Institute of Economic Studies, Faculty of Social Sciences
Charles University in Prague

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Jakub Mikolasek

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Institute of Economic Studies,
Faculty of Social Sciences,
Charles University in Prague

[UK FSV – IES]

Opletalova 26
CZ-110 00, Prague
E-mail : ies@fsv.cuni.cz
http://ies.fsv.cuni.cz

Institut ekonomických studií
Fakulta sociálních věd
Univerzita Karlova v Praze

Opletalova 26
110 00 Praha 1

E-mail : ies@fsv.cuni.cz
http://ies.fsv.cuni.cz

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Jakub Mikolasek[a]

[a]Institute of Economic Studies, Faculty of Social Sciences, Charles University in Prague, Smetanovo nábřeží 6, 111 01 Prague 1, Czech Republic

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1 INTRODUCTION

Tax and legal constraints are the most prominent policymaker's tools to his effort to moderate alcohol consumption in order to improve public health and social welfare. But for any policy to be efficient, it needs either to be universally applicable, or the opposite - be focused on its target. In this paper, we go beyond the world of alcohol market, elasticities and aggregate demand curves to have a look at behavior of individual consumers. During our analysis, we find that it is gender, university ID card and a smoking cigarette, may correspond with dramatically different patterns of alcohol consumption. Although our results do not provide an answer to the question how to prevent alcohol abuse, neither uncovers its original roots, it can tell any policymaker "where to focus" their efforts.

In this paper, we are interested in whether the likelihood of an individual being an alcohol abuser can be predicted by some of descriptive socio-demographic factors such as age, marital status, smoking habits, education, employment status, income and municipality size. Unlike for other studies, which tend to assess the importance of an individual predictor disregarding possible influence of other individual characteristics, we let all descriptive variables enter a single logistic regression. Only this way, we can properly assess their individual strength in defining propensity an individual's propensity to heavy binge drinking.

Czech Republic provides a very suitable data samples for this type of analysis since its inhabitants' attitude to alcohol is more than warm. According to WHO (2014) methodology, estimating alcohol consumption by population over age of 15, Czech Republic has the doubtful privilege to be one of the World's leaders in per head alcohol consumption (in terms of annual pure-ethanol intake), with consumption of 13,0 liters (11,8 being reported consumption and 1,2 being an estimate of unreported volume)[1]. The European average reaches 10,9 liters. WHO report also mentions high incidence of heavy episodic drinking (53,5% for men aged 15+ whereas only 24,9% for women.) surpassed only by Ireland[2].

[1] Source: WHO (2014). The Czech Republic is actually the 9th country in WHO leaderboard, absulute leaders being Belarus (17,5 liters), Republic of Moldova (16,8 liters, due to high potential unreported consumption), Lithuania (15,4) and Russian Federation (15,1).

[2] For many countries, however, the data on heavy episodic drinking is unavailable

For to cross-validate our results, we use two datasets collected through two individual questionnaire researches. The first was done by Czech National Monitoring Centre for Drugs and Drug Addiction (2012). It tracks respondents' attitude towards alcohol, tobacco and other (mostly illicit) substances. The second survey was conducted by National Institute of Public Health (2009). It contains a very detailed set of alcohol-related questions including impact on one's health, psyche and social relations.

As expected, it turns out, that men are more than twice[3] more likely to abuse alcohol than women. In fact, the behavior of men and women is so much different, that it is sensible to run separate regressions for each of the sexes. Doing so uncovers some gender-specific findings, such as higher heavy drinking prevalence among female students, women with lower education and unemployed men. Generally, the strength of "risk" factors (in terms of corresponding odds ratios) tends to be higher for women than for men, with exception of income, where the situation is reversed. For both sexes, there is a very strong linkage between heavy drinking and smoking. Not only have we observed high odds of heavy drinking among current smokers. The relation is almost as strong for ex-smokers too. More importantly, the number of cigarettes smoked seems to be highly correlated with abusive behavior with respect to alcohol.

It turns out that whereas most of the findings of simple cross-tabulations and regression models are in line with each other, in some cases, letting an additional regressor in the model can render the other predictor insignificant. This is especially true for women, for whom being single seems to be a significant pro-abuse driver but when confronted with other drivers, it turns out that the higher abuse rates should be attributed to lower age categories and "student" instead. Similar situation is observed concerning education and income. Opposite situation could be found for income. Whereas taken separately, income may not seem as a significant abuse driver, when other variables are accounted for, higher income becomes a significant pro-abuse driver for women while the opposite is

[3] Underlying odds ratios ranging from 2,1 to 5,1 depending on particular definition of abuse.

true for men – it is lower income which contributes most to the chance of being an alcohol-abusing man.

It is important to state that by the nature of our analysis, its results are of a descriptive nature rather than of an implicative one. Without further knowledge, we cannot assess causality between our predictors and the dependent variable. First, there might be some other variables, determining alcohol abuse, which are not controlled for in our dataset. Second, even if we controlled for all variables, we can hardly tell about causal relations (e.g. whether it was smoking which made someone drink, or drinking which made him smoke). But even if we cannot draw such a direct causality line between each socio-demographic factor and alcohol consumption, we can clearly state that differences between various socio-demographic groups with respect to heavy drinking are strong enough to be considered in any alcohol related policy.

2 LITERATURE REVIEW

Alcohol consumption and its impact on both health and economic welfare of the society has always been given much research attention not only in the United States and Canada but also (especially in past two decades) in Europe. The key purpose of the research effort is to provide relevant foundation for designing strategies and policies to diminish harm caused by alcohol abuse. Out of the most influential institutions dealing with these issues we should mention at least National Institute of Alcohol Abuse and Alcoholism (NIAAA) for US, Institute of Alcohol Studies (IAS) for EU and last but not least World Health Organization (WHO) who have published an extensive Global Status Report on the topic in 2011. From the most cited pan-European research on economic costs of alcohol abuse we should mention a report by Anderson and Baumberg (2006). Among recent literature dealing specifically with social and behavioral determinants of alcohol consumption, the most relevant for this study is perhaps a paper by Dias, Olivera and Lopes (2011). They employ binomial and multinomial models, very similar to ours[4]. Their sample group is, however, not limited by age which does broaden the sample but on the other hand seizes perhaps too much explanatory power in favor of

[4] Dias, Olivera and Lopes (2011) do separate estimates for two beverage groups: Wine and Beer+Spirits. This split is, however, not applicable for Czech Republic, where wine does not play such a dominant role in alcohol consumption.

the age variable (as both under-aged and elderly people naturally show significantly lower drinking levels).

In the Czech Republic, local alcohol consumption and its implications for health have long been monitored especially by National Institute of Public Health and Prague Psychiatric Center - review Kubička and Csémy (2004), Nešpor (2007), Sovinová and Csémy (2010). The welfare implications of alcohol consumption in the Czech Republic are evaluated for instance by Janda and Mikolášek (2009). One of the latest studies, Csémy, Sovinová and Procházka (2011) is of a special interest to our study as it uses one of the datasets examined in this paper, but does not use the same methodology. Their interpretation of the data is limited to cross-tabulation only. Our study extends this by application of binomial and multinomial modeling, allowing all determinants to interact in a single regression. By this, we try to isolate the impact of individual socio-demographic variables on the likelihood of one's alcohol abuse. To the author's best knowledge, this approach, using Czech data, hasn't been taken yet.

3 METHODOLOGY

3.1 The model

Our analysis consists of three steps. First, the data is cross-tabulated in order to assess unrestricted association of the key variables (prevalence of monthly, weekly and daily abuse, supplemented with occurrence of abstinence) with the social, behavioral and demographic predictors. After then, we leave a rather limited world of bivariate analysis and let our explanatory variables form a single system. First, we employ multinomial logistic model (1) to evaluate the association of individual predictors with two levels of heavy episodic drinking. In order to provide a simple and easier-interpretable model, we calculate a binary logistic model (2) which aggregates all abuse frequencies into one, modeling only two states: abusive and non-abusive (including abstinence). In both regressions the set of explanatory variables takes linear form expressed as *t(x)* in expression (3).

$$\pi(y = m|x) = \frac{1}{1+\sum_1^{M-1} e^t} \quad (1)$$

$$\pi(x) = \frac{e^t}{e^t+1} \quad (2)$$

$$t = \beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3 \ldots+\varepsilon \quad (3)$$

3.2 Dependent variables definition

According to WHO[5], moderate alcohol consumption is defined as daily intake of less than 20 grams of pure ethanol content for women and 40 grams for men. Risky or hazardous consumption is then defied as regular daily consumption of 20-40 grams of ethanol per women and 40-60 grams for men[6]. Anything above these thresholds is treated as harmful consumption. In our first dataset (referred as *NMC*), we can track the frequency of "heavy episodic drinking" - drinking of five drinks (0,2l of wine, 0,5l of beer or 0,04l of spirits[7]) on one occasion, which could be translated to a dose of more than 80-120 grams of ethanol, which exceeds the above mentioned limits for both men and women. The frequency of such episodic drinking is categorized as "daily or almost daily", "weekly", "monthly", "less frequently". In the later text we simplify these as "daily, weekly and monthly abuse" (although "abuse" may not be a strictly appropriate expression).

Given frequent differences in strength of certain predictors for men and women, it would be legitimate to split our analysis into two separate regressions for, one for each gender. However, given the very low frequency of abuse in women, especially as weekly o more frequent episodic drinking is concerned, such separate models may not lead to robust estimations due to very low sample variation. Therefore, we first stay with one regression employing sex as one of independent variables (to show its implications to odds of abuse) and second split the model into two, one for each sex. Moreover, since there is generally very low incidence of heavy drinking on daily basis, we need to merge the topmost two categories of alcohol abuse (weekly and daily) in order to obtain statistically more frequent event.

3.3 Alternative dependent variables definition

As mentioned before, definition of alcohol abuse through frequencies of heavy episodic drinking is rather simplifying and largely inaccurate, especially due to different capabilities of male

[5] WHO (2010, 2011)

[6] In literature, even stricter criteria can be found. Burger and Mensink, for example, set the limits for „more than tolerable" consumption to above 10-12g for women and 20-24g for men.

[7] For this purpose, ethanol content was set to 4% for beer, 12% for wine and 32% for spirits. (WHO methodology uses 4,5%, 14% and 40% respectivelly, which does not, however, correspond with typical Czech beverage mix)

and female organism in dealing with ethanol. Fortunately, the second dataset (referred as *NIPH*) not only offers a comparison to NMC data, but also provides us with an opportunity to estimate individual level abuse using more precise quantitative measures. In addition to drinking frequencies the dataset also includes average doses of individual alcoholic beverages. Multiplying the vectors of frequencies and those of average doses, we can obtain direct measurement of average daily alcohol intake. We can then apply a more precise definition of "risky consumption" as consumption of more than 20 grams of ethanol for women or 40 grams for men. The NIPH study also provides a way to measure real impact of alcohol consumption on an individual using a 10-question AUDIT screening[8]. We follow the methodology of Csémy, Sovinová and Procházka while treating critical score of 16 and more as "harmful" consumption. The results of modeling with these alternative definitions of abuse are shown in section 5.3.3.

4 FULL-POPULATION STUDY ON USAGE OF ADDICTIVE SUBSTANCES AND ATTITUDES TOWARDS THEM.[9]

4.1 Participants' selection

The Full-population study on usage of addictive substances and attitudes towards them was conducted by National Monitoring Centre for Drugs and Drug Addiction to map individual consumer behavior and attitudes towards alcohol, cigarettes and other substances considered as drugs across the Czech population.

The respondents' selection was made by choosing a set of municipalities together with desired number of respondents to reflect regional stratification of the Czech population, based on National census

[8] AUDIT is a WHO created standardized questionnaire designed for quick identification of potential alcohol-related problems. Its (10) alternative assesses general drinking frequency, heavy episodic drinking frequency, addiction indicators, impact of alcohol consumption on one's behavior, mental capabilities, memory and physical condition.

[9] Original Czech title of the study: "Celopopulační studie užívání návykových látek a postojů k němu v České republice"

(2011). Within each city, a random walk data collection was performed[10]. The refusal rate (after the respondent was reached) was 14%, slightly higher in men than in women.

The final dataset consists of 2134 observations, consisting of 1154 (54,1%) women, 980 (45,9%) men. Mean age (standard deviation) was 39,3 years (14,8) for women and 38,2 (14,3) for men. The full range of age was from 15 to 64 years for both sexes. Prevalence of alcohol drinking (defined as those who have drunk alcohol within last 12 months) was 921 (79,8%) for women and 869 (88,7%) in men. Prevalence of smoking (similar definition) was 393 (34,1%) in women and 444 (45,3%) in men. For the purpose of our cross-sectional models, 190 observations were excluded due to missing information on age or income (respondents were generally allowed not to answer certain personal questions). The cross-sectional analyses were therefore conducted on 1944 individuals.

4.2 Variables' specifics

In the survey contains responses concerning concerned frequency of drinking more than five drinks (let us denote this as "abuse" for sake of simplicity) within last 12 months. Using above mentioned WHO definition, the daily abuse fulfills the criteria of harmful drinking for both men and women. Weekly abuse falls into category of hazardous drinking for women and if performed at least twice a week, even for men. Monthly abuse is not necessarily connected with health risk, but it still means "getting drunk" (with all potentially associated risks and costs) for both sexes.

In our sample, an abstinent is defined as a person who has drunk no alcohol over past twelve months. Similar definition is being used for non-smoker. Ex-smokers are defined as current non-smokers who had, however, smoked regularly in the past. For regular daily smokers, the survey provides information on number of cigarettes smoked.

The set of socio-demographic determinants consists of sex, family status, education, employment status (including being a student, retired, on maternity leave etc.), size category of a municipality in which the respondent is residing, net income category and age. As the relation of age and alcohol abuse seems to be largely non-linear[11], a split into six categories was used; one for under

[10] Within each municipality a random street was chosen as a starting point of the interviewer's random-walk. The respondent's selection within each addressed household was then done to mimic the age structure of the population (using standard Kish grid).
[11] Which is reported also by Wolfe (2009)

legal drinking age (15-17 years), one for young adults, frequently being students (18-24 years) and then four categories by ten years.

4.3 Results

4.3.1 Basic statistical properties

Table I. shows the prevalence of abstinence and monthly/weekly/daily abuse (review the above definition). For evaluation of statistical difference in mean prevalence for particular determinant category, Chi-square test was used (respective *p*-values are listed at the bottom of each determinant's block). It is legitimate to assume important role of gender in determining individual behavior towards alcohol consumption[12]. Therefore, we stratify all other individual determinants by sex. Our sample reflects common observation that prevalence of alcohol consumption as well as its abuse (of any magnitude) is generally higher for men than for women. In fact, only 14,2% of women reported drinking five or more units of alcohol on a monthly of more frequent basis whereas the incidence was 38,1% for men. However, it is necessary to mention that fact of consuming five drinks doesn't generally impact both sexes the same. In other words, for most women, even smaller dose may be needed to "get drunk". On the other hand, it is legitimate to assume that the five-unit threshold results in drunkenness even for vast majority men. An unbiased indicator of difference across sexes is for prevalence of abstinence which as almost double in women (20,2%) than in men (11,3%) the total ratio of abstinence was 15,7%.[13]

Now let us analyze the association of socio-demographic drivers with abstinence. Apart from marital status, all examined characteristics seem to have significant relation with prevalence of abstinence. Concerning age both sexes share similar, yet in some respect quite different, pattern. It is worth noticing that under-aged men seem to show even higher prevalence of abstinence than women (35,7% compared to 23,5%) which is then reversed when they turn into their twenties (12,7% and 13,1%). In late twenties and early thirties, women seem to show higher level of abstinence (19,1%;

[12] Among recent research studies backing this statement let us name at least Christie-Mizell and Peralta (2009)

[13] This value seems to be significantly greater than for other studies, even the previous round of NMC questionnaire (2008) reports abstinence levels 9,5%. The partil prohibition introduced in Cezech Republic in September 2012 should only have marginal impact on reporting abstinence levels as the survey was done between September and November 2012 and respondents were asked whether they abstain for last 12 months.

which is likely to be correlated with pregnancy but probably not as strongly with maternity[14] as discussed below) whereas the ratio in men continues to drop. The ratio then grows up as both sexes approach retirement age. In both sexes, there is a significant negative correlation between abstinence and smoking. Whereas prevalence of abstinence ranges from 6,3% to 11,5% for current-smokers and ex-smokers, it is more than double for non-smokers (16,5% for men and 24,6% for women). Surprisingly, education seems to have negative impact on abstinence level as well, with university (10,2% abstinent for women and 6,8% for men) being less than half the rate when compared to primary education (23,6% and 21,5% respectively). Very different patterns concerning sexes have been found in Employment status. Whereas being a student means significant decrease in likelihood of being an abstinent in women (13,4% compared to average of 20,2%), the proportion is actually higher for men (with 22,1% abstinent among male students). For both sexes, abstinence is relatively more frequent among retired and disabled people. Surprisingly, women on maternity leave (usually from 7th week after delivery) do not exhibit above average abstinence rate. Abstinence seems to be significantly less frequent in larger cities, which is to some extent connected with higher mean age of respondents from rural areas than for those from larger cities (in small municipalities, the proportion of the highest age category ranges from 21% to 29% whereas it is 17% for Large cities and only 13% for Prague). Increasing income seems to have strong negative link to level of abstinence which is in line with the above findings on education.

Concerning alcohol abuse, which is the primary concern of this paper, the determinants' pattern is, however, more complex. In line with previous findings on abstinence, under-aged men exhibit lower prevalence of heavy episodic drinking than women (abuse on monthly or more frequent basis concerns 9,5% of men and 16,7% women). This is then reversed dramatically in later age. For men, this ratio (sum of all three abuse statuses in Table 1) jumps over 40% as the ratio stays quite

[14] Similar findings had been reported by Denny, Tsai, Floyd and Green (2009)

Table I. NMS: Prevalence of abstinence, monthly, weekly, daily abuse by social, demographic and smoking characteristics, by sex.

	Women				Men			
	Abstinent	**Monthly abuse**	**Weekly abuse**	**Daily abuse**	**Abstinent**	**Monthly abuse**	**Weekly abuse**	**Daily abuse**
n (%)	233 (20,2%)	165 (9,6%)	53 (4,4%)	2 (0,2%)	111 (11,3%)	373 (18,1%)	196 (16,3%)	36 (3,7%)
Age *(years)*								
<18	10 (23,8%)	7 (16,7%)	1 (2,4%)	0 (0,0%)	15 (23,8%)	2 (9,3%)	4 (0,4%)	0 (0,0%)
18-24	23 (13,1%)	44 (25,1%)	13 (7,4%)	0 (0,0%)	21 (13,1%)	39 (21,8%)	32 (15,5%)	1 (0,6%)
25-34	57 (19,1%)	48 (16,1%)	11 (3,7%)	1 (0,3%)	25 (19,1%)	49 (19,3%)	52 (17,7%)	6 (2,3%)
35-44	28 (14,3%)	25 (12,8%)	10 (5,1%)	0 (0,0%)	13 (14,3%)	32 (21,0%)	34 (20,5%)	11 (6,1%)
45-54	32 (19,4%)	24 (14,5%)	13 (7,9%)	1 (0,6%)	9 (19,4%)	33 (20,5%)	15 (12,9%)	8 (6,0%)
55-64	71 (27,3%)	14 (5,4%)	4 (1,5%)	0 (0,0%)	25 (27,3%)	21 (7,2%)	23 (13,2%)	10 (5,3%)
p	0,002	<0,001	0,015	n/a*	<0,001	<0,001	0,054	0,017
Family Status								
Single	118 (19,2%)	105 (17,1%)	30 (4,9%)	1 (0,2%)	68 (12,6%)	101 (19,4%)	96 (17,1%)	16 (3,0%)
Spouse	102 (19,3%)	58 (11,0%)	978 (4,4%)	1 (0,2%)	41 (9,4%)	76 (16,6%)	64 (15,6%)	20 (4,6%)
p	n/s**	0,003	n/s**	n/a*	0,115	n/s**	n/s**	n/s**
Smoking								
Non-smoker	174 (24,6%)	65 (9,2%)	20 (2,8%)	0 (0,0%)	79 (16,5%)	69 (3,1%)	49 (5,5%)	9 (1,9%)
Smoker	45 (11,5%)	94 (23,9%)	30 (7,6%)	2 (0,5%)	28 (6,3%)	99 (27,2%)	103 (21,7%)	23 (5,2%)
Ex-smoker	4 (7,5%)	6 (11,3%)	3 (5,7%)	0 (0,0%)	4 (6,9%)	9 (12,8%)	8 (14,0%)	4 (6,9%)
p	<0,001	<0,001	0,001	n/a*	<0,001	<0,001	<0,001	0,012
Education								
Primary	34 (23,6%)	27 (18,8%)	9 (6,3%)	0 (0,0%)	20 (21,5%)	9 (6,4%)	13 (13,6%)	3 (3,2%)
Secondary	167 (20,8%)	104 (12,9%)	35 (4,4%)	1 (0,1%)	79 (10,7%)	146 (20,5%)	126 (17,5%)	29 (3,9%)
University	20 (10,2%)	32 (16,3%)	9 (4,6%)	1 (0,5%)	10 (6,8%)	22 (9,5%)	19 (11,4%)	3 (2,0%)
p	0,001	0,122	n/s**	n/a*	0,002	0,003	n/s**	n/s**
Employment status								
Unemployed	13 (24,5%)	9 (17,0%)	4 (7,5%)	0 (0,0%)	4 (8,2%)	13 (26,8%)	8 (16,4%)	2 (4,1%)
Student	20 (13,4%)	38 (25,5%)	9 (6,0%)	0 (0,0%)	29 (22,1%)	29 (14,2%)	16 (8,2%)	0 (0,0%)
Retired	50 (31,3%)	9 (5,6%)	3 (1,9%)	0 (0,0%)	11 (14,7%)	10 (11,8%)	9 (14,6%)	5 (6,7%)
Disabled	15 (39,5%)	0 (0,0%)	0 (0,0%)	0 (0,0%)	5 (17,9%)	2 (8,4%)	5 (17,4%)	1 (3,6%)
Working	125 (16,6%)	109 (14,5%)	37 (4,9%)	2 (0,3%)	62 (8,9%)	123 (19,0%)	122 (17,5%)	28 (4,0%)
p	<0,001	<0,001	n/a*	n/a*	<0,001	n/s**	n/s**	n/a*
Municipality size (inhabitants)								
<5 000	78 (19,6%)	63 (15,9%)	22 (5,5%)	0 (0,0%)	37 (10,7%)	60 (19,3%)	65 (18,4%)	13 (3,8%)
<20 000	44 (19,5%)	39 (17,3%)	11 (4,9%)	1 (0,4%)	25 (13,4%)	39 (22,5%)	33 (17,9%)	8 (4,3%)
<50 000	36 (25,4%)	14 (9,9%)	2 (1,4%)	0 (0,0%)	17 (14,5%)	18 (8,5%)	15 (9,5%)	1 (0,9%)
<100 000	27 (22,5%)	14 (11,7%)	5 (4,2%)	0 (0,0%)	17 (16,5%)	13 (9,6%)	16 (13,3%)	2 (1,9%)
<1 000 000	19 (15,2%)	18 (14,4%)	7 (5,6%)	1 (0,8%)	3 (3,1%)	20 (23,3%)	16 (19,3%)	7 (7,1%)
Prague	19 (13,2%)	17 (11,8%)	6 (4,2%)	0 (0,0%)	12 (9,2%)	27 (15,6%)	20 (11,2%)	0 (0,0%)
p	0,111	n/s**	n/s**	n/a*	0,033	0,055	n/s**	0,216
Net Income (CZK per month)								
No income	27 (18,8%)	31 (21,5%)	8 (5,6%)	0 (0,0%)	22 (20,6%)	21 (10,9%)	13 (7,2%)	0 (0,0%)
<5 000	21 (30,4%)	8 (11,6%)	2 (2,9%)	0 (0,0%)	6 (15,4%)	10 (27,8%)	8 (18,1%)	1 (2,6%)
<10 000	54 (20,1%)	26 (9,7%)	9 (3,3%)	1 (0,4%)	16 (18,4%)	13 (12,4%)	11 (13,5%)	5 (5,7%)
<15 000	61 (21,3%)	39 (13,6%)	10 (3,5%)	0 (0,0%)	21 (9,9%)	37 (14,3%)	30 (12,9%)	8 (3,8%)
< 20 000	30 (14,7%)	32 (15,7%)	9 (4,4%)	0 (0,0%)	20 (8,8%)	43 (24,3%)	50 (21,4%)	10 (4,4%)
< 30 000	11 (13,4%)	15 (18,3%)	7 (8,5%)	0 (0,0%)	10 (6,3%)	27 (14,9%)	22 (13,9%)	8 (5,0%)
>30 000	0 (0,0%)	3 (15,0%)	0 (0,0%)	0 (0,0%)	7 (9,2%)	13 (21,2%)	15 (20,1%)	4 (5,3%)
p	0,015	0,047	n/a*	n/a*	0,002	0,091	0,065	n/a*

p -value obtained from Chi-square test. Null hypothesis being that the observed frequencies are equal to the expected (average) one

* p-value unavailable because of non-fulfilment of Chi-square test conditions

** not significant

table above 40% until age of 54, with increasing proportion of daily heavy drinking. For women, the total abuse ratio increases only to 25,1% and the falls quickly to levels below 15%. Daily heavy drinking in women is almost non-existent. The only case with significant impact of family status where married women for whom the prevalence of monthly heavy episodic drinking is half compared to those single (6,6% and 12,2% respectively). Analogically to the case of abstinence, there is a significant positive relation between smoking (either current or historic) and heavy episodic drinking of any frequency, this is especially significant for men (50,7% in total). Unlike for our observations on abstinence, the level of education does not exhibit significant connection with alcohol abuse apart from above-average monthly abuse in men with secondary education[15]. Concerning employment categories, the most important for both sexes is increase in monthly abuse ratio for students which is especially significant for women (19,5% compared to average of 9,6%). Interestingly, unemployment is connected with higher abuse rate particularly for men (46,9% compared to the average 38,1%). For both sexes, the lowest abuse rate is reached by disabled individuals. Due to their low count however, the statistical significance of this result is not high. As income groups are concerned, both sexes show increased proportion of monthly and weekly abuse for either no income or highest income groups.

4.3.2 Logistic regression modeling

Table II. shows odds ratios[16] (OR) of alcohol abuse associated with individual social and demographic characteristics together with their respective two-sided 95% confidence intervals (CI). In part A. we follow the multinomial model examining monthly abuse and abuse on weekly and more frequent basis, null hypothesis being no regular abuse (abuse is again defined in a simplified way as consumption of five or more drinks on one occasion each month). The results identify sex, age and smoking habits as the strongest determinants. Education and family status had to be excluded from the model for being statistically insignificant predictors of abuse and since they didn't pass specification test. Prevalence of heavy episodic drinking is much higher in men (monthly OR: 2,107 CI: 31,584-2,802; weekly OR: 5,458 CI: 3,785-7,871) as well as for both current smokers (monthly OR:

[15] Amibiguous and time-varying effects of education on Alcohol drinking has also been reported by Crosnoe and Riegle-Crumb (2007).

[16] Odds ratios can be loosely interpreted as how many times more probable is certain event given one value of explanatory variable comparing to its default value. Eg is an OR value of being a man in case of alcohol abuse is 2, then we could state that man are approximately twice as likely use alcohol in abusive levels.

Table II. NMC: Statistical relation (Odds ratios and their 95% confidence intervals) of periodic abuse according social, demographic and smoking characteristics.

	A. Multinomial model (two abuse frequencies)						B. Binomial model		
	Weekly and more ferq. abuse			Monthly abuse			Monthly and more ferq. abus		
Sex									
Man	5,118	(3,502-7,48)	***	2,061	(1,53-2,775)	***	2,964	(2,315-3,796)	***
Woman	1,000		a)	1,000		a)	1,000		a)
Age *(years)*									
<18	0,294	(0,052-1,647)		0,914	(0,284-2,941)		0,605	(0,224-1,635)	*
18-24	2,253	(1,078-4,712)	**	2,448	(1,192-5,027)	**	2,329	(1,325-4,092)	***
25-34	1,702	(0,939-3,084)	*	2,181	(1,205-3,947)	***	1,938	(1,229-3,054)	***
35-44	2,050	(1,115-3,769)	**	1,801	(0,965-3,364)	*	1,913	(1,192-3,069)	***
45-54	1,552	(0,807-2,988)		2,240	(1,188-4,222)	**	1,886	(1,153-3,086)	**
55-64	1,000		a)	1,000		a)	1,000		a)
Family Status									
Single	0,968	(0,684-1,37)		1,057	(0,766-1,459)		1,014	(0,782-1,315)	
Married/Spouse	1,000		a)	1,000		a)	1,000		a)
Smoking									
Smoker	2,455	(1,608-3,747)	***	2,031	(1,399-2,948)	***	2,195	(1,615-2,984)	***
Ex-smoker	2,130	(1,357-3,342)	***	1,849	(1,248-2,74)	***	1,965	(1,425-2,708)	***
Non-smoker	1,000		a)	1,000		a)	1,000		a)
Cig. smoked/day	1,042	(1,018-1,066)	***	1,036	(1,012-1,06)	***	1,039	(1,02-1,059)	***
Education									
Primary	1,285	(0,62-2,666)		0,765	(0,389-1,505)		0,963	(0,559-1,659)	
Secondary	1,038	(0,636-1,692)		1,111	(0,724-1,704)		1,084	(0,764-1,539)	
University	1,000		a)	1,000		a)	1,000		a)
Employment status									
Unemployed	0,817	(0,352-1,899)		1,642	(0,795-3,391)		1,251	(0,676-2,313)	
Student	1,194	(0,497-2,87)		3,334	(1,613-6,893)	***	2,291	(1,237-4,242)	***
Retired	1,253	(0,571-2,75)		1,233	(0,577-2,632)		1,236	(0,688-2,221)	
Disabled	0,911	(0,331-2,505)		0,321	(0,073-1,415)	*	0,622	(0,265-1,459)	
Maternity Leave	0,737	(0,262-2,072)		1,126	(0,55-2,305)		0,967	(0,522-1,79)	
Working	1,000		a)	1,000		a)	1,000		a)
Municipality size (inhabitants)									
<5 000	1,783	(1,053-3,017)	**	1,332	(0,848-2,093)		1,504	(1,034-2,189)	**
<20 000	1,712	(0,966-3,032)	*	1,669	(1,031-2,7)	**	1,682	(1,122-2,522)	**
<50 000	0,952	(0,472-1,92)		0,914	(0,511-1,636)		0,928	(0,571-1,509)	
<100 000	1,190	(0,609-2,326)		0,812	(0,437-1,509)		0,966	(0,59-1,581)	
<1 000 000	1,647	(0,87-3,12)	*	1,181	(0,668-2,089)		1,350	(0,846-2,155)	
Prague	1,000			1,000			1,000		a)
Net Income (CZK per month)									
No income	0,543	(0,197-1,498)		0,476	(0,191-1,182)	*	0,498	(0,235-1,055)	*
<5 000	0,597	(0,207-1,721)		0,449	(0,171-1,183)	*	0,488	(0,221-1,079)	*
<10 000	0,567	(0,247-1,301)		0,443	(0,2-0,98)	**	0,487	(0,259-0,919)	**
<15 000	0,540	(0,264-1,106)	*	0,741	(0,373-1,474)		0,646	(0,371-1,126)	*
< 20 000	0,934	(0,476-1,833)		0,854	(0,438-1,664)		0,887	(0,52-1,511)	
< 30 000	0,847	(0,42-1,708)		0,764	(0,38-1,538)		0,799	(0,458-1,392)	
>30 000	1,000			1,000			1,000		a)

Odds Ratios (95% CI) obtained from unconditional multinomial logistic regression. Pseudo R-squared: Cox and Snell 0,17; Nagelkerke 0,22.

Fit: 8,3% correctly predicted abuse freq., 98,1% correctly identified non-abusers

*** *p* -value < 0,01

** *p* -value < 0,05

* *p* -value < 0,10

[a)] variable ommited as reference category

Odds Ratios (95% CI) obtained from binomial logistic regression. Pseudo R-squared: Cox and Snell 0,15; Nagelkerke 0,22. Fit: 28,4% correctly predicted abusers, 93,4% non-abusers

1,915 CI: 1,368-2,681; weekly OR: 2,360 CI: 1,598-3,485) and ex-smokers (monthly OR: 1,633 CI: 0,838-3,183; weekly OR: 2,607 CI: 1,361-4,993). Moreover, the number of cigarettes smoked per day has further positive correlation with alcohol abuse. In other words, even among smokers, the frequency of smoking and drinking seems to be much interrelated. The causality of these two behavior patterns, however, is unclear as it cannot be simply decided whether smoking is a driver for alcohol consumption or vice versa. Both monthly and weekly abuse is more than two times likely for young adults (aged 18-24). All age categories between age of 24 and 55 generally show higher prevalence of heavy episodic drinking. As concerning types of economic activity, the most significant increase in probability of alcohol abuse is reported for students (monthly OR: 3,283 CI: 1,662-6,485). Retired and disabled individuals do not exhibit lower rate of alcohol abuse, which is mainly due to correlation of these statuses with income and age. In income, low (but non-zero) income groups show negative association with alcohol consumption (OR between 0,5 to 0,6; the reference group being respondents with net income above 30 thousand CZK). We have found higher frequency of heavy drinking in rural areas and very small towns (OR ranging from 1,622 to 1,831). The overall predictive power of the multinomial model (in terms of goodness of fit) is not high. If the cut value is set to 0,5 (e.g. individuals with predicted probability given in (1) is greater than 50%) it correctly predicts 15,2% of weekly abuse and only 1,1% (its rate of correct identification of abuse of any frequency is 11,3%). The type I error (false rejecting of non-abuser null hypothesis), however, occurs only in 1,7% cases.

In order to provide a model with higher explanatory power and easier interpretability, we calculate also a binary logistic regression, where depended variable consists of aggregation of all abuse frequencies (therefore denoting every heavy episodic drinking on monthly or more frequent basis as abuse). Parameters of this model are listed in part B. of Table II. The outcomes of the model are very similar to the multinomial one. Heavy episodic drinking is more likely to occur in men (OR: 3,064; CI: 2,415-3,886), smokers (OR:1,879; CI: 3,886) and ex-smokers (OR:1,714; CI: 1,155-2,546). The odds are much higher for students (OR: 2,470; CI: 1,383-4,413), especially in combination of young-adult age category (OR: 2,025; CI: 1,184-3,463). Other age categories show similar pattern apart from under aged (OR: 0,466; CI: 0,188-1,151) and those close to the age of retirement (age 55-64 – taken as a reference category). Again, our results show lower incidence of heavy episodic drinking for lower income (net income < 15 thousand CZK; OR ranging from 0,507 to 0,522). The abuse is significantly

more frequent in smallest (<10 000 inhabitants) municipalities (OR: 0,491 to 0,522 with Prague being a reference category). The explanatory power of this simplified model is, by definition, higher. Heavy episodic drinking is predicted correctly for 28,6% abusers while Type I. error only occurs for 6,7% non-abusers. Given the cross-section nature of the problem, these results could be treated as satisfactory.

Analyzing gender differences using sex dummy can indicate the difference in drinking patterns between the two groups but may as well deliver biased results when individual socio-demographic factors are assessed. (The cross-tabulation analysis has already outlined such differences for age and education). As weekly or more often heavy episodic drinking is too scarce in women, we'll limit the scope of this analysis to monthly or more often (thus comparable to Table II., column B).

The differences between sexes are illustrated in Table III. As age groups among both sexes are concerned, we observe very different abuse patterns. Whereas young adult men show relatively flat incidence of heavy episodic drinking

Table III. NMC: Statistical relation (Odds ratios and their 95% confidence intervals) of monthly or more often abuse according to social, demographic and smoking characteristics, split by sex.

	Monthly and more ferq. abuse					
	Women			Men		
Age *(years)*						
<18	1,331	(0,28-6,332)	*	0,442	(0,108-1,806)	*
18-24	3,915	(1,281-11,964	**	2,016	(1,006-4,041)	**
25-34	2,962	(1,112-7,887)	**	1,817	(1,055-3,127)	**
35-44	2,539	(0,928-6,95)	*	1,905	(1,08-3,362)	**
45-54	2,753	(0,993-7,629)	*	1,884	(1,03-3,447)	**
55-64	1,000		a)	1,000		a)
Family Status						
Single	0,954	(0,624-1,459)		1,081	(0,77-1,518)	
Married/Spouse	1,000		a)	1,000		a)
Smoking						
Smoker	2,345	(1,431-3,844)	***	2,054	(1,375-3,068)	***
Ex-smoker	1,985	(1,172-3,362)	**	1,900	(1,253-2,881)	***
Non-smoker	1,000		a)	1,000		a)
Cig. smoked/day	1,039	(0,999-1,08)	***	1,040	(1,017-1,064)	***
Education						
Primary	0,830	(0,385-1,79)		1,008	(0,464-2,191)	
Secondary	0,660	(0,391-1,115)	*	1,573	(0,97-2,55)	*
University	1,000		a)	1,000		a)
Employment status						
Unemployed	1,102	(0,404-3,002)		1,176	(0,519-2,669)	
Student	2,558	(1,005-6,511)	**	1,614	(0,695-3,746)	
Retired	1,193	(0,378-3,763)		1,461	(0,703-3,034)	
Disabled	0,000	n/a		0,970	(0,358-2,627)	
Maternity Leave	0,929	(0,463-1,863)		1,041	(0,075-14,423	
Working	1,000		a)	1,000		a)
Municipality size (inhabitants)						
<5 000	1,574	(0,827-2,995)		1,299	(0,806-2,095)	
<20 000	2,060	(1,049-4,047)	**	1,399	(0,833-2,347)	
<50 000	0,894	(0,39-2,05)		0,853	(0,461-1,578)	
<100 000	1,268	(0,561-2,867)		0,773	(0,413-1,446)	
<1 000 000	1,344	(0,612-2,953)		1,372	(0,751-2,506)	
Prague	1,000		a)	1,000		a)
Net Income (CZK per month)						
No income	0,635	(0,132-3,053)		0,532	(0,207-1,367)	
<5 000	0,443	(0,087-2,248)		0,731	(0,257-2,078)	
<10 000	0,638	(0,154-2,652)		0,548	(0,248-1,209)	*
<15 000	0,976	(0,246-3,873)		0,554	(0,295-1,042)	*
< 20 000	0,977	(0,251-3,802)		0,832	(0,456-1,519)	
< 30 000	1,175	(0,286-4,834)		0,656	(0,353-1,219)	
>30 000	1,000		a)	1,000		a)

OR (95% CI) obtained from unconditional binomial logistic regressions.

Pseudo R-squared: Cox and Snell 0,09; Nagelkerke 0,15.
Fit: 1,3% correctly predicted abusers, 99,6% correctly predicted non-abusers

Pseudo R-squared: Cox and Snell 0,11; Nagelkerke 0,16.
Fit: 41,9% correctly predicted abusers, 83,5%

*** *p* -value < 0,01
** *p* -value < 0,05
* *p* -value < 0,10

a) variable ommited as reference category

(odds ratios range from 1,817 to 2,016 when compared to the highest age group), women show much higher differences, (starting at OR: 3,915; CI: 1,281-11,964 in age group of 18-24 years, while not falling below 2,500 until age of 55). Moreover, women really seem to exhibit stronger tendency to episodic drinking while under-aged (1,331, compared to only 0,442 for men). Men with secondary education seem to be more likely than those with university degree. Interestingly, for women the situation seems to be just the opposite. The relation between smoking and heavy episodic drinking, on the other hand, seems to be almost exactly the same for both sexes.

It is worth mentioning that while someone might notice seemingly lower explanatory power of split-sexes regressions in Table III. (Nagelkerke pseudo-R^2 0,15 and 0,16) compared to that of Table II.B (0,22) the reality is just the opposite. With typical cut-off value of 0,5 the split-sexes models are altogether able to predict 29,4% of abusers and 93,5% non-abusers (while the "unisex" regression scores only 28,4% and 93,4%).

Comparing table I and Table III, we can see why simple cross-tabulating of the data may lead to misleading conclusions. Whereas in terms of average abuse incidents, being single seems to be a significant pro-abuse driver in women, it turns out, that the higher abuse rates should be attributed to younger age categories and "student" status (both of which are correlated with marital status). The same applies to education and income. Although we see increased abuse levels in women with primary education, we do so only for younger age categories. Again, it is students and young women in general, who could not have finished their education yet, their income is usually modest if any and in the same time exhibit significant consumption of alcohol. In Men, on the other hand, secondary education is a significantly positive abuse driver even if other explanatory variables are taken into account.

Let us now compare the results with another dataset – that by National Institute of Public Health.

5 RESEARCH ON LIFESTYLE, HEALTH AND ALCOHOL.[17]

5.1 Participants' selection[18]

Similarly to NMC Dataset, the set of respondents in Research on Lifestyle, Health and Alcohol (conducted by National Institute of Public Health – hereafter referred to as NIPH) was constructed to serve as a representative sample of the Czech population as concerning sex, age (given above boundaries), education and region of residence. The interviewers were chosen to fit given quota using random walk within each electoral ward. The refusal ratio was 16,3%.

The dataset consisted of 2221 observations, 1080 (48,6%) of which were women and1141 (51,4%) men. Mean age (standard deviation) is 30,1 (5,8) for women and 29,9 years (5,7) for men. Prevalence of abstinence (again defined not having drunk any alcohol within last 12 months) in this age group was 75 (6,9%) for women and 38 (3,3%) in men. Prevalence of smoking (similar definition) was 342 (31,7%) in women and 527 (46,2%) in men.[19]For the purpose of our cross-sectional models, 68 observations needed to be excluded due to missing variables. The cross-sectional analyses were therefore conducted on 2153 individual observations.

5.2 Variables' specifics

The key difference in respondent groups of our two data samples is that the target of NIPH was only part of population aged 18-39, which we could arguably denote as "young adults". Moreover, the NIPH dataset includes an interesting variable – the age of first experience with alcohol consumption, which we employ in part 5.3.3 Otherwise, the variables are directly comparable.

5.3 Results

Again, we start our analysis with cross-tabulating the key variables in order to their relations. Then we list results of comparative analysis using same variables as in case of NMC data in multinomial and binary logistic mode. Moreover, additional analysis is carried on using alternative dependent variables - quantified alcohol abuse and personal impact from AUDIT screening.

[17]Original Czech title of the study: "Výzkum Životní styl, Zdraví a Alkohol"

[18]Taken from Csémy, Sovinová and Procházka (2011)

[19]Compared to NMC sample, this means about 10% higher prevalence of alcohol drinking which cannot be attributed only to different age structure. Prevalence of smoking remains is exactly the same.

5.3.1 Basic statistical properties

Table IV. shows a cross tabulation of demographic indicators and frequencies of heavy episodic drinking (referred as abuse) which is directly comparable with Table I. Apart from Municipality size and Income, all variables seem to have significant relation to prevalence of both abstinence and alcohol abuse. The importance of age is diminished as the range is limited only to 19-39 years. In fact, only the youngest category (19-24 years) shows significantly higher prevalence (in both women and men), while there is almost no variance in abstinence levels across age groups. In line with NMC findings, NIPH data also show very strong positive relation of alcohol abuse and smoking. The reverse opposite applies to abstinence, where only 2,6% of women and 0,8% of men smokers abstain, whereas respective figures for non-smokers amount to 9,4% and 6,3%. Unlike for NMC, family status turns out to bear some explanatory power as single persons exhibit higher abuse rates, especially for women. As employment status is concerned, students and unemployed again show higher abuse rates, but also higher abstinence rates in women.

Table IV. NIPH: Prevalence of abstinence, montly, weekly and daily abuse by social, demographic and smoking chacracteristics, by sex.

	Women				Men			
	Abstinent	Monthly abuse	Weekly abuse	Daily abuse	Abstinent	Monthly abuse	Weekly abuse	Daily abuse
n (%)	75 (6,9%)	93 (8,6%)	32 (3,0%)	21 (1,9%)	38 (3,3%)	227 (19,9%)	129 (11,3%)	71 (6,2%)
Age (years)								
19-24	12 (5,2%)	28 (12,2%)	10 (4,4%)	10 (4,4%)	7 (2,7%)	71 (27,7%)	35 (13,7%)	17 (6,6%)
25-34	46 (7,9%)	46 (7,9%)	14 (2,4%)	5 (0,9%)	21 (3,4%)	110 (18,0%)	69 (11,3%)	37 (6,1%)
35-39	17 (6,9%)	19 (7,1%)	8 (3,0%)	6 (2,2%)	10 (3,6%)	46 (16,8%)	25 (9,1%)	17 (6,2%)
p	n/s**	0,082	n/s**	n/s**	0,823	0,002	0,255	0,823
Family status								
Single	37 (8,2%)	53 (11,7%)	19 (4,2%)	14 (3,1%)	23 (3,9%)	133 (22,4%)	85 (14,3%)	41 (6,9%)
Spouse	38 (6,1%)	40 (6,4%)	13 (2,1%)	7 (1,1%)	15 (2,7%)	94 (17,2%)	44 (8,0%)	29 (5,3%)
p	n/s**	0,002	0,041	0,02	n/s**	0,028	0,001	n/s**
Smoking								
Smoker	9 (2,6%)	56 (16,4%)	20 (5,8%)	13 (3,8%)	4 (0,8%)	132 (25,0%)	83 (15,7%)	50 (9,5%)
Ex-smoker	12 (7,5%)	8 (5,0%)	6 (3,7%)	1 (0,6%)	5 (3,2%)	23 (14,9%)	17 (11,0%)	5 (3,2%)
Non-smoker	54 (9,4%)	29 (5,0%)	6 (1,0%)	7 (1,2%)	29 (6,3%)	72 (15,7%)	29 (6,3%)	15 (3,3%)
p	0,001	<0,001	<0,001	0,01	<0,001	<0,001	<0,001	<0,001
Education								
Primary	14 (8,4%)	17 (10,2%)	11 (6,6%)	7 (4,2%)	9 (3,9%)	58 (25,1%)	33 (14,3%)	26 (11,3%)
Secondary	53 (7,0%)	70 (9,3%)	21 (2,8%)	14 (1,9%)	25 (3,1%)	150 (18,8%)	87 (10,9%)	41 (5,1%)
University	8 (5,1%)	6 (3,8%)	0 (0,0%)	0 (0,0%)	4 (3,5%)	19 (16,8%)	9 (8,0%)	3 (2,7%)
p	n/s**	0,064	0,002	n/a*	n/s**	0,075	0,18	0,001
Employment Status								
Unemployed	9 (13,0%)	8 (11,6%)	6 (8,7%)	1 (1,4%)	2 (2,1%)	26 (27,7%)	13 (13,8%)	11 (11,7%)
Student	4 (5,7%)	12 (17,1%)	2 (2,9%)	2 (2,9%)	4 (5,5%)	15 (20,5%)	8 (11,0%)	2 (2,7%)
Retired	0 (0,0%)	0 (0,0%)	0 (0,0%)	0 (0,0%)	2 (66,7%)	0 (0,0%)	0 (0,0%)	0 (0,0%)
Disabled	3 (33,3%)	0 (0,0%)	0 (0,0%)	1 (11,1%)	2 (20,0%)	1 (10,0%)	0 (0,0%)	0 (0,0%)
Working	42 (5,5%)	69 (9,0%)	21 (2,7%)	15 (1,9%)	28 (3,0%)	184 (19,4%)	106 (11,2%)	57 (6,0%)
Maternity	16 (10,3%)	3 (1,9%)	3 (1,9%)	1 (0,6%)	0 (0,0%)	0 (0,0%)	0 (0,0%)	0 (0,0%)
p	0,002	0,004	n/a*	n/a*	<0,001	n/s**	n/a*	n/a*
Municipality size (inhabitants)								
<500	7 (8,4%)	5 (6,0%)	2 (2,4%)	2 (2,4%)	4 (5,2%)	18 (23,4%)	9 (11,7%)	7 (9,1%)
<2 000	11 (5,8%)	18 (9,5%)	3 (1,6%)	5 (2,6%)	7 (3,6%)	40 (20,3%)	23 (11,7%)	17 (8,6%)
<5 000	10 (9,2%)	12 (11,0%)	4 (3,7%)	0 (0,0%)	6 (4,8%)	27 (21,8%)	15 (12,1%)	4 (3,2%)
<20 000	12 (6,0%)	20 (10,0%)	8 (4,0%)	4 (2,0%)	7 (3,2%)	36 (16,6%)	26 (12,0%)	16 (7,4%)
<100 000	14 (5,9%)	22 (9,2%)	6 (2,5%)	3 (1,3%)	7 (2,8%)	46 (18,1%)	30 (11,8%)	10 (3,9%)
>100 000	21 (8,1%)	16 (6,2%)	9 (3,5%)	7 (2,7%)	7 (2,6%)	60 (22,1%)	26 (9,6%)	16 (5,9%)
p	n/s**	n/s**	n/s**	n/a*	n/s**	n/s**	n/s**	n/s**
Net Income (CZK per month)								
Deeply below av	18 (13,1%)	15 (10,9%)	7 (5,1%)	2 (1,5%)	4 (4,2%)	28 (29,5%)	11 (11,6%)	2 (2,1%)
Below arerage	17 (7,0%)	13 (5,3%)	10 (4,1%)	8 (3,3%)	7 (5,0%)	28 (20,0%)	22 (15,7%)	9 (6,4%)
Slightly below a	11 (5,9%)	12 (6,5%)	5 (2,7%)	4 (2,2%)	3 (1,8%)	35 (21,3%)	22 (13,4%)	11 (6,7%)
Average	16 (5,0%)	33 (10,3%)	4 (1,3%)	4 (1,3%)	12 (2,7%)	83 (18,9%)	43 (9,8%)	26 (5,9%)
Slightly above a	7 (6,4%)	13 (11,9%)	3 (2,8%)	1 (0,9%)	7 (4,1%)	32 (18,8%)	20 (11,8%)	10 (5,9%)
Above arerage	2 (10,0%)	2 (10,0%)	1 (5,0%)	0 (0,0%)	0 (0,0%)	10 (18,2%)	4 (7,3%)	4 (7,3%)
Highly abve avg.	1 (16,7%)	0 (0,0%)	1 (16,7%)	0 (0,0%)	1 (16,7%)	1 (16,7%)	0 (0,0%)	0 (0,0%)
p	0,105	n/s**	0,13	n/a*	0,209	n/s**	n/a*	n/a*

p -value obtained from Chi-square test.

* p-value unavailable because of non-fulfilment of Chi-square test conditions

** not significant

5.3.2 Logistic regression modeling

Similarly to Chapter 3.3.2, we estimate a multinomial model capturing incidence of weekly or more often and monthly abuse. Table V. shows social and demographic characteristics together with abuse-associated odds ratios (OR) and their respective two-sided 95% confidence intervals (CI).

Table V. NIPH: Statistical relation (Odds ratios and their 95% confidence intervals) of periodic abuse according to social, demographic and smoking characteristics.

	A. Multinomial model (two abuse frequencies)				B. Binomial model		
	Weekly and more ferq. abuse		Monthly abuse		Monthly and more ferq. abuse		
Sex							
Man	3,746	(2,643-5,308) ***	2,476	(1,872-3,276) ***	2,906	(2,302-3,669)	***
Woman	1,000	[a]	1,000	[a]	1,000		[a]
Age *(years)*							
19-24	1,344	(0,843-2,14)	1,626	(1,068-2,475) **	1,492	(1,054-2,111)	*
25-34	0,932	(0,644-1,347)	1,083	(0,777-1,51)	1,018	(0,777-1,333)	
35-39	1,000	[a]	1,000	[a]	1,000		[a]
Family Status							
Single	1,637	(1,184-2,265) ***	1,346	(1,012-1,792) **	1,468	(1,16-1,859)	***
Married/Spouse	1,000	[a]	1,000	[a]	1,000		[a]
Smoking							
Smoker	2,170	(1,409-3,342) ***	2,311	(1,612-3,313) ***	2,225	(1,644-3,013)	***
Ex-smoker	1,635	(0,997-2,681) *	1,111	(0,713-1,732)	1,307	(0,921-1,856)	*
Non-smoker	1,000	[a]	1,000	[a]	1,000		[a]
Cig. smoked/da	1,039	(1,019-1,059) ***	1,013	(0,994-1,032)	1,025	(1,01-1,041)	***
Education							
Primary	2,834	(1,397-5,749) ***	1,669	(0,958-2,908) *	2,055	(1,287-3,281)	***
Secondary	1,945	(1,021-3,702) **	1,340	(0,835-2,148)	1,528	(1,021-2,287)	**
University	1,000	[a]	1,000	[a]	1,000		[a]
Employment status							
Unemployed	1,693	(0,917-3,126) *	1,313	(0,74-2,329)	1,462	(0,914-2,338)	*
Student	0,915	(0,438-1,911)	1,166	(0,643-2,115)	1,074	(0,645-1,79)	
Retired, Disable	0,234	(0,027-2,043)	0,209	(0,026-1,67) *	0,222	(0,047-1,05)	*
Maternity Leave	0,600	(0,203-1,772)	0,245	(0,075-0,803) **	0,370	(0,164-0,833)	**
Working	1,000	[a]	1,000	[a]	1,000		[a]
Municipality size (inhabitants)							
<500	1,155	(0,635-2,1)	1,042	(0,606-1,791)	1,086	(0,694-1,699)	
<2 000	1,161	(0,744-1,813)	1,109	(0,747-1,648)	1,133	(0,816-1,573)	
<5 000	0,904	(0,517-1,583)	1,144	(0,726-1,803)	1,047	(0,709-1,547)	
<20 000	1,120	(0,726-1,729)	0,852	(0,571-1,27)	0,960	(0,694-1,328)	
<100 000	0,775	(0,5-1,202)	0,878	(0,603-1,28)	0,835	(0,609-1,145)	
Prague	1,000		1,000		1,000		[a]
Net Income (CZK per month)							
Deeply below a	0,579	(0,271-1,24)	1,637	(0,82-3,267)	1,282	(0,736-2,232)	
below arerage	1,329	(0,651-2,713)	1,268	(0,621-2,586)	1,434	(0,805-2,553)	
Slightly below a	1,301	(0,614-2,759)	1,600	(0,77-3,326)	1,450	(0,835-2,52)	
Average	1,124	(0,543-2,328)	1,808	(0,898-3,639) *	2,022	(1,111-3,679)	**
Slightly above a	1,740	(0,788-3,846)	2,361	(1,112-5,011) **	1,957	(0,902-4,246)	*
Above arerage	1,762	(0,624-4,976)	2,204	(0,842-5,768) *	1,082	(0,197-5,954)	*
Highly abve avg.	1,000	[a]	1,000	[a]	1,000		[a]

Odds Ratios (95% conf. intervals) obtained from unconditional multinomial logistic regression. Pseudo R-squared: Cox and Snell 0,17; Nagelkerke 0,22. Fit: 7,2% correctly predicted abuse frequencies

*** *p* -value < 0,01

** *p* -value < 0,05

* *p* -value < 0,10

[a] variable ommited as reference category

Odds Ratios (95% conf. intervals) obtained from binomial logistic regression. Pseudo R-squared: Cox and Snell 0,16; Nagelkerke 0,24. Fit: 31,5% correctly predicted abusers.

Sex again turns out to be the most important factor (OR: from 2,476; CI: 1,872 – 3,276 for monthly abuse up to OR: 3,746; CI: 2,643 – 5,308 for weekly or more often). Single respondents show significantly higher likelihood of alcohol abuse than married ones (OR ranging from 1,346 to 1,637). The ORs of being a smoker as well as of each additional cigarette smoked per day are almost exactly the same as in NMC results, depicting smoking as one of the key complements of binge drinking (OR from 2,170 to 2,311). Interestingly, being a student has no more significant impact on alcohol abuse (which is possibly a result of a different age structure of the sample).

For the same reasons as in case of NMC dataset, we split the analysis into two models, one for each sex. The outcome is again very similar to the first dataset. We cannot observe differences between under aged but we can observe significant increase in abuse frequencies for young (aged 19-24) adult men (OR: 1,758, CI: 1,142-2,707). While overall prevalence of heavy episodic drinking in women is lower, fact

Table VI. NIPH Statistical relation (Odds ratios and their 95% confidence intervals) of monthly or more often abuse according to socil, demographic and smoking characteristics, split by sex

	Monthly and more ferq. abuse					
	Women			Men		
Age *(years)*						
19-24	1,190	(0,65-2,177)		1,758	(1,142-2,707)	**
25-34	0,924	(0,569-1,501)		1,073	(0,774-1,487)	
35-39	1,000		a)	1,000		a)
Family Status						
Single	1,464	(0,963-2,225)	*	1,425	(1,067-1,904)	**
Married/Spouse	1,000		a)	1,000		a)
Smoking						
Smoker	3,012	(1,789-5,073)	***	1,829	(1,251-2,674)	***
Ex-smoker	1,372	(0,725-2,595)		1,256	(0,819-1,924)	
Non-smoker	1,000		a)	1,000		a)
Cig. smoked/day	1,027	(0,997-1,058)	***	1,029	(1,011-1,048)	***
Education						
Primary	4,503	(1,63-12,443)	***	1,530	(0,882-2,655)	*
Secondary	3,751	(1,523-9,239)	***	1,066	(0,662-1,717)	
University	1,000		a)	1,000		a)
Employment status						
Unemployed	1,243	(0,574-2,693)		1,693	(0,907-3,163)	*
Student	1,582	(0,725-3,456)		0,853	(0,434-1,675)	
Retired, Disable	0,882	(0,1-7,765)		0,136	(0,016-1,138)	*
Maternity Leave	0,429	(0,185-0,999)	**	n/a		
Working	1,000		a)	1,000		a)
Municipality size (inhabitants)						
<500	0,920	(0,399-2,123)		1,211	(0,7-2,095)	
<2 000	1,098	(0,607-1,987)		1,134	(0,76-1,693)	
<5 000	1,127	(0,564-2,251)		0,978	(0,608-1,573)	
<20 000	1,111	(0,627-1,967)		0,889	(0,598-1,321)	
<100 000	1,035	(0,588-1,822)		0,768	(0,524-1,126)	
Prague	1,000		a)	1,000		a)
Net Income (CZK per month)						
Deeply below av	0,810	(0,314-2,087)		1,648	(0,823-3,299)	
below arerage	0,906	(0,332-2,472)		1,796	(0,881-3,66)	*
Slightly below a	1,075	(0,41-2,815)		1,686	(0,853-3,33)	*
Average	1,759	(0,607-5,097)		2,198	(1,056-4,573)	**
Slightly above a	2,228	(0,437-11,356)		2,020	(0,819-4,982)	*
Above arerage	1,351	(0,095-19,123)	*	1,083	(0,108-10,888)	*
Highly abve avg.	1,000		a)	1,000		a)

Odds Ratios (95% CI) obtained from unconditional binomial logistic regressions.

Pseudo R-squared: Cox and Snell 0,11; Nagelkerke 0,19. Fit: 7,2% correctly predicted abusers, 99,6% non-bausers

Pseudo R-squared: Cox and Snell 0,16; Nagelkerke 0,24. Fit: 39,2% correctly predicted abusers, 83,8% non-bausers

*** *p* -value < 0,01

** *p* -value < 0,05

* *p* -value < 0,10

a) variable ommited as reference category

of being a smoker increases the odds much greater for women than for men (OR: 3,012; CI: 1,789-5,073 for women compared to CI: 1,829; CI: 1,251-2,674 for men). Moreover, lower education seems to have similar effect (OR: 4,503; CI: 1,630-12,443 for women while for men it is only OR: 1,530; CI: 0,882-2,655). Lower income as well as being unemployed, seems again to be a driver of increased alcohol abuse, but only for men[20].

The explanatory power of the models is again not overwhelming, but expected for this type of cross-section analysis.

While comparing tables IV and VI, we do not see differences in explanatory power of marital status (seen on NMC data) anymore, as the youngest age category is now missing. On the other hand, interesting differences are found in income. It may not seem as a significant abuse driver when cross-tabulated. But after other variables are accounted for, higher income becomes a significant and differentiated across the two sexes. Higher income turns out to be a

Table VII. NIPH: Statistical relation (Odds ratios and their 95% conf. intervals) of periodic abuse with to social, demographic and smoking characteristics, based on quantitative abuse measures and AUDIT screening

	A. Multinomial model (two abuse frequencies)					
	Risky consumption			Harmful Consumption		
Sex						
Man	1,463	(1,16-1,845)	***	3,987	(2,5-6,358)	***
Woman	1,000		a)	1,000		a)
Age *(years)*						
19-24	0,658	(0,458-0,946)	**	0,783	(0,444-1,379)	
25-34	0,752	(0,573-0,986)	**	0,988	(0,63-1,549)	
35-39	1,000		a)	1,000		a)
Family Status						
Single	1,271	(0,995-1,625)	*	1,545	(1,037-2,3)	**
Married/Spouse	1,000		a)	1,000		a)
Smoking						
Smoker	2,455	(1,774-3,395)	***	4,271	(2,379-7,667)	***
Ex-smoker	1,802	(1,263-2,571)	***	1,987	(0,964-4,095)	*
Non-smoker	1,000		a)	1,000		a)
Cig. smoked/day	1,034	(1,017-1,05)	***	1,021	(1-1,042)	**
Education						
Primary	1,313	(0,854-2,018)		2,299	(0,969-5,45)	*
Secondary	0,770	(0,533-1,114)		1,283	(0,563-2,927)	
University	1,000		a)	1,000		a)
Employment status						
Unemployed	1,346	(0,91-1,991)	*	2,689	(1,671-4,329)	***
Student	0,759	(0,449-1,283)		0,608	(0,223-1,653)	
Disabled, Retire	0,213	(0,042-1,066)	*	1,042	(0,202-5,386)	
Maternity	0,310	(0,15-0,641)	***	1,049	(0,3-3,668)	
Working	1,000		a)	1,000		a)
Municipality size (inhabitants)						***
<5 000	0,963	(0,605-1,532)		0,897	(0,418-1,924)	
<20 000	1,312	(0,934-1,844)	*	1,763	(1,057-2,94)	**
<50 000	0,997	(0,655-1,516)		1,121	(0,58-2,168)	
<100 000	1,077	(0,772-1,502)		0,817	(0,467-1,43)	
<1 000 000	0,803	(0,577-1,119)		0,798	(0,466-1,365)	
Prague	1,000			1,000		
Age of first alc. consumption						
per year	0,833	(0,793-0,875)	***	0,943	(0,877-1,013)	*
Pseudo R-squared: Cox and Snell 0,16; Nagelkerke 0,24. Fit: 26,0% correctly predicted abusers, 94,4% correctly predicted non-abusers				Pseudo R-squared: Cox and Snell 0,11; Nagelkerke 0,26. Fit: 4,9% correctly predicted abusers, 99,5% correctly predicted non-abusers		

*** *p* -value < 0,01
** *p* -value < 0,05
* *p* -value < 0,10
a) variable ommited as reference category

[20] It is worth mentioning that unemployed men in student age often show lower than average drinking figures as reported for example by Svensson and Hagquist (2010)

pro-abuse driver for women while the opposite is true for men. It is lower income men who seem to be more likely to drink alcohol in abusive volumes.

5.3.3 Modeling using alternative abuse definitions

The results of binomial regressions evaluating prevalence of Risky and Harmful consumption (see above definition) are summarized in Table VII. We can see a decreased (but still highly significant) importance of sex on overall abuse (OR: 1,463; CI: 1,160-1,845) which is a result of the fact, that level of risky consumption in women is now appropriately set to lower volumes compared to men.

Table VIII. NIPH: Statistical relation (Odds ratios and their 95% conf. intervals) of periodic abuse with to social, demographic and smoking characteristics, based on quantitative abuse measures and AUDIT screening, split by sex.

	Women		Men	
	Risky consumption	**Harmful Consumption**	**Risky consumption**	**Harmful Consumption**
***Age** (years)*				
19-24	0,644 (0,36-1,151) *	0,216 (0,051-0,913) **	0,658 (0,411-1,055) *	1,004 (0,534-1,888)
25-34	0,679 (0,439-1,052) *	0,517 (0,184-1,453)	0,801 (0,563-1,139)	1,205 (0,724-2,003)
35-39	1,000 [a)]	1,000 [a)]	1,000 [a)]	1,000 [a)]
Family Status				
Single	1,082 (0,728-1,606)	2,379 (0,899-6,297) *	1,424 (1,035-1,959) **	1,478 (0,952-2,295) *
Married/Spouse	1,000 [a)]	1,000 [a)]	1,000 [a)]	1,000 [a)]
Smoking				
Smoker	1,880 (1,121-3,155) **	6,865 (1,511-31,192) **	2,909 (1,892-4,471) ***	3,924 (2,061-7,471) ***
Ex-smoker	1,851 (1,082-3,167) **	2,521 (0,391-16,274)	1,804 (1,119-2,908) **	1,982 (0,898-4,373) *
Non-smoker	1,000 [a)]	1,000 [a)]	1,000 [a)]	1,000 [a)]
Cig. smoked/day	1,055 (1,023-1,089) ***	1,066 (1,012-1,124) **	1,025 (1,006-1,045) **	1,016 (0,993-1,039)
Education				
Primary	0,706 (0,361-1,383)	1,316 (0,134-12,953)	1,842 (1,026-3,306) **	2,292 (0,894-5,875) *
Secondary	0,654 (0,387-1,104) *	1,437 (0,176-11,769)	0,873 (0,52-1,466)	1,178 (0,479-2,9)
University	1,000 [a)]	1,000 [a)]	1,000 [a)]	1,000 [a)]
Employment status				
Unemployed	1,684 (0,87-3,261) *	9,899 (3,137-31,237) ***	1,195 (0,731-1,953)	2,182 (1,275-3,735) ***
Student	0,964 (0,432-2,152)	0,000 n/a	0,635 (0,316-1,275)	0,651 (0,232-1,827)
Disabled, Retire	0,688 (0,075-6,303)	9,607 (0,693-133,166) *	0,122 (0,014-1,106) *	0,519 (0,058-4,613)
Maternity	0,333 (0,158-0,698) ***	2,357 (0,591-9,4)	n/a	n/a
Working	1,000 [a)]	1,000 [a)]	1,000 [a)]	1,000 [a)]
Municipality size (inhabitants)				
<5 000	0,612 (0,278-1,345)	2,427 (0,55-10,701)	1,219 (0,673-2,208)	0,637 (0,256-1,585)
<20 000	1,093 (0,637-1,878)	1,207 (0,343-4,246)	1,431 (0,919-2,228) *	1,796 (1,018-3,168) **
<50 000	1,012 (0,528-1,94)	0,597 (0,094-3,799)	0,980 (0,565-1,699)	1,232 (0,602-2,518)
<100 000	0,942 (0,555-1,601)	0,219 (0,037-1,306) *	1,175 (0,763-1,809)	0,946 (0,518-1,728)
<1 000 000	0,690 (0,403-1,18)	0,781 (0,212-2,884)	0,880 (0,576-1,345)	0,799 (0,442-1,443)
Prague	1,000	1,000	1,000	1,000
Age of first alc. consumption				
per year	0,811 (0,752-0,875) ***	0,972 (0,847-0)	0,841 (0,787-0,899) ***	0,923 (0,848-0) *
*** *p* -value < 0,01 ** *p* -value < 0,05 * *p* -value < 0,15	Pseudo R-squared: Cox and Snell 0,11; Nagelkerke 0,19 Fit: 8,7% correctly predicted abusers, 98,4% correctly predicted non-abusers	Pseudo R-squared: Cox and Snell 0,07; Nagelkerke 0,32. Fit: 15,4% correctly predicted abusers, 99,9% correctly predicted non-abusers.	Pseudo R-squared: Cox and Snell 0,17; Nagelkerke 0,24 Fit: 37,5% correctly predicted abusers, 90,3%	Pseudo R-squared: Cox and Snell 0,10; Nagelkerke 0,20 Fit: 5,1% correctly predicted abusers, 99,4% non-abusers.

[a)] variable ommited as reference category

The income-bracket variable has been omitted from the model due to its overall insignificance. Due to this omission, the importance of Employment status became even slightly more significant (this is especially true for unemployed respondents). The very high OR of Harmful consumption in men-smokers is likely to be attributed to harm caused by smoking itself. Other results as well as explanatory power of the model remain very similar to those using frequencies-based definition of abuse. An interesting observation is brought by the new explanatory variable, unique to NIPH dataset

– the age of the first experience with alcohol consumption. The highly significant values for Risky consumption (OR: 0,833; CI: 0,793-0,875) suggest that the later one starts drinking alcohol, the lower the probability of excessive consumption in the future. For every year one starts drinking earlier, the odds of heavy episodic drinking are multiplied by 1,2 (=1/0,833).

When we split the dataset by sex (see Table VIII.) the picture does not change dramatically. We observe higher odds of harmful consumption in single women (OR: 2,379; CI: 0,899-6,297 compared to OR: 1,478; CI: 0,952-2,295 in single men). The same applies to women smokers (OR: 6,865 CI: 1,511-31,192 compared to OR: 3,924; CI: 2,061-7,471). Given the fact that harmful consumption in women is much less likely than for men (see Table VII.), this observation means rather bridging the gap between sexes for smokers and singles rather than some extreme behavior observed in women. Among other drivers, being unemployed remains a significant driver of harmful consumption for both men and women. Interestingly, being on maternity leave (which only applies to women) results in significantly lower odds in Risky consumption (OR: 0,333; CI: 0,158-0,698) but (sadly) has no significant impact on Harmful consumption. The age of the first experience with alcohol-drinking has very similar impact on both sexes which is highly significant for odds of risky consumption and partially significant for harmful consumption.

6 NOTE ON OTHER DATA SOURCES

Arguably one of the most popular Czech sources for micro-level consumer behavior is Household Budget Survey (HBS) conducted by Czech Statistical Office. It contains illustrative set of socio-demographic characteristics and yearly track on consumption of individual consumer goods (including alcohol) and is therefore one of the few sources from which own-price and cross-price elasticities of consumer goods could be estimated for the Czech Republic[21]. Even more importantly, HBS respondents are tracked for multiple years, creating a balanced panel dataset, which could be priceless for many research purposes. Unfortunately, this dataset is almost completely unsuitable for assessment of individual alcohol consumption and possible abuse. The construction of HBS relies on aggregation per household, which means we could only assess average values per all household

[21] as done for example by Janda, Mikolášek and Netuka, M., (2010)

members. By doing so, however, the observations of extreme behavior (heavy drinking or abstinence) we are the most interested in, might be lost for us. Although this pitfall might be overcome by picking only single-member households (10%-15% of the dataset), we'd be left with a selection which would be far from being a representative sample of general Czech populace. Therefore, we need to use data on truly individual basis.

7 DISCUSSION

As discussed earlier the most relevant studies to compare our results with are that by Csémy, Sovinová and Procházka (2011, hereafter the Czech study) who ran a very similar analysis on NIPH data. While their interpretation of the data was limited to cross-tabulation only (where our findings are, by definition, identical), our study extends this by application of binomial and multinomial modeling. The other closely related study by Dias, Oliveira and Lopes (2011, hereafter *Portuguese study*) was analyzing socio-demographic drivers of alcohol consumption for Portuguese urban population, including binomial models. Their focus group is not capped by any age category and apart from cross-tabulated results, they provide (unlike for previously mentioned paper) a multinomial logistic model similar to ours. To some extent, there are natural restrictions for direct comparability of our results with this study in form of the differences in cultural background and consumer habits between Portugal and the Czech Republic and the fact, that their study was conducted on urban population only.

Both ours and the above mentioned studies agree on higher prevalence of heavy (episodic) drinking in men compared to women. Whereas Csémy, Sovinová and Procházka do not account for populace aged above 40, the Portuguese study, as well as our paper, report higher incidence of abuse for middle-aged and pre-retirement age groups. The Czech study however, reports lower frequency of above-limit intake for students which is quite contradictory to our findings on NMC data, where we found slightly higher incidence of weekly episodic drinking and significantly higher that of monthly frequency, especially in young women. Portuguese study does not distinguish students as a separate work-type or social group.

As marital status is concerned, both above mentioned studies found lower abuse rate in married or coupled groups compared to singles. Our study was unable to confirm such an observation

on MNC data but is in line on NIPH sample. When assessing relation of alcohol abuse with education, both mentioned studies report negative relation between education and alcohol abuse. These results, however, cannot be taken without caution. As shown in Table I., education, when treated independently of other drivers seems as being relevant driver of both prevalence of abstinence and abuse. In both our NMC and NIPH samples, individuals with only basic education seem to exhibit higher rate of abstinence and lower rate of abuse. Compared to secondary education, respondents with university education seem to show similar traits. Though when we account also for age group and income, impact of education turns out to be insignificant. The explanation to that is quite straight forward – majority of under-aged could only finished basic education level by the time being questioned. Those aged 19-24 usually couldn't have finished their university degree yet. In the older age categories, however, the restrictive attitude of communist regime towards higher education resulted in much higher rate of basic education for populace which is now in their fifties and sixties. In fact, while taking into account even other factors in binomial model, lower education turns out to be a significant driver only for frequent heavy episodic drinking in Women and Harmful consumption in men. Having that said, it is legitimate to ask whether education alone could really serve as an unbiased determinant of alcohol consumption and abuse. A better proxy, perhaps, could be some measure of socioeconomic status which is likely to be tightly correlated with education (Makela, 1999).

According to Csémy, Sovinová and Procházka income is reported to have ambiguous impact on alcohol abuse with high prevalence in both very-low and highly above average income groups. Our study does only fully confirm the latter part of the statement, while effect of low income on alcohol abuse is positive only for men. This could again be a result of a fact, that our study does account for student status (much correlated with abuse in young adult population) and does also include retired respondents for whom abuse rates as well as income tend to be lower. The mentioned Czech study did not consider type of residence being of significant influence. Our results, on the other hand, show some interesting relation between municipality sizes, the respondent is residing in, and his or her alcohol-related behavior. Abstinence seems to be significantly less frequent in larger cities (which could be to some extent driven by lower mean age of respondents from large cities compared to those from "rural" areas). On the other hand, the heavy drinking indicators are significantly higher for small municipalities, especially for weekly and daily abuse.

The most interesting findings of this study are the dramatic differences in abuse patterns between women and men. Although men show significantly higher tendency to abuse alcohol in general, women seem to show dramatic increase in abuse rates in certain circumstances. In fact, our results suggest that young smoking female student is even more likely to abuse alcohol than male with the same characteristics[22]. Our study definitely confirms importance of preventive programs for youth as there is significantly higher likelihood of heavy binge drinking for young age groups. We've even found strong evidence of increased probability of alcohol abuse with decreasing age of the first alcohol-drinking experience. Among income drivers, personal wealth does not seem to have significant influence on one's attitude towards drinking. The only, but possibly highly important abuse rates. Apart from gender, the most important factor associated with abuse of alcohol is smoking. Apart from sex, the least disputable driver in terms of results is smoking. To the best knowledge of the author, there is no published paper which would claim negative relation between alcohol abuse (or its consumption in general) and smoking. Results of our study not only support this statement, but confirm this relation even for ex-smokers[23]. Moreover, we found evidence that even among current smokers the number of cigarettes smoked per day has a very strong correlation with prevalence of heavy episodic drinking, risky drinking as well as harmful drinking.

It is important to mention that all our results should be interpreted with caution. Not only that our models may not (by definition of the dataset) capture some important unobserved factors which influence its results, such as health condition or peer effects. They are neither capable of capturing the causality of individual associations (e.g. whether smoking promotes drinking or vice versa). Taking this into account, the findings of our analysis could serve as a source material for public policy measures to mitigate health, economic and social burden of alcohol related problems in the Czech Republic as it provides a suitable basis targeting groups of potential abusers. However, the result-based recommendation, would not be an easy one to implement or enforce, since targeting any policies based on sex, income or family status is both demanding and politically sensitive.

[22] The multiple of odds ratios in this case for women are 3,5 higher than for male whereas corresponding general difference between men and women is only 2,9. (see Table V. and Table VI.)
[23] Which is in line with observations by Dias, Oliveira and Lopes

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Univerzita Karlova v Praze, Fakulta sociálních věd
Institut ekonomických studií [UK FSV – IES] Praha 1, Opletalova 26
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