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THE ALCOHOL PURCHASE TASK IN YOUNG MEN FROM THE GENERAL POPULATION

Nicolas Bertholet [1]

James G. Murphy [2]

Jean-Bernard Daeppen [1]

Gerhard Gmel [1]

Jacques Gaume [1]

1 : Alcohol Treatment Center, Department of Community Medicine and Health, Lausanne University Hospital, Lausanne, Switzerland

2: Department of Psychology, University of Memphis, Memphis, TN, USA

Corresponding author:

Nicolas Bertholet, MD, MSc

Alcohol Treatment Center

Beaumont 21b, P2, 02

1011 Lausanne CHUV

Switzerland

Nicolas.Bertholet@chuv.ch

+413147351

ABSTRACT:

Background: The alcohol purchase task (APT), which presents a scenario and asks participants how many drinks they would purchase and consume at different prices, has been used among students and small clinical samples to obtain measures of alcohol demand but not in large, general population samples.

Methods: We administered the APT to a large sample of young men from the general population (Cohort Study on Substance Use Risk Factors). Participants who reported drinking in the past year (n=4790), reported on past 12 months alcohol use, on DSM-5 alcohol use disorder (AUD) criteria and on alcohol related consequences were included.

Results: Among the APT's demand parameters, intensity was 8.7 (SD=6.5) indicating that, when drinks are free, participants report a planned consumption of almost 9 drinks. The maximum alcohol expenditure (O_{max}) was over 35CHF (1CHF=1.1USD) and the demand became elastic (P_{max}) at 8.4CHF (SD=5.6). The mean price at which the consumption was suppressed was 15.6CHF (SD=5.4). Exponential equation provided a satisfactory fit to individual responses (mean R square: 0.8, median: 0.8). Demand intensity was correlated with alcohol use, number of AUD criteria and number of consequences (all $r>=0.3$, $p<0.0001$). O_{max} was correlated with alcohol use ($p<0.0001$). The elasticity parameter was weakly correlated with alcohol use in the expected direction.

Conclusion: The APT measures are useful in characterizing demand for alcohol in young men in the general population. Demand may provide a clinically useful index of strength of motivation for alcohol use in general population samples.

KEYWORDS: alcohol purchase task; behavioral economics; alcohol; general population; men

1. INTRODUCTION:

The economic model of addiction is the subject of a growing number of scientific studies (Bickel et al., 2014; Bickel and Marsch, 2001; Murphy et al., 2007). Behavioral economics provides a theoretical framework of substance use and addiction that can be used to assess problem severity (level of desire for substance use) and to develop prevention interventions (Murphy et al., 2012). It uses concepts from economics and psychology to model how individuals value resources (in this case, alcohol) as a function of environmental constraints (Bickel and Marsch, 2001). Hence, substance use can be understood as the result of numerous factors related to individual characteristics and ecological factors. According to the behavioral economics framework, substance use is more likely when constraints on use are minimal and when there are important constraints on access to substance-free reinforcers. For example, alcohol, like other psychoactive substances, is a potent reinforcer, but its consumption is sensitive to constraints on access (including drink price) and the presence of alternative reinforcers. Therefore, in contexts where the monetary and behavioral "costs" of alcohol are limited -i.e. in environments with easy access to alcohol (high density of alcohol outlets, late openings of alcohol outlets), social tolerance towards behaviors influenced by alcohol use (like intoxication), and low price of alcoholic beverages- consumption is likely to be elevated. Notably, various studies have established that increases in price are associated with decreases in consumption (Lhachimi et al., 2012; Skidmore and Murphy, 2011; Wagenaar et al., 2009). Similarly, the density of alcohol outlets has been shown to be associated not only with consumption but also with negative consequences related to alcohol use (Ahern et al., 2013; Popova et al., 2009; Spoerri et al., 2013), including in Switzerland.

Demand for alcohol indicates how much a given individual wants or values alcohol. As such, it may provide unique information on substance use problem severity that may not be captured by other measures such as alcohol consumption, problems, or AUD symptoms. Indeed, one of the characteristics of substance use disorder is related to the resource allocation for a particular substance, a feature that can be captured by behavioral economic measures.

Instruments have been developed to assess the demand for substances such as alcohol (Murphy and MacKillop, 2006), cigarettes (MacKillop et al., 2008), and marijuana (Collins et al., 2014). The hypothetical alcohol purchase task assesses the number of drinks an individual would purchase during a party if the drinks were available at various prices (from free to large amounts of money). The alcohol purchase task is used to construct demand curves, it can be used to quantify the influence of drink price on consumption. Associations have been shown between alcohol demand, impulsivity and alcohol use disorders (Gray and Mackillop, 2013). Individuals who tend to respond impulsively to negative emotions appear to have a greater demand for alcohol (9), but the link between demand and impulsivity is not limited to negative affect situations (10). Demand has also been shown to be associated with dependence symptoms in a small US community sample (10), and with alcohol problems in college student samples (11, 15).

The alcohol purchase task has been used among US students to obtain measures of alcohol demand, and has been shown to be reliable and valid and to predict alcohol use and problems in this population (Amlung et al., 2012; Murphy and MacKillop, 2006; Murphy et al., 2009). In addition the alcohol purchase task has been used to study the impact of ecological

aspects of alcohol use; Gentile and colleagues assessed the influence of academic constraint on alcohol demand (Gentile et al., 2012). Nevertheless, outside of the US and college student context, little information is available on the alcohol purchase task and on the association between behavioral economics measures and alcohol use and consequences. Specifically, knowledge on the potential utility of behavioral economic demand curve measures in characterizing alcohol demand in general population samples is lacking. Indeed, a better knowledge of the use of an alcohol purchase task outside of student populations will be of interest, especially in the prospect of a broader application of interventions based on a behavioral economics framework (Murphy et al., 2012). In this regard, research is needed outside of the US student population. The burden of alcohol use is especially high among young men (particularly in terms of violence, and intentional and unintentional injuries) and, in Switzerland, 20 to 24% of all deaths of men aged 15 to 34 are attributable to alcohol (Marmet et al., 2014). Therefore a population based sample of young male individuals is of particular interest. In addition, demand curves have a potential utility for policy makers, since they could be used to model the impact of drink price changes on consumption in this high risk group. Therefore, we assigned a hypothetical alcohol purchase task to young men from the general population, studied the impact of drink price on hypothetical consumption, and assessed whether demand parameters were associated with alcohol use, alcohol use consequences and problem severity (including criteria for alcohol use disorder, according to the DSM-5).

We hypothesized that reported consumption would be sensitive to price and well described by an exponential decay function (Hursh and Silberberg, 2008), and that alcohol demand parameters would be associated with alcohol use, alcohol use consequences and

problem severity.

2. METHODS

2.1 Study population and setting:

The present study was conducted in Switzerland and was part of the Cohort Study on Substance Use Risk Factors (C-SURF, see www.c-surf.ch). Young Swiss males were approached for enrollment in this large cohort study as they presented at army recruitment centers in the French and German speaking parts of Switzerland, which has a mandatory 2-day procedure to assess eligibility to serve in the military. Virtually all males, aged 20, have to participate to the procedure. This offers a unique opportunity to access the entire Swiss population of this age group, allowing approaching individuals from a broad socio-economic and educational background. C-SURF participants were approached and included in the study as they attended the centers at Lausanne (French-speaking part of Switzerland) and Windisch and Mels (German-speaking part). In order to minimize the risk of under or over reporting of substance use, participants were informed that all information they provided was confidential, kept separate from the army, and had no implications for army conscription procedures. Participants were notified that the research was not connected to the army and that military personnel could not see the responses or other data from any individual. Virtually all center attendees were eligible to participate in the study if they gave their written, informed consent. The Ethics Committee

for Clinical Research at the Lausanne University Medical School approved the project.

Participants were recruited between August 23, 2010 and July 31, 2011. Of the 13,245 young men approached as they attended the army recruitment centers, 11,819 were briefly screened to assess the sample representativeness and 7563 agreed to participate in the cohort study. Within two weeks after enrolment, participants were invited by mail or email to complete the baseline cohort study questionnaire. The baseline questionnaire was completed by 5990 participants (79.2% of consenters). A second questionnaire, which included questions used for the present study, was sent to participants 15 months after the baseline assessment (January 2012 – April 2013) and completed by 5,520 participants (73.0% of consenters). The cohort study questionnaire were paper-pencil or online questionnaires (according to the participant preference). Participants were eligible for the present study if they completed the second questionnaire. Details on the recruitment procedure and on comparisons between consenters and non-consenters, and between responders and non-responders have been published (Studer et al., 2013a; Studer et al., 2013b). No extreme differences were observed between consenters and non-consenters but non-consenters reported higher substance use patterns than consenters. With respect to alcohol use, non consenters reported a higher prevalence of monthly binge drinking compared to consenters (50.3 vs 48.4% among French speaking participants ($p=0.2$), 47.4 vs 44.1% among German speaking participants ($p=0.02$) and a higher prevalence of risky drinking (defined as >= 21 drinks per week, 9.4 vs 6.6 among French speaking participants ($p<.001$), 7.8 vs 4.9 among German speaking participants ($p<.001$)). There were no significant differences between consenters and non consenters on the weekly drinking volume (mean number of drinks per week (SD) 1.47(1.37) vs 1.40(1.30) among French speaking

participants (p=0.09), 1.36(1.40) vs 1.35(1.33) among German speaking participants (p=0.8)). For the present study, no differences were observed on the APT between those completing it online or with the paper-pencil version. Participants were only men. Women are allowed to join the military service on a voluntary basis, but were not included in the present study due to their scarcity and resulting non-representativeness.

2.2 Measures:

All participants reported current (past 12 months) alcohol use: number of drinks per drinking day and number of drinking days per week (used to compute the number of drinks per week), maximum number of drinks per occasion, and frequency of binge drinking episodes (binge episodes were defined as 6 or more drinks on one occasion). A standard drink was defined as 1dl of wine, 2.5dl of beer, 1 mixed drink, or 2cl of strong liquor (~10g of ethanol). A visual aid was provided to participants with illustrations of standard drinks.

The number of criteria for alcohol abuse and alcohol dependence and consequences of drinking were assessed. Abuse and dependence criteria were assessed with specific questions (Knight et al., 2002) adapted from the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) (Bucholz et al., 1994; Hesselbrock et al., 1999). They were adapted to elicit self-reporting of DSM-5 alcohol use disorder criteria (APA, 2013) during the year preceding the survey. The 11 alcohol use disorder criteria were: 1.) drinking larger amounts or for longer periods than intended; 2.) persistent desire or unsuccessful efforts to cut down or control drinking; 3.) great deal of time spent on activities to obtain alcohol or to recover from its effects; 4.) craving or strong desire to use alcohol; 5.) use resulting in failure to fulfill major role

obligations at work/school/home; 6.) continued use despite persistent or recurrent social or interpersonal problems due to drinking; 7.) giving up or reducing important social, occupational or recreational activities in favor of drinking; 8.) drinking in hazardous situations; 9.) continued drinking despite knowledge of a physical or psychological problem caused or exacerbated by drinking; 10.) tolerance; and 11.) withdrawal symptoms or withdrawal relief/avoidance. The number of positive responses to the items was then summed and participants categorized as having no alcohol use disorder (0-1 criterion) or mild (2-3 criteria), moderate (4-5) or severe alcohol use disorder (6 or more criteria).

Nine consequences of drinking were assessed: 1.) hangover; 2.) blackouts; 3.) doing things that you regretted later; 4.) unplanned sexual intercourse because of your drinking; 5.) unprotected sexual intercourse because of your drinking; 6.) being injured; 7.) trouble with the police or other officials; 8.) being involved in arguments or fights; 9.) property damage. The number of positive responses (i.e. having had the corresponding consequence during the last 12 months) was then summed (possible range: 0-9).

Participants also completed a hypothetical alcohol purchase task, adapted from Murphy and MacKillop (Murphy and MacKillop, 2006). In this, we presented a scenario and asked participants how many drinks they would purchase and consume at 11 different prices ("Imagine you are in a situation you usually drink alcohol (at a bar, at a party, at home, etc.). You did not drink alcohol before nor will you go have a drink elsewhere afterwards. How many drinks would you have if each drink was free/50cts/1, 2, 3, 4, 6, 8, 10, 15, 20 Swiss francs"). A visual aid accompanied the question, indicating what is considered a standard drink (see

above). One Swiss franc (1CHF) is equivalent to 1.1 USD, 0.7£ or 0.8€ (Jan 2012 – April 2013). The hypothetical alcohol purchase task has good test-retest reliability (Murphy et al., 2009), and strong associations have been observed between hypothetical drink purchases and subsequent lab based actual purchases (Amlung et al., 2012). All measures were self-reported.

2.3 Analyses:

Participants with incomplete data on the alcohol purchase task were excluded. The reported consumption was then plotted as a function of price and expenditures at each price were computed by multiplying reported consumption by price. Four indices of alcohol demand can be observed directly from these consumption or expenditure data: 1. intensity of demand (i.e., consumption when the drinks are free); 2. maximum alcohol expenditure (O_{max}); 3. price at which the demand becomes elastic (P_{max}, i.e. price at which an increase in price leads to a greater than proportional decrease in consumption, which is also the price associated with O_{max}); 4. first price at which the consumption is suppressed (breakpoint) (Murphy et al., 2009). Participants who reported that they would drink at the highest price proposed were assigned a breakpoint at the highest price (CHF 20).

In addition to observing the aforementioned indices from the raw alcohol consumption and expenditure data, elasticity was computed by fitting demand curves for each participant using the exponential equation described by Hursh and Silberberg (2008). In this equation, ln Q: = ln Qmax + k ($e^{-[alpha]P}$ – 1), Q is the quantity consumed, k specifies the range of the dependent variable (alcohol consumption) in natural logarithmic units, and [alpha] specifies the rate of

change in consumption with changes in price (elasticity). The value of k (3.5 in the present study) is constant across all curve fits. Individual differences in elasticity are thereby scaled with a single parameter ([alpha]) which is standardized and independent of reinforcer magnitude. Larger [alpha] values reflect *greater* price sensitivity (elasticity). Demand curves were fit according to the Hursh and Silberberg (2008) guidelines using the calculator provided on the Institute for Behavioral Resources website (http://www.ibrinc.org/index.php?id=70).

Correlations between alcohol demand parameters and measure of alcohol use, number of DSM-5 criteria for alcohol use disorder and number of consequences were computed. Curves presenting the mean hypothetical consumption and the proportion of people reporting hypothetical binge drinking (defined as 6 or more drinks) at each price were computed, for the entire sample, and by DSM-5 alcohol use disorder level (none, mild, moderate, severe). Curves were also computed by levels of the following demographic variables: highest completed education levels, professional status, relationship status, living arrangements, source of income, and perceived economic situation of the family, as socio-economic characteristics might impact alcohol consumption and purchasing.

We did assess to what extent the price influenced the consumption. A negative binomial generalized estimating equation (GEE) model with auto-regressive correlation structure for the alcohol purchase task items within individuals was used to assess the change in hypothetical drinking associated with each increase in 1CHF in the drink price. This model indicates the specific reduction in drinking per dollar increment.

3. RESULTS

Of cohort participants (n=5520), 410 were excluded because they were not drinkers, 219 were exclude because of missing data on the alcohol purchase task, and 101 were excluded because of incoherent data. The 4790 participants (86.8 % of cohort participants) who completed the alcohol purchase task were included in the present study. Most of the participants completed more than obligatory school (43.9% completed an apprenticeship or professional school and 47.9% completed high school or more), more than half were in training (56.1%, vs 39.4% employed and 3.7% receiving social welfare), and 36.1% reported covering their living expenses by themselves. Almost half of the participants (46.3%) perceived the economic situation of their family as "above average". Participants reported a mean (SD) of 8.4 (10.6) drinks per week, and 48.2% reported binge drinking at least monthly. Detailed demographics and measures of alcohol use are presented in Table 1.

Alcohol consumption decreased as prices increased, from a mean (SD) of 8.7 (6.5) when drinks are free to 0.9 (1.6) when drinks are 20CHF (50cts: 8.1(5.9); 1CHF: 7.7(5.6); 2CHF: 7.1 (5.1); 3CHF: 6.3 (4.6); 4CHF: 5.4 (4.2); 6CHF: 4.3(3.6); 8CHF: 3.2(3.1); 10CHF: 2.3(2.6); 15CHF: 1.4(2.1); 20CHF: 0.9(1.6)). The mean alcohol demand curve is presented in Figure 1 and indicates that, as expected, the demand decreased as the price increased. Further analysis showed that each increase of 1 CHF was related to a 10.6% decrease in number of drinks (negative binomial generalized estimating equation (GEE) model with auto-regressive correlation structure for the alcohol purchase task items within individuals: incidence-rate ratio=0.894, semi-robust standard error=0.001, $z= -81.9$, $p<0.001$).

Figures 2a and 2b present the mean hypothetical consumption and the proportion of people reporting hypothetical binge drinking for the full sample and by DSM-5 alcohol use disorder severity level. We observed that, at each price, an increase in alcohol use disorder severity corresponded to a more elevated hypothetical consumption and a more elevated proportion of reported binge drinking. Using the GEE model reported above stratified by DSM-5 severity level, an increase of 1 CHF was related to a 10.8% decrease in the number of drinks for individuals without an alcohol use disorder, to a 10.5% decrease in the number of drinks for individuals with a mild alcohol use disorder, to a 10.6% decrease in the number of drinks for individuals with a moderate alcohol use disorder, and to a 9.9% decrease in the number of drinks for those with a severe alcohol use disorder (all $p<0.0001$).

Curves by socio-economic characteristics were similar across groups and are therefore not presented herein.

The alcohol demand parameters generated from the alcohol purchase task are presented in Table 2. The intensity was at a mean (SD) 8.68 (6.46) indicating that, when drinks are free, participants report a planned consumption of almost 9 standard drinks. The mean O_{max} (i.e. maximum alcohol expenditure) was 36.22CHF and the demand became elastic at a mean price of 8.4 (5.6) CHF (i.e. for higher prices the decrease in consumption is proportionally more pronounced than the increase in price). The mean price at which the consumption is suppressed is 15.6 (5.4) CHF. Exponential equation provided a satisfactory fit to individual participants responses (n=4790, mean R square 0.79, median 0.80).

Correlation coefficients between the alcohol demand parameters and alcohol use

variables are presented in Table 3. Correlation coefficients indicate how strongly the independent variable (alcohol demand parameters) is correlated with the dependent variable (alcohol use variables). A correlation coefficient r=0.5 means that the independent variable accounts for 25% of the variance (r^2=0.25) in the alcohol use variable. In psychology and social sciences, the relationships are complex and we do not expect a single variable to fully account for the variance in a dependent variable. According to Cohen, r=0.1 can be interpreted as a small effect size, r=0.3 as medium and r=0.5 as large (Cohen, 1988). Intensity was correlated with the number of drinks per week (r=0.46, p<0.0001), the presence of monthly binge drinking (r=0.43, p<0.0001), the maximum number of drinks consumed on one occasion (r=0.58, p<0.0001). Correlations were significant but weaker for the number of DSM-5 alcohol use disorder criteria (r=0.34, <0.0001) and the number of consequences (r=0.35, p<0.0001). O_{max} was correlated at 0.4 or over with the number of drinks per week (r=0.42, p<0.0001), and the maximum number of drinks per occasion (r=0.45, p<0.0001). Correlations were weaker for monthly binge drinking, number of alcohol use disorder criteria and number of consequences (all r>=0.25-<=0.4, all p<0.0001). Elasticity was inversely correlated with the alcohol use measures (greater price sensitivity = less drinking) but only weakly (all r<=-0.10->=-0.13, all p<0.0001). Surprisingly, breakpoint and P_{max} were not strongly correlated with any of the alcohol use measures (r>=0.02-0.19).

4. DISCUSSION

The present study provides further support for the validity of the alcohol purchase task

as a novel theoretically based measure of alcohol demand. Reported hypothetical consumption was high at low prices and decreased as prices increased (i.e., the demand decreased as the price increased). Our study adds to the current evidence by showing the applicability for behavioral economics measure of alcohol use outside of the US college student population. Specifically, our results support the use of the alcohol purchase task in a large general population sample of young men, and more broadly offers support for the use of a behavioral economics framework to characterize alcohol-related decision making in that population. We observed that each increase in 1 CHF was associated with a significant decrease (>10%) in the reported hypothetical alcohol consumption, and that that level of decrease was fairly constant across individuals with and without AUD symptoms. The current study adds to the evidence linking alcohol demand to alcohol use and severity of alcohol problems. Our results were in line with other studies conducted in student populations (MacKillop and Murphy, 2007; Murphy and MacKillop, 2006; Murphy et al., 2009).

Our results are consistent with macroeconomic studies using population-level price and consumption data that have found consistently that alcohol consumption is related significantly to price and availability, with increases in cost decreasing overall consumption and alcohol related morbidity and mortality (Patra et al., 2012; Treno et al., 2013; Zhao et al., 2013). For example, in a natural experiment, following a significant (~33%) alcohol price reduction in Finland, there were concomitant increases in rates of hospitalizations from 11 – 38%, primarily due to mental and behavioral disorders related to alcohol misuse (Herttua et al., 2011). This is in line with recommendations of contextual measures made by the World Health Organization, such as taxes and price increases, to decrease the harmful use of alcohol (World Health

Organization, 2010). If differences were observed across alcohol use disorder severity levels on the alcohol purchase task, participants with and without alcohol use disorders and across all alcohol use disorders severity levels, appear to show a decrease of the demand as the price increases. As such, it can be hypothesized that price increases will affect most of the population, including individuals with more severe disorders. Although our results suggest that that elasticity is significantly associated with AUD symptoms, indicating that the relative proportional impact of price increases would be slightly less among more severe drinkers, the association is very small and the overall impact of price increase robust across the full range of drinkers in our sample. All results also support the utility of the APT, and the potential impact of drink price increases, across socio economic groups.

The present study has limitations. Because of the cross sectional design, this study did not allow us to assess the potential predictive aspect of the alcohol purchase task measures. Also, because only men at age 20 were included in the C-SURF study, our results are not generalizable to the entire population of Swiss young adults. Further studies should be conducted among women and among younger and older adults. Even though the recruitment took place in a setting allowing approaching a census of the population at age 20, young men who agreed to participate in the cohort study were using less substances than those who agreed to participate. As reported elsewhere, more than 90% of the approached individuals were screened for substance use, and we have been able to compare consenters to non consenters. Analyses showed that the difference between consenters and non-consenters would not have a significant impact on the evaluation of prevalence of use if the participation rate was more than 50% (Studer et al., 2013a; Studer et al., 2013b). Nevertheless, selection bias

and non-response bias is possible, as in any other cohort study. Another limitation is that we only used a hypothetical alcohol purchase task and did not compare it to an operant task, a procedure that would have require a lab experiment and that would not have been feasible due to the design of the cohort study. Although several studies have demonstrated the test-retest reliability (15) and validity (association with actual drink purchases; 16) of the alcohol purchase task, there may be error associated with the consumption estimates. An additional limitation is the use of a non validated tool to assess consequences of drinking, in which each consequence was given equal weighting.

5. CONCLUSIONS

The current study supports the use of a behavioral economics framework in understanding the alcohol use of young men in the general population. Our results provide valuable information on the impact of price on alcohol demand and support efforts to reduce overall consumption, and binge drinking, by increasing drink price. In terms of policy, this suggests that measures targeting the price of alcoholic beverages are likely to reach a broad segment of the young male population. Inversely, making alcoholic beverages cheaper or situations in which alcohol can be obtain at a very low price will likely be associated with an increase in the consumption per occasion. To obtain a most desirable effect, prices should reach Pmax, i.e. close to 9 CHF in our study. Further studies are needed to evaluate the predictive aspects of behavioral economics measures in this population. All results are also consistent with previous research and indicate that the APT may provide a brief and clinically meaningful index of risk for binge drinking and AUD symptoms in general populations samples

of young adult drinkers.

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Ethics approval:

The study was approved by the Ethics Committee for Clinical Research of the Lausanne University Medical School.

Conflict of interest:

None of the authors declare a conflict of interest.

Table 1: Characteristics of participants (n=4790)

Age, mean	21.2 (1.2)
Education level (highest completed)	
Obligatory school, N (%)	387 (8.2%)
Apprenticeship/professional school, N (%)	2065 (43.9%)
High school, N (%)	2252 (47.9%)
Professional status	
Employed, N (%)	1818 (39.4%)
Training, N (%)	2589 (56.1%)
Social welfare, N (%)	208 (3.7%)
Single (vs stable relationship), N (%)	4498 (94.0%)
Who covers the living expenses?	
Parents/stipend, N (%)	1102 (23.0%)
Participants themselves, N (%)	1728 (36.1%)
Mix, N (%)	1953 (40.8%)
Perceived economic situation of the family	
Above average (vs average or below average), N (%)	2110 (46.3%)
Drinks per week, mean (SD)	8.4 (10.6)
Binge drinking, monthly, N (%)	2304 (48.2%)
Number of DSM-5 alcohol use disorder criteria (0-11), mean (SD)	1.3 (1.7)
DSM-5 alcohol use disorder severity	
No alcohol use disorder (0-1 criterion), N (%)	3116 (65.2%)
Mild alcohol use disorder (2-3 criteria), N (%)	1176 (24.6%)
Moderate alcohol use disorder (4-5 criteria), N (%)	348 (7.3%)
Severe alcohol use disorder (6+ criteria), N (%)	142 (3.0%)
Number of consequences of alcohol use (0-9), mean (SD)	1.3 (1.7)

Table 2: alcohol demand parameters generated from the alcohol purchase task (n=4790)

	mean	sd
Observed parameters		
Intensity (in standard drinks)	8.68	6.46
Breakpoint (in CHF)	15.59	5.44
O_{max} (in CHF)	36.22	32.54
P_{max} (in CHF)	8.39	5.60
Predicted (demand curve)		
Elasticity (alpha)	0.01	0.04

Note: CHF= Swiss franc; Intensity=consumption when the drinks are free; Breakpoint=first price at which the consumption is suppressed; O_{max} =maximum alcohol expenditure; P_{max} =price at which the demand becomes elastic (i.e. price at which an increase in price leads to a greater than proportional decrease in consumption)

Table 3: correlation coefficients between alcohol demand parameters and alcohol use variables.

Correlations		Intensity	Breakpoint	O_{max}	P_{max}	Elasticity
Drinks per week	r	0.46	0.16	0.42	0.05	-0.11
	p	<0.001	<0.001	<0.001	<0.001	<0.001
Binge monthly	r	0.43	0.19	0.38	0.03	-0.13
	p	<0.001	<0.001	<0.001	0.02	<0.001
Max drinks per occasion	r	0.58	0.20	0.45	0.05	-0.14
	p	<0.001	<0.001	<0.001	0.001	<0.001
# DSM-5 alcohol use	r	0.34	0.15	0.26	0.02	-0.10
disorder criteria [0-11]	p	<0.001	<0.001	<0.001	0.30	<0.001
# consequences [0-9]	r	0.35	0.16	0.29	0.05	-0.10
	p	<0.001	<0.001	<0.001	0.001	<0.001

Figure 1: Demand curve (log consumption; log price)

Mean alcohol demand curve for all participants. For each price, the mean reported number of drinks is indicated with dots.

Figure 1

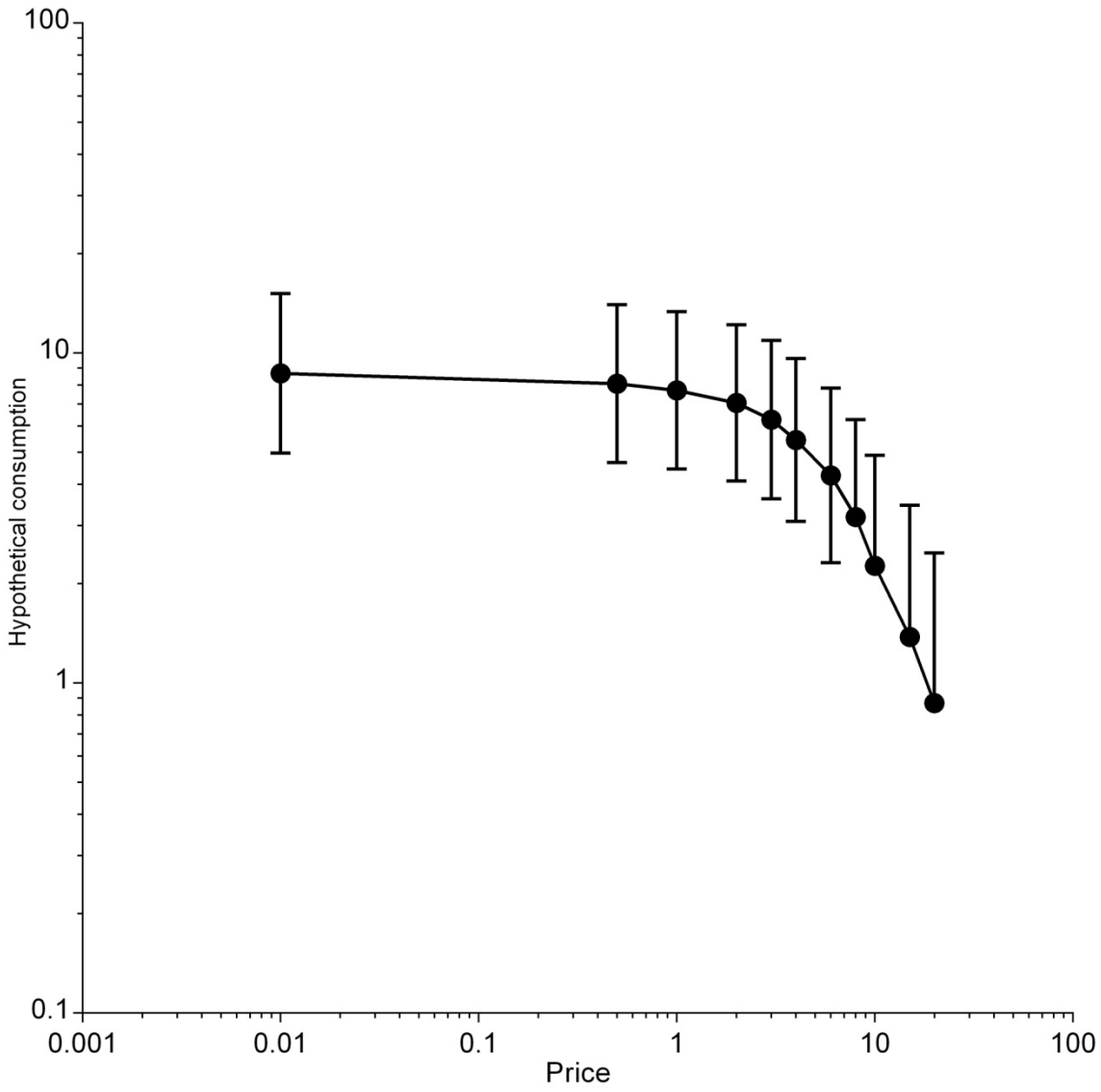
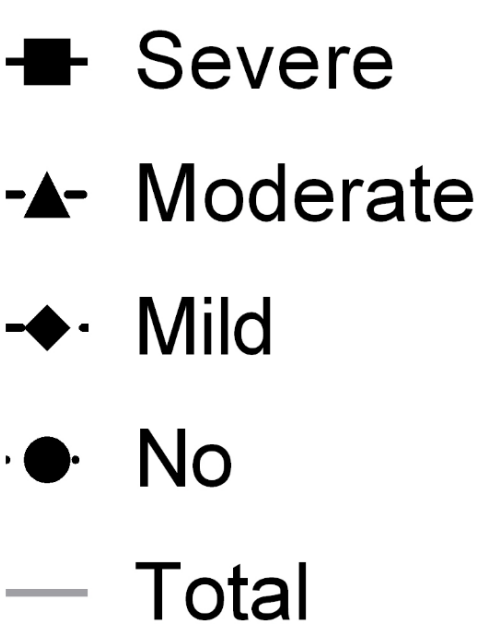

100
10
1
0.1
Hypothetical consumption
0.001
0.01
0.1
1
10
100
Price

Figure 2a: Hypothetical consumption by price and alcohol use disorder severity (DSM-5)



AUD: alcohol use disorder, according to the DSM-5: 0-1 criterion=no alcohol use disorder, 2-3 mild alcohol use disorder, 4-5 moderate alcohol use disorder, 6 or more=severe alcohol use disorder.

Figure 2a

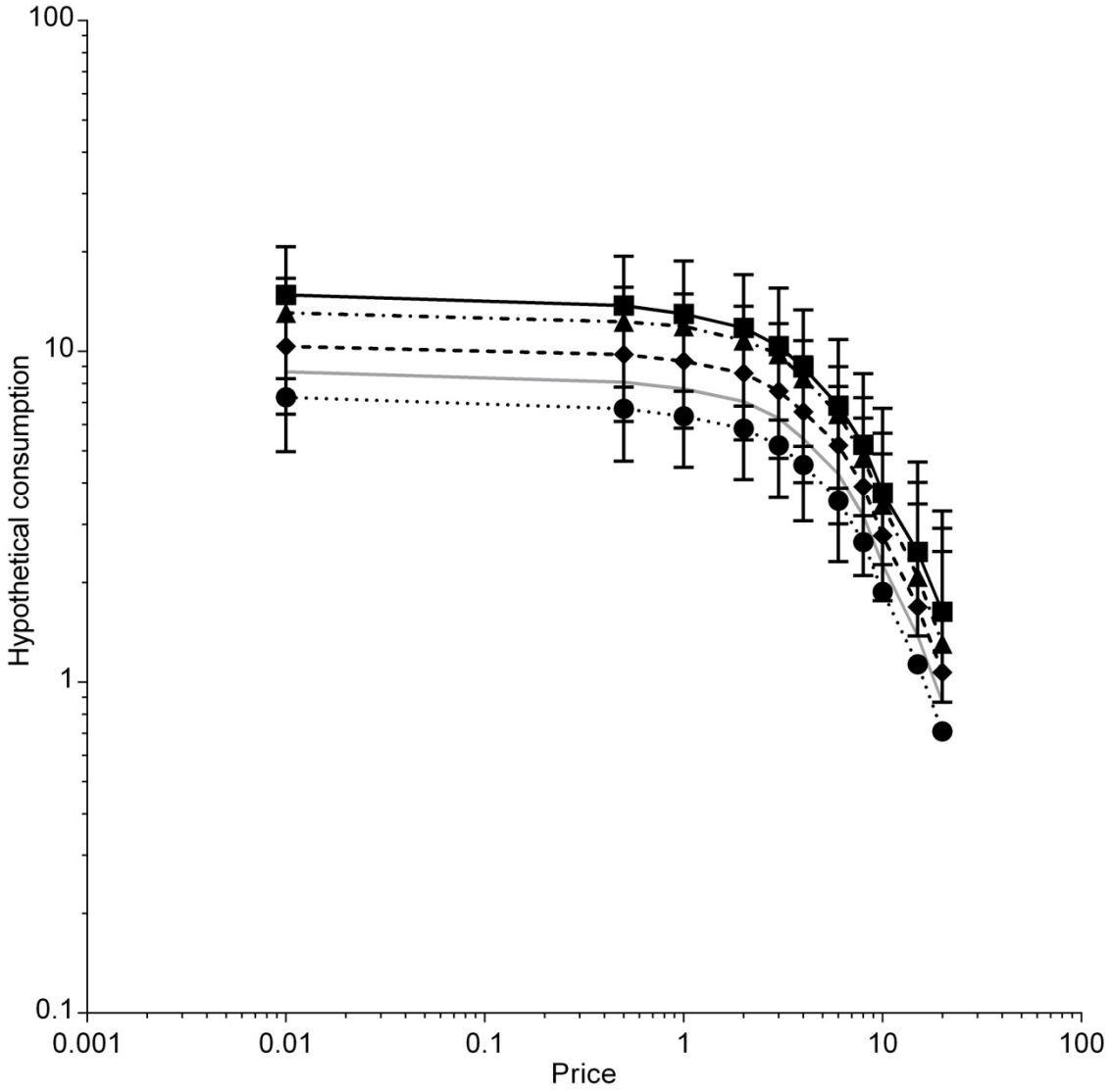
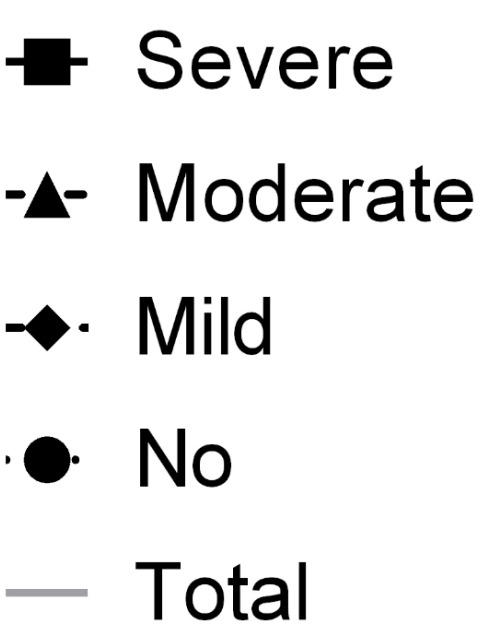
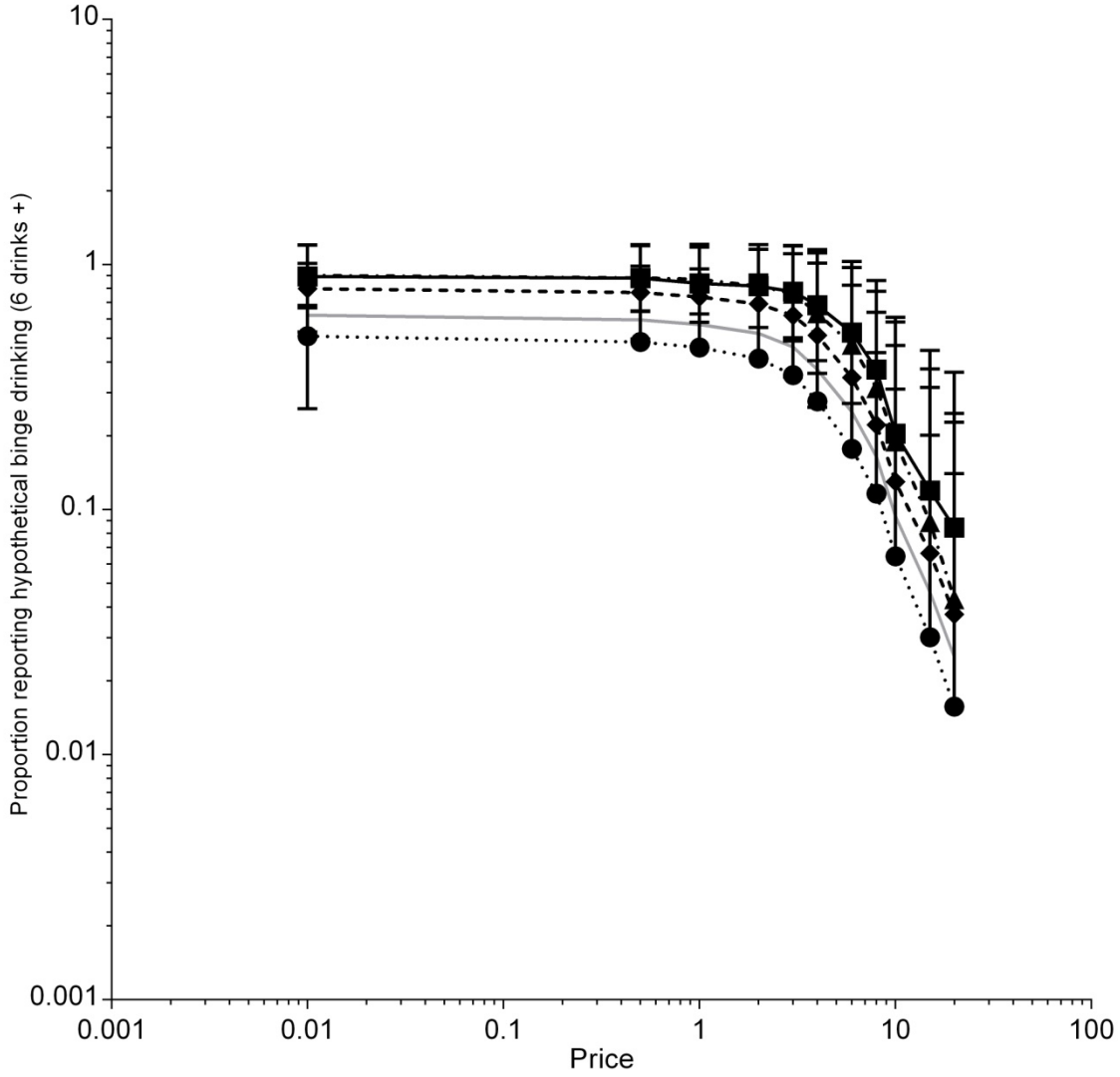

100
10
1
0.1
Hypothetical consumption
0.001
0.01
0.1
1
10
100
Price

Figure 2b: Proportion reporting hypothetical binge drinking by price and alcohol use disorder severity (DSM-5)



AUD: alcohol use disorder, according to the DSM-5: 0-1 criterion=no alcohol use disorder, 2-3 mild alcohol use disorder, 4-5 moderate alcohol use disorder, 6 or more=severe alcohol use disorder.

Figure 2b


Proportion reporting hypothetical binge drinking (6 drinks +)
10
1
0.1
0.01
0.001
0.001
0.01
0.1
1
10
100
Price

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