* 2010;125:e778-86. doi: 10.1542/peds.2009-0597.
37. Bellis MA, Hughes K, Leckenby N, Jones L, Baban A, Kachaeva M, et al. Adverse childhood experiences and associations with health-harming behaviours in young adults: surveys in eight eastern European countries. *Bull World Health Organ.* 2014;92:641-55. doi: 10.2471/BLT.13.129247.
38. Zorjan S, Smrke U, Šprah L. The role of attitudes to, and the frequency of, domestic violence encounters in the healthcare professionals' handling of domestic violence cases. *Zdr Varst.* 2017;56:166-171. doi: 10.1515/sjph-2017-0022.
39. Koprivnikar H, Zupanic T. The use of different tobacco and related products, with and without flavours, among 15-year-olds in Slovenia. *Zdr Varst.* 2017;56:74-81. doi: 10.1515/sjph-2017-0010.
40. Brajovic M, Bellis M, Kucek A, Terzic N, Baban A, Sethi D, Zaletel-Kragelj L. Identification of adverse childhood experiences strongly predicting suicidal behaviour among emerging adults in Montenegro and Romania: a new way to targeted cost-effective prevention. *Ann Ist Super Sanita.* 2018;54:348-57. doi: 10.4415/ANN\_18\_04\_12.
41. Hanel PH, Vione KC. Do student samples provide an accurate estimate of the general public? *PLoS One.* 2016;11:e0168354. doi: 10.1371/journal.pone.0168354.