Gender, Age, and Educational Level Attribute to Blood Alcohol Concentration in Hospitalized Intoxicated Adolescents; A Cohort Study

Eva Van Zanten, Tjeerd Van der Ploeg, Joris J. Van Hoof, and Nicolaas Van der Lely

Background: The prevalence of adolescents hospitalized with acute alcohol intoxication, mainly because of severe reduced consciousness, is increasing. However, the characteristics of these adolescents are mainly unidentified. In this clinical research, we aimed to identify factors that attribute to higher ethanol concentration, on which targeted alcohol health interventions can be designed.

Methods: Since 2007, alcohol intoxication among adolescents has been one of the leading topics of the Dutch Pediatric Surveillance System. In the current study, we have analyzed which demographic characteristics, general alcohol use behaviors, and clinical intoxication data were related to the blood alcohol concentration (BAC) levels at hospital admittance. We included all adolescents aged <18 years, admitted with BAC >0.0 g/l, and reduced consciousness during the years 2007, 2008, 2009, and 2010.

Results: A total of 2,023 adolescents with alcohol intoxication were reported, and 1,618 questionnaires were returned, of which 1,350 met our inclusion criteria. In univariate analysis, age, gender, educational level, place of alcohol purchase, place of alcohol consumption, age of first drink, and regular alcohol use during the weekend correlated with higher BAC. After multivariate analysis, older adolescents, boys, and higher educational level significantly attributed to higher BAC at admittance.

Conclusions: In alcohol-intoxicated adolescents with reduced consciousness, gender, age, and also educational level correlate with BAC at admittance. Explanatory factors could be found in sensitivity to alcohol, but also in socioeconomic factors, which influence availability. Intervention strategies could be targeted more specific now for the subgroups found in this study to decrease the growing burden of adolescent alcohol intoxication, both on the societal level and on the clinical level.

Key Words: Adolescent, Alcohol Intoxication, Education, Gender.

I DENTIFYING RISK GROUPS is essential for generating foci for intervention and prevention strategies against alcohol intoxication among adolescents. As this is a relatively new phenomenon, the definition is disputable, and characteristics mostly unknown. On the one hand, traditional risk factors for alcohol abuse could apply, such as male gender, living with peers, a family history of alcohol use, psychiatric disorders, and substance abuse (Boot et al., 2010; Mares et al., 2011; Wilens and Biederman, 2006). On the other hand, alcohol use has become a common good in the Netherlands; up to 85% of adolescents consume alcohol (Hibell et al., 2009). So far, Dutch research demonstrated that the population adolescents admitted with alcohol intoxication is

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a demographic reflection of Dutch society (van Hoof et al., 2011).

According to international research, the amount of alcohol used can be influenced through intervention by national guidelines, commercial policies, or parental involvement (Bellis et al., 2010; Hughes et al., 2011; Purshouse et al., 2010; Schelleman-Offermans et al., 2012). Nevertheless, the number of alcohol-intoxicated adolescents admitted to Dutch hospital continues to rise, bearing witness to a pediatric problem that is not yet being treated successfully (Bouthoorn et al., 2011b; van Hoof et al., 2011). Most of these adolescents binge drink their way into hospital. Binge drinking is defined as drinking 4 (women) to 5 (men) alcoholic drinks in a short period of time (Wechsler et al., 1995). However, as youngsters react differently to alcohol, these definitions could even underestimate the amount of alcohol involved in binge drinking among adolescents (Donovan, 2009). Also, reduced consciousness seems to be a practical criterion that applies to the adolescents that are admitted and could be considered in defining alcohol intoxication.

The acute consequences of alcohol intoxication, such as hypothermia, reduced consciousness, and electrolyte disturbances, are serious but often reversible (Bouthoorn et al., 2011a). Nonetheless, fatal cases of alcohol overdose are also known. In the long term, however, alcohol use at a

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young age is related to several harmful problems, such as unintentional injury, violence, and delinquency (Black et al., 2009; Hingson et al., 2009; Miller and Spicer, 2012), unwanted sexual experience (Dahle et al., 2010), smoking, cannabis, and other drugs use (Miller et al., 2007). Over the past decade, reports have shown a negative effect of alcohol on brain function. Binge-drinking patterns in particular have a negative effect on higher cognitive functions (Tapert et al., 2004/2005). Besides, alcohol use in early adolescence predicts alcohol use in early adulthood and at a mature age (McCarty et al., 2004). The World Health Organization (WHO) recently identified alcohol use among young people (10 to 24 years) as the most important factor contributing to disability adjustable life years (Gore et al., 2011).

In this study, we investigated the group of adolescents that are admitted to the hospital due to alcohol intoxication with reduced consciousness. We hypothesized that this specific group might be divided into subgroups. For example, insight into generalized or incidental alcohol abuse, social problems, or educational factors could be gained. We used an explanatory multivariate model to investigate the influence of demographic characteristics and patterns of alcohol use on the blood alcohol concentration (BAC) in adolescents with alcohol intoxication. We hereby aim to identify characteristics, which could then be targeted for intervention strategies during follow-up.

MATERIALS AND METHODS

Data Collection

This study analyzed data collected by the Dutch Pediatric Surveillance System (NSCK). All reporting pediatricians are Advanced Pediatric Life Support trained and certified, and assess patients accordingly. In the Netherlands, when an adolescent is admitted to the pediatric department, the pediatrician interviews the patient the morning after admittance. The information from that conversation is coded onto the questionnaire provided. The pediatric department reports an admission and returns the questionnaire by mail or digitally to the research group. Data collection started in 2007 and is on going. To collect information on alcohol intoxication, the NSCK includes all the adolescents (age < 18 years) with any amount of alcohol in the blood (concentration >0.0 g/l). For the current analysis, we selected those patients who had been admitted primarily because of alcohol intoxication and were unresponsive according to AVPU criteria.

Variables

The questionnaire which was used to collect patient information contained 4 main parts: (i) general characteristics of the adolescent, (ii) demographic information, (iii), patterns of alcohol and substance use, and (iv) intoxication characteristics. In this study, the outcome variable was defined as BAC (grams of alcohol per liter blood). The 17 explanatory variables analyzed in this study were as follows:

- 1. General: gender, age
- 2. Demographic: family composition, position within the family, siblings, parental knowledge of alcohol use, educational level, school performance, religion, culture, registration to medical aid agencies
- Alcohol use patterns: age of first alcoholic drink, mean number of glasses per week day, mean number of glasses per weekend day

4. Intoxication characteristics: alcohol-obtaining practice, location of alcohol consumption, people present during consumption

Data Analysis

Data were analyzed using SPSS for Windows, version 18. We performed a multivariate linear regression analysis with BAC as outcome variable. BAC was normally distributed.

Each explanatory variable was analyzed with respect to the outcome variable using univariate analysis. All variables were checked for normality with the Kolmogorov–Smirnov test. Depending on the presence of normality, we used either analysis of variance (ANOVA) or Kruskal–Wallis for the univariate analysis. Analysis of the difference in outcome with respect to 2 groups was performed using the Mann–Whitney test or the independent sample *t*-test. The relation between a continuous variable and the outcome was tested using Pearson's correlation. We used the general linear model method for the multivariate analysis, including the independent variables that were significant in the univariate analysis. A *p*-value below 0.05 was considered as significant. We only analyzed the main effects of the explanatory variables. No imputation techniques were used.

RESULTS

From 2007 until 2010, a total of 2,023 cases were reported, and 1,618 questionnaires were returned. The response rate was 79.9%, and 90% of the Dutch hospitals had participated. In the beginning of registration, some of the returned questionnaires were given double identification numbers, and a total of 1,536 were eligible. In total, 1,350 questionnaires with main reason of admittance reduced consciousness were analyzed. Most patients admitted with alcohol intoxication are brought to the closest hospital by ambulance, because they are found unconscious in either gatherings at home, on the street, or at a bar. A much smaller amount is brought in by friends or care-takers because they have found them. Other reasons for admittance, in which patients were underage and had a positive ethanol concentration, were excluded in the analysis (traffic accidents [n = 50], other accidents [n = 65], violence [n = 44], suicide attempts [n = 10], and other [n = 17]). From earlier publications in the same cohort, we know that only 9-12% report positive on questions on other drug use, the majority of patients do not combine alcohol with other substances. These percentages are stable over the years (chi-square, p = 0.124).

Mean age was 15.1 years (confidence interval [CI]: 15.02 to 15.24), the youngest child admitted was 11 years old. Mean

Variable	Number	Value (95% CI)
Age (years)	1,343	15.1 (15.02–15.24)
Age of first alcoholic drink (years)	907	13.5 (13.3–13.7)
Alcohol use during week	659	0.20 (0.10–0.29)
Alcohol use during the weekend (glasses per day)	662	2.92 (2.63–3.21)

Table 2. Explanatory Variables, Subgroups, and Mean Blood Alcohol Concentration (BAC)

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Cultural background Datch 1,256 1,06 1,06 1,00 Dutch 1,059 84.3 1,66 1,83 1,90 Moroccan 10 0,8 2,03 1,50,2,27 1,11 Dutch Antilles 15 1.2 1,87 1,50,2,24 Turkish 27 2.1 1,83 1,57,2,20 Other 104 8.3 1,72 1,92 1,82 1,62 1,72 1,92 1,82 1,87 1,75 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73 1,73		None	79	7.4	1.84 (1.68–1.99)
Dutch 1059 84.3 1.66 (182-190) Moroccan 10 0.8 203 (150-257) Surinam 41 3.3 1.92 (172-21) Dutch Antilles 15 1.2 1.87 (150-24) Turkish 27 2.1 1.83 (157-2.10) Other 100 685 3 1.72 (160-1.85) Religion 865 3 1.72 (160-1.85) Catholic 152 1.2 1.89 (182-2.01) Christian 98 1.11 1.87 (157-2.19) Jewish 3 0.3 2.40 (113-360) Muslim 133 60.2 1.84 (179-1.87) Buddhist 3 0.3 0.70 (000-1.43) More 533 60.2 1.84 (179-1.90) Other 49 5.5 1.76 (1.62-1.90) Educational level 1.122 1.76 (1.62-1.90) Preminiersity 196 17.4 1.38 (1.72-2.19) School performances 1.16 (1.82-1.91) 1.16 (1.92-2.91)	Cultural background		1.256		
Moreocan 10 0.6 2.03 (15.9.257) Surinam 41 3.3 1.32 (17.5.211) Dutch Anilles 15 1.2 1.87 (15.9.2.21) Turkish 172 1.83 (15.7.210) 1.83 (15.7.210) Other 104 8.3 1.72 (160-1.85) Catholic 152 17.2 1.82 (18.2.01) Jewish 3 0.3 2.40 (119-3.60) Musim 33 3.7 1.67 (16.8-2.07) Hindu 14 1.6 1.62 (1.37-1.87) Budchist 3 0.3 0.70 (0.00-1.43) None 533 60.2 1.44 (1.79-1.90) Other 49 5.5 1.76 (16.2-1.90) Prevocational 575 44.3 1.79 (17.4-1.84) General secondary 2.47 2.6 1.91 (1.83-2.00) Prevocational 575 44.3 1.79 (17.4-1.84) General secondary 2.47 2.6 1.91 (1.83-2.00) Previniversity 196 17.2 <t< td=""><td>Canana Daong. Cana</td><td>Dutch</td><td>1.059</td><td>84.3</td><td>1.86 (1.83–1.90)</td></t<>	Canana Daong. Cana	Dutch	1.059	84.3	1.86 (1.83–1.90)
Surinam 41 3.3 192 (1.73-2.11) Dutch Antilies 15 1.2 187 (155-24) Dutch Antilies 27 2.1 183 (157-24) Other 104 8.85		Moroccan	10	0.8	2 03 (1 50-2 57)
Dutch Antilles 15 12 187 (155-22) Turkish 27 131 135 (157-21) Other 104 8.3 132 (185-21) Other 104 8.3 172 (180-1.85) Catholic 152 17.2 1.82 (1.82-2.01) Othistian 98 11.1 1.87 (1.75-1.99) Jewish 3 0.3 2.40 (119-360) Muslin 33 0.3 0.70 (0.00-1.43) None 553 60.2 1.84 (1.79-1.90) Other 49 5.5 1.63 (1.82-2.00) Preunversity 196 1.72 1.99 (1.74-1.87) General secondary 2.47 21.6 1.91 (1.83-2.00) Preunversity 196 1.74 1.92 (1.84-2.00) Secial Education 32 2.9 1.96 (1.72-1.91) Working 3 0.3 2.13 (0.00-4.64) Preunversity 196 1.22 1.99 (1.74-1.80) Other 5.7 5.1 1.97 (1.57-1.80)		Surinam	41	3.3	1 92 (1 73_2 11)
Turkish 27 2.1 163 (157-2.10) Other 104 3.3 1.72 (1.80-1.85) Religion Catholic 152 17.2 1.92 (1.82-2.01) Gatholic 152 17.2 1.92 (1.82-2.01) Jewish 3 0.3 2.40 (1.19-3.60) Musim 33 3.7 1.87 (1.86-2.07) Hindu 14 1.6 1.62 (1.37-1.87) Buddhist 3 0.3 0.70 (0.00-1.43) None 533 60.2 1.84 (1.79-1.90) Other 49 5.5 1.76 (1.82-1.90) Educational level 1.122 1.90 (1.74-1.84) General secondary 247 21.6 1.91 (1.43-2.00) Prevocational 575 4.3 1.79 (1.74-1.84) General secondary 247 2.16 1.91 (1.43-2.00) Special Education 32 2.9 1.96 (1.72-2.19) Prevocational 575 4.3 1.79 (1.74-1.84) General secondary 242 0.9		Dutch Antilles	15	1.2	1.87 (1.50_2.24)
Other 104 8.3 1.72 (150-1.65) Religion 885		Turkish	27	2.1	1.83 (1.57_2.10)
Religion International (1,1,2,1,1,3,0) Religion Catholic 152 17.2 1.92 (1,82-2.01) Christian 98 11.1 1.87 (1,75-1.99) Jewish 3 0.3 2.40 (1,19.3,60) Muslim 33 3.7 1.87 (1,88-2.07) Hindu 14 1.6 1.62 (1,37-1.87) Buddhist 3 0.3 0.70 (0,00-1.43) 0.00 (0,00-1.43) 0.00 (0,00-1.43) 0.70 (1,00-1.43) Buddhist 3 0.3 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) Buddhist 3 0.3 0.73 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,00-1.43) 0.70 (1,71-1.84) 0.70 (1,71-1.84) 0.70 (1,71-1.84) 0.70 (1,71-1.84) 0.70 (1,71-1.84) 0.70 (1,71-1.84) 0.70 (1,71-1.84) 0.70 (1,71-1.84) 0.70 (1,71-1.84)		Other	104	2.1	1 72 (1 60 1 85)
Indigion Obs Catholic 152 17.2 1.92 (1.82.2.01) Christian 96 11.1 1.87 (1.75.1.99) Jewish 3 0.3 2.400 (1.19.3.60) Muslim 33 3.7 1.87 (1.82.2.07) Hindu 14 1.6 1.62 (1.37.1.87) Buddhist 3 0.3 0.70 (0.00-1.43) None 533 60.2 1.84 (1.79-1.90) Educational level 1.122 1.76 (1.82-1.90) 1.84 (1.79-1.30) Educational secondary 2.47 21.6 1.91 (1.43-2.00) Special Education 32 2.9 1.96 (1.72-2.19) Working 3 0.3 2.13 (0.00-4.64) Other 57 5.1 1.70 (1.54-1.86) School performances 10.03 1.86 (1.82-1.91) 1.86 (1.82-1.91) Morking 3 0.3 2.13 (0.04.64) 1.82 (1.82-1.91) School performances 1.036 1.74 1.86 (1.82-1.91) Repeated more 12	Poligion	Other	995	0.5	1.72 (1.00–1.85)
Chinkin 122 11.2 1.22 (1.75-1.99) Jewish 3 0.3 2.40 (1.19-3.60) Muslim 33 3.7 1.87 (1.88-2.07) Hindu 14 1.6 1.62 (1.37-1.87) Buddhist 3 0.3 0.77 (0.00-1.43) Buddhist 3 0.3 0.70 (0.00-1.43) None 533 60.2 1.84 (1.79-1.90) Other 49 5.5 1.76 (1.82-1.90) Prevocational 5.7 21.6 1.91 (1.83-2.00) Prevocational 5.2 2.9 1.96 (1.72-2.19) Working 3 0.3 2.13 (0.00-4.64) Preliminary school 12 0.9 1.54 (1.01-2.07) Other 5.7 5.1 1.70 (1.54-1.86) Repeated 822 79.3 1.86 (1.82-1.91) Repeated more 12 0.9 1.54 (1.01-2.07) Other 5.7 1.2 1.83 (1.38-2.28) Har once 1.70 (1.54-1.86) 1.76 (1.67-1.86)	Teligion	Catholia	150	17.0	1 02 (1 92 2 01)
Jewish 30 11.1 120 (1.19-1.36) Jewish 3 0.3 2.40 (1.19-3.60) Muslim 33 3.7 1.87 (1.68-2.07) Hindu 14 1.6 1.62 (1.37-1.87) Buddhist 3 0.3 0.70 (0.00-1.43) None 533 60.2 1.84 (1.79-1.90) Other 49 5.5 1.76 (1.62-1.90) Prevocational 575 44.3 1.79 (1.74-1.84) General secondary 2.47 21.6 1.91 (1.83-2.00) Previocational 527 44.3 1.79 (1.74-1.84) General secondary 2.47 2.16 1.91 (1.83-2.00) Special Education 32 2.9 1.96 (1.72-2.19) Working 3 0.3 2.13 (0.00-4.64) Preliminary school 12 0.9 1.54 (1.01-2.07) Working 3 0.3 1.86 (1.82-1.91) Repeated 180 17.7 1.78 (1.67-1.88) Plos on pretormances 122 2.1<		Califolic	08	11.2	1.82 (1.02-2.01)
Johnson 30 33 37 1.87 (1.88-2.07) Muslim 33 3.7 1.87 (1.88-2.07) Hindu 14 1.6 1.62 (1.37-1.87) Buddhist 3 0.3 0.70 (0.00-1.43) None 533 60.2 1.84 (1.79-1.90) Other 49 5.5 1.76 (1.82-1.90) Educational level 1.122 1.79 (1.74-1.84) 1.79 (1.74-1.84) General secondary 247 21.6 1.91 (183-2.00) Special Education 32 2.9 1.96 (1.72-2.19) Working 3 0.3 2.13 (0.00-4.64) Preliminary school 12 0.9 1.54 (1.01-2.07) Other 57 5.1 1.70 (1.54-1.86) School performances 1.036 1.74 1.76 (1.67-1.82) Morepeated 822 79.3 1.86 (1.82-1.91) Hepeated more 12 1.2 1.83 (1.38-2.28) Han once 1 1.76 (1.67-1.82) 1.76 (1.67-1.82) Idquor stor		lowish	30	0.2	2 40 (1 10 2 60)
Midsilini 0.3 0.7 1.0 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 <th1.00< th=""> 1.00 1.00 <t< td=""><td></td><td>Muclim</td><td>22</td><td>0.3</td><td>2.40 (1.19-3.00)</td></t<></th1.00<>		Muclim	22	0.3	2.40 (1.19-3.00)
Initial 14 1.3 1.02 (1.37–1.07) Buddhist 3 0.3 0.70 (0.00–1.43) None 5.53 60.2 1.84 (1.79–1.90) Other 49 5.5 1.76 (1.62–1.90) Educational level 1.122 77 21.6 1.91 (1.83–2.00) Prevocational 575 44.3 1.79 (1.74–1.84) General secondary 247 21.6 1.91 (1.83–2.00) Special Education 32 2.9 9.136 (1.72–19) Working 3 0.3 2.13 (0.00–4.64) Preliminary school 12 0.9 1.54 (1.01–2.07) Other 5 5 School performances 10.036 1.74 1.36 (1.82–1.91) 1.86 (1.82–1.91) Repeated 180 1.74 1.76 (1.67–1.88) 1.82 (1.67–1.88) 1.82 (1.67–1.88) Place of purchase 100- 12 1.2 1.38 (1.38–2.28) 1.38 (1.38–2.28) Place of purchase 12.32 1.96 (1.59–2.33) 1.76 (1.67–1.88) 1.77 1.79 (1.7–1.87) 1.96 (1.69–2.		Hindu	14	1.6	1.62 (1.27, 1.97)
Bouldnist 3 0.3 0.70 (0.00-14-3) (0.10 (0.00-14-3)) None 533 60.2 1.84 (1.79-1.90) Other 49 5.5 1.76 (1.62-1.30) Educational level 1122 11 11 Prevocational 575 44.3 1.79 (1.74-1.84) General secondary 247 21.6 1.91 (1.83-2.00) Preuniversity 196 1.7.4 1.92 (1.84-2.00) Preuniversity 196 7.7.4 1.92 (1.84-2.00) Preuniversity 196 3 0.3 2.13 (0.00-4.64) Versitionary school 12 0.9 1.54 (1.01-2.07) Other 57 5.1 1.70 (1.54-1.86) School performances 10.3 17.4 1.76 (1.67-1.89) Repeated 180 17.4 1.76 (1.67-1.89) Itan once 12 1.2 1.83 (1.38-2.28) Place of purchase 123 11.6 1.85 (1.75-1.95) Friends 577 46.8 1.86 (1.81-1.91) <		Puddbiot	14	1.0	1.02(1.07 - 1.07)
Notice 333 00.2 1.54 (1.7.9-1.30) Educational level 1,122 1.76 (1.62-1.90) Prevocational 5.75 44.3 1.79 (1.74-1.84) General secondary 247 21.6 1.91 (1.83-2.00) Preuniversity 196 17.4 1.92 (1.84-2.00) Special Education 32 2.9 1.86 (1.72-2.19) Working 3 0.3 2.13 (0.00-4.64) Preliminary school 12 0.9 1.54 (1.01-2.07) Other 57 5.1 1.70 (1.54-1.86) School performances 100 17.4 1.76 (1.67-1.88) Repeated 180 17.4 1.76 (1.59-2.33) Place of purchase 1232 1 1.96 (1.59-2.33) Place of purchase 1232 1 1.96 (1.59-2.33) Place of purchase 1232 1 1.96 (1.59-2.33) Friends 577 4.8 1.86 (1.81-1.91) Grocery store 121 9.8 1.78 (1.67-1.89) Liquor store		Nono	522	60.2	1.84(1.70, 1.00)
Educational level 1,13 1,76 (1,22-1,30) General secondary 247 21,6 1,91 (1,34-2,00) Preuniversity 196 17,4 192 (1,84-2,00) Special Education 32 2.9 1.96 (1,72-2,19) Working 3 0.3 2.13 (0,00-4,64) Preliminary school 12 0.9 1.54 (1,01-2,07) Other 57 5.1 1.70 (1,54-1,86) School performances 10,36 1.86 (1,82-1,91) Repeated 180 17,4 1.95 (1,15-2,07) School performances 1.036 1.86 (1,82-1,91) Repeated more 12 1.2 1.83 (1,38-2,28) Place of purchase 1.232 1.96 (1,59-2,33) 1.96 (1,59-2,33) Place of purchase 1.232 1.96 (1,67-1,89) 1.76 (1,67-1,89) Liquor store 1.23 1.78 (1,67-1,89) 1.78 (1,67-1,89) Place of consumption 1.28 1.77 1.96 (1,70-1,91) Grocery store 1.21 9.8 1.79 (1,71-1,87) <t< td=""><td></td><td>Other</td><td>40</td><td>5 E</td><td>1.04 (1.79–1.90)</td></t<>		Other	40	5 E	1.04 (1.79–1.90)
Educational nevel Prevocational 575 44.3 1.729 (1.74-1.84) General secondary 247 21.6 1.91 (1.83-2.00) Preuniversity 196 17.4 1.92 (1.84-2.00) Special Education 32 2.9 1.96 (1.72-2.19) Working 3 0.3 2.13 (0.00-4.64) Preliminary school 12 0.9 1.54 (1.01-2.07) Other 57 5.1 1.70 (1.54-1.86) School performances Not-repeated 822 79.3 1.86 (1.82-1.91) Repeated more 12 1.2 1.83 (1.38-2.28) 1.83 (1.83-2.28) Itan once 12 1.2 1.83 (1.83-2.28) 1.83 (1.83-2.28) Place of purchase 12 1.2 1.83 (1.82-1.91) 1.86 (1.81-1.91) Grocery store 121 9.8 1.78 (1.67-1.89) 1.61 (1.67-1.89) Liquor store 45 3.7 2.20 (1.98-2.42) 1.84 (1.81-1.91) Other 1.28 1.7 1.79 (1.71-1.87) 1.84 (1.67-1.81) <	Educational loval	Other	49	5.5	1.76 (1.62–1.90)
Here 573 44.3 1.79 1.74 1.84 General secondary 247 21.6 1.91 1.83.2.00) Preuniversity 196 17.4 1.92 1.84<2.00)	Educational level	Broycostional	1,122	44.2	1 70 (1 74 1 94)
Preuniversity 196 17.4 1.9 (1.82–2.00) Special Education 32 2.9 1.96 (1.72–2.19) Working 3 0.3 2.13 (0.00-4.64) Preliminary school 12 0.9 1.54 (1.01–2.07) Other 57 5.1 1.70 (1.54–1.167) Other 10.36 Not-repeated 822 79.3 1.86 (1.82–1.91) Repeated more 12 1.2 1.8 (1.38–2.8) than once 2 2.1 1.96 (1.59–2.33) Place of purchase 12 1.23 Place of purchase 12 1.23 Place of purchase 12 1.23 Place of consumption 12 9.8 1.78 (1.67–1.89) Liquor store 45 3.7 2.20 (1.98–2.42) Place of consumption 1.81 (1.73–1.95) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home 1.9 0.7 2.22 (1.61–2.42) Other 8.8 6.7 1.84 (1.76–1.82) Difference 8.8 6.7 1.84 (1.76–1.95) Other 8.8 6.7 1.84 (1.71–1.98) Difference 8.8 6.7 1.84 (1.71–1.98) Difference 8.8 6.7 1.84 (575	44.3	1.01 (1.02, 0.00)
Place of purchase fried investigy 190 190 17.4 1.92 (1.94–2.09) Working 32 2.9 1.96 (1.72–2.19) Working 3 0.3 2.13 (0.00–4.64) Preliminary school 12 0.9 1.54 (1.01–2.07) Other 57 5.1 1.70 (1.54–1.86) Not-repeated 822 79.3 1.86 (1.82–1.91) Repeated 180 17.4 1.76 (1.67–1.88) Repeated more 12 1.2 1.83 (1.38–2.28) than once 12 1.2 1.83 (1.38–2.28) Place of purchase 12.2 1.2 1.83 (1.38–2.28) Friends 577 46.8 1.86 (1.81–1.91) Grocery store 121 9.8 1.76 (1.57–1.95) Liquor store 45 3.7 2.20 (1.98–2.42) Place of consumption 1.310 7.1.78 (1.67–1.87) Other 128 10.4 1.83 (1.73–1.93) Place of consumption 1.310 7.1.78 (1.67–1.89) Liquor store 4.5 3.5 1.75 (1.67–1.95) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home of thers 4.62 35.3 1.99 (1.84–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0 1.84 (1.81–1.91) Cantina 41 3.1 2.01 (1.83–2.18) In pub/restaurants 201 15.3 1.77 (1.68–1.85) On vacation 9 0.7 2.22 (1.8–1.85) On vacation 9 0.7 2.22 (1.68–2.81)		Broupivoroity	247	21.0	1.02 (1.84, 2.00)
Special Education 32 2.9 1.96 (1.72-2.19) Working 3 0.3 2.13 (0.00-4.64) Preliminary school 12 0.9 1.54 (1.01-2.07) Other 57 5.1 1.70 (1.54-1.86) School performances Not-repeated 822 79.3 1.86 (1.82-1.91) Repeated 1036 1.2 1.83 (1.38-2.28) 1.86 (1.59-2.33) Place of purchase 12 2.2 1.1 1.96 (1.59-2.33) Place of purchase 1.232 1.85 (1.75-1.95) 1.85 (1.75-1.95) Place of purchase 12 9.8 1.78 (1.67-1.89) Place of consumption 12 9.8 1.78 (1.67-1.89) Place of consumption 121 9.8 1.78 (1.67-1.89) Place of consumption 130 1.77 1.79 (1.71-1.87) Place of consumption 131 0.41 (1.02-0.04) 1.83 (1.73-1.93) At home 104 7.9 1.80 (1.70-1.91) Independent home 11 0.8 1.60 (1.16-2.04)		Special Education	190	17.4	1.92 (1.04-2.00)
Working 3 0.3 2.13 (0.00-4.84) Preliminary school 12 0.9 1.54 (1.01-2.07) Other 57 5.1 1.70 (1.54-1.86) School performances 1036 1 1.66 (1.82-1.91) Repeated 180 17.4 1.76 (1.67-1.88) Repeated more 12 1.2 1.83 (1.38-2.28) than once 1 1.22 2.1 1.96 (1.59-2.33) Place of purchase 1.23 1.96 (1.59-2.33) 1.66 (1.81-1.91) Grocery store 121 9.8 1.78 (1.67-1.89) Friends 577 46.8 1.86 (1.81-1.91) Grocery store 121 9.8 1.78 (1.67-1.89) Liquor store 45 3.7 2.20 (1.98-2.42) Pubs and restaurant 218 17.7 1.79 (1.71-1.87) Other 1.310 1.60 (1.16-2.04) 1.60 (1.16-2.04) At home 104 7.9 1.80 (1.70-1.91) Independent home 11 0.8 1.60 (1.16-2.04)		Working	32	2.9	1.90(1.72-2.19)
Other 12 0.9 1.34 (1.01–2.07) School performances 1,036 1.86 (1.82–1.91) Repeated 822 79.3 1.86 (1.82–1.91) Repeated 180 17.4 1.76 (1.67–1.88) Repeated 180 17.4 1.76 (1.67–1.88) Repeated more 12 1.2 1.83 (1.38–2.28) 1.41 (1.01–2.07) 1.54 (1.69–2.33) Place of purchase 1.232 1.96 (1.59–2.33) 1.66 (1.81–1.91) 1.65 (1.75–1.95) Friends 577 46.8 1.86 (1.81–1.91) 1.65 (1.75–1.89) Grocery store 121 9.8 1.78 (1.67–1.89) Liquor store 45 3.7 2.20 (1.98–2.42) Place of consumption 1.310 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home of others 462 35.3 1.89 (1.84–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0		Proliminany achool	10	0.3	2.13(0.00-4.04) 1 54 (1 01 0 07)
School performances 1,036 1 1,01(1:54-1:80) School performances 1,036 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Other	12	0.9	1.54 (1.01–2.07)
School performances Not-repeated Repeated 1036 822 79.3 1.86 (1.82-1.91) Repeated more 12 1.2 1.83 (1.38-2.28) Han once 12 1.2 1.83 (1.38-2.28) Drop-out 22 2.1 1.96 (1.59-2.33) Place of purchase 1.232 11.6 1.85 (1.75-1.95) Friends 577 46.8 1.86 (1.81-1.91) Grocery store 121 9.8 1.78 (1.67-1.89) Liquor store 45 3.7 2.20 (1.98-2.42) Pubs and restaurant 218 17.7 1.79 (1.71-1.87) Other 1.28 10.4 1.83 (1.70-1.91) Independent home 11 0.8 1.60 (1.16-2.04) At home of others 462 35.3 1.89 (1.84-1.95) On the street 329 25.1 1.82 (1.75-1.89) At home of others 462 35.3 1.89 (1.84-1.95) On the street 329 25.1 1.82 (1.75-1.89) At work 12 0.9 1.63 (0.99-2.2	Cabaal norformanaaa	Other	1 006	5.1	1.70 (1.54–1.60)
Notrepeated 180 17.4 1.76 (1.67-1.81) Repeated more 12 1.2 1.83 (1.38-2.28) than once 12 1.2 1.83 (1.38-2.28) Place of purchase 1.232 1.66 (1.57-1.95) Friends 577 46.8 1.86 (1.81-1.91) Grocery store 121 9.8 1.78 (1.67-1.89) Liquor store 45 3.7 2.20 (1.98-2.42) Pubs and restaurant 218 17.7 1.79 (1.71-1.87) Other 1.28 10.4 1.83 (1.73-1.93) Place of consumption 1,310 1.300 1.80 (1.70-1.91) Independent home 11 0.8 1.60 (1.16-2.04) At home of others 462 35.3 1.89 (1.82-1.95) On the street 329 25.1 1.82 (1.75-1.89) At work 12 0.9 1.63 (0.99-2.27) At school party 53 4.0 1.84 (1.68-2.01) Cantina 41 3.1 2.01 (1.83-2.18) In pub/restaurants	School performances	Not reported	1,030	70.0	1.96 (1.90, 1.01)
Independent of the properties 160 17.4 1.76 (1.57-1.86) Repeated more than once 12 1.2 1.83 (1.38-2.28) Drop-out 22 2.1 1.96 (1.59-2.33) Place of purchase 11,232 11.6 1.85 (1.75-1.95) Friends 577 46.8 1.86 (1.81-1.91) Grocery store 121 9.8 1.78 (1.67-1.89) Liquor store 45 3.7 2.20 (1.98-2.42) Pubs and restaurant 218 17.7 1.79 (1.71-1.87) Other 128 10.4 1.83 (1.73-1.93) Place of consumption 104 7.9 1.80 (1.70-1.91) Independent home 11 0.8 1.60 (1.16-2.04) At home of others 462 35.3 1.89 (1.84-1.95) On the street 329 25.1 1.82 (1.75-1.89) At school party 53 4.0 1.84 (1.68-2.01) Cantina 41 3.1 2.01 (1.83-2.18) In pub/restaurants 201 15.3 1.77 (1.68-1.85)		Not-repeated	022	19.3	1.80 (1.82-1.91)
Place of purchase Indre 12 1.2 1.2 1.83 (1.38–2.28) than once Intervention Interve		Repeated	180	17.4	1.00 (1.00 - 0.00)
Intrance 22 2.1 1.96 (1.59–2.3) Place of purchase 1,232 Home 143 11.6 1.85 (1.75–1.95) Friends 577 46.8 1.86 (1.81–1.91) Grocery store 121 9.8 1.78 (1.67–1.89) Liquor store 45 3.7 2.20 (1.98–2.42) Pubs and restaurant 218 17.7 1.79 (1.71–1.87) Other 128 10.4 1.83 (1.73–1.93) Place of consumption 1 0.8 1.60 (1.16–2.04) At home of others 462 35.3 1.89 (1.84–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0 1.84 (1.68–2.01) Cantina 41 3.1 2.01 (1.83–2.18) In pub/restaurants 201 15.3 1.77 (1.68–1.85) On vacation 9 0.7 2.28		Repeated more	12	1.2	1.83 (1.38–2.28)
Drop-out 22 2.1 1.96 (1.59-2.3) Place of purchase 1,232		than once	00	0.1	1.00 (1.50, 0.00)
Place of purchase 1,232 Home 143 11.6 1.85 (1.75–1.95) Friends 577 46.8 1.86 (1.81–1.91) Grocery store 121 9.8 1.78 (1.67–1.89) Liquor store 45 3.7 2.20 (1.98–2.42) Pubs and restaurant 218 17.7 1.79 (1.71–1.87) Other 128 10.4 1.83 (1.73–1.93) Place of consumption 1,310 1.80 (1.70–1.91) Independent home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home of others 462 35.3 1.89 (1.84–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0 1.84 (1.68–2.01) Cantina 41 3.1 2.01 (1.83–2.18) In pub/restaurants 201 15.3 1.77 (1.68–1.85) On vacation 9 0.7 2.28 (1.61–2.95) Other 88 6.7 1.84 (1.71–1.98)		Drop-out	22	2.1	1.96 (1.59–2.33)
Home 143 11.6 1.85 (1.75–1.95) Friends 577 46.8 1.86 (1.81–1.91) Grocery store 121 9.8 1.78 (1.67–1.89) Liquor store 45 3.7 2.20 (1.98–2.42) Pubs and restaurant 218 17.7 1.79 (1.71–1.87) Other 128 10.4 1.83 (1.73–1.93) Place of consumption 1,310 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home of others 462 35.3 1.89 (1.89–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0 1.84 (1.68–2.01) Cantina 41 3.1 2.01 (1.83–2.18) In pub/restaurants 201 15.3 1.77 (1.68–1.85) On vacation 9 0.7 2.28 (1.61–2.95) Other 88 6.7 1.84 (1.71–1.98)	Place of purchase	L La sur a	1,232	11.0	
Friends 57/ 46.8 1.86 (1.81–1.91) Grocery store 121 9.8 1.78 (1.67–1.89) Liquor store 45 3.7 2.20 (1.98–2.42) Pubs and restaurant 218 17.7 1.79 (1.71–1.87) Other 128 10.4 1.83 (1.73–1.93) Place of consumption 1,310 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home of others 462 35.3 1.89 (1.84–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0 1.84 (1.68–2.01) Cantina 41 3.1 2.01 (1.83–2.18) In pub/restaurants 201 15.3 1.77 (1.68–1.85) On vacation 9 0.7 2.28 (1.61–2.95) Other 88 6.7 1.84 (1.71–1.98)		Home	143	11.6	1.85 (1.75–1.95)
Grocery store 121 9.8 1.78 (1.67–1.89) Liquor store 45 3.7 2.20 (1.98–2.42) Pubs and restaurant 218 17.7 1.79 (1.98–2.42) Pubs and restaurant 218 17.7 1.79 (1.98–2.42) Pubs and restaurant 218 17.7 1.79 (1.71–1.87) Other 128 10.4 1.83 (1.73–1.93) Place of consumption 1,310 1.60 (1.16–2.04) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home of others 462 35.3 1.89 (1.84–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0 1.84 (1.68–2.01) Cantina 41 3.1 2.01 (1.83–2.18) In pub/restaurants 201 15.3 1.77 (1.68–1.85) On vacation 9 0.7 2.28 (1.61–2.95) Other		Friends	577	46.8	1.86 (1.81–1.91)
Liquor store 45 3.7 2.20 (1.98–2.42) Pubs and restaurant 218 17.7 1.79 (1.71–1.87) Other 128 10.4 1.83 (1.73–1.93) Place of consumption 1,310 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home of others 462 35.3 1.89 (1.84–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0 1.84 (1.68–2.01) Cantina 41 3.1 2.01 (1.83–2.18) In pub/restaurants 201 15.3 1.77 (1.68–1.85) On vacation 9 0.7 2.28 (1.61–2.95) Other 88 6.7 1.84 (1.71–1.98)		Grocery store	121	9.8	1.78 (1.67–1.89)
Pubs and restaurant 218 17.7 1.79 (1.71–1.87) Other 128 10.4 1.83 (1.73–1.93) Place of consumption 1,310 7.9 1.80 (1.70–1.91) At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home of others 462 35.3 1.89 (1.84–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0 1.84 (1.68–2.01) Cantina 41 3.1 2.01 (1.83–2.18) In pub/restaurants 201 15.3 1.77 (1.68–1.85) On vacation 9 0.7 2.28 (1.61–2.95) Other 88 6.7 1.84 (1.71–1.98)		Liquor store	45	3.7	2.20 (1.98–2.42)
Other 128 10.4 1.83 (1.73–1.93) Place of consumption 1,310 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		Pubs and restaurant	218	17.7	1.79 (1.71–1.87)
Place of consumption 1,310 At home 104 7.9 1.80 (1.70–1.91) Independent home 11 0.8 1.60 (1.16–2.04) At home of others 462 35.3 1.89 (1.84–1.95) On the street 329 25.1 1.82 (1.75–1.89) At work 12 0.9 1.63 (0.99–2.27) At school party 53 4.0 1.84 (1.68–2.01) Cantina 41 3.1 2.01 (1.83–2.18) In pub/restaurants 201 15.3 1.77 (1.68–1.85) On vacation 9 0.7 2.28 (1.61–2.95) Other 88 6.7 1.84 (1.71–1.98)		Other	128	10.4	1.83 (1.73–1.93)
At home1047.91.80 (1.70–1.91)Independent home110.81.60 (1.16–2.04)At home of others46235.31.89 (1.84–1.95)On the street32925.11.82 (1.75–1.89)At work120.91.63 (0.99–2.27)At school party534.01.84 (1.68–2.01)Cantina413.12.01 (1.83–2.18)In pub/restaurants20115.31.77 (1.68–1.85)On vacation90.72.28 (1.61–2.95)Other886.71.84 (1.71–1.98)	Place of consumption		1,310		
Independent home110.81.60 (1.16-2.04)At home of others46235.31.89 (1.84-1.95)On the street32925.11.82 (1.75-1.89)At work120.91.63 (0.99-2.27)At school party534.01.84 (1.68-2.01)Cantina413.12.01 (1.83-2.18)In pub/restaurants20115.31.77 (1.68-1.85)On vacation90.72.28 (1.61-2.95)Other886.71.84 (1.71-1.98)		Athome	104	7.9	1.80 (1.70–1.91)
At home of others46235.31.89 (1.84–1.95)On the street32925.11.82 (1.75–1.89)At work120.91.63 (0.99–2.27)At school party534.01.84 (1.68–2.01)Cantina413.12.01 (1.83–2.18)In pub/restaurants20115.31.77 (1.68–1.85)On vacation90.72.28 (1.61–2.95)Other886.71.84 (1.71–1.98)		Independent home	11	0.8	1.60 (1.16–2.04)
On the street32925.11.82 (1.75–1.89)At work120.91.63 (0.99–2.27)At school party534.01.84 (1.68–2.01)Cantina413.12.01 (1.83–2.18)In pub/restaurants20115.31.77 (1.68–1.85)On vacation90.72.28 (1.61–2.95)Other886.71.84 (1.71–1.98)		At home of others	462	35.3	1.89 (1.84–1.95)
At work120.91.63 (0.99–2.27)At school party534.01.84 (1.68–2.01)Cantina413.12.01 (1.83–2.18)In pub/restaurants20115.31.77 (1.68–1.85)On vacation90.72.28 (1.61–2.95)Other886.71.84 (1.71–1.98)		On the street	329	25.1	1.82 (1.75–1.89)
At school party534.01.84 (1.68–2.01)Cantina413.12.01 (1.83–2.18)In pub/restaurants20115.31.77 (1.68–1.85)On vacation90.72.28 (1.61–2.95)Other886.71.84 (1.71–1.98)		At work	12	0.9	1.63 (0.99–2.27)
Cantina413.12.01 (1.83–2.18)In pub/restaurants20115.31.77 (1.68–1.85)On vacation90.72.28 (1.61–2.95)Other886.71.84 (1.71–1.98)		At school party	53	4.0	1.84 (1.68–2.01)
In pub/restaurants20115.31.77 (1.68–1.85)On vacation90.72.28 (1.61–2.95)Other886.71.84 (1.71–1.98)		Cantina	41	3.1	2.01 (1.83–2.18)
On vacation90.72.28 (1.61–2.95)Other886.71.84 (1.71–1.98)		In pub/restaurants	201	15.3	1.77 (1.68–1.85)
Other 88 6.7 1.84 (1.71–1.98)		Onvacation	9	0.7	2.28 (1.61–2.95)
		Other	88	6.7	1.84 (1.71–1.98)

Continued.

 Table 2. (Continued)

Variable	Х	Number	Percentage (%)	Mean BAC (g/l) (95% Cl)
Persons present		1,324		
	Nobody	32	2.4	1.76 (1.52–2.00)
	Friends	1,238	93.5	1.85 (1.81–1.88)
	Parents	7	0.5	1.49 (0.73–2.26)
	Other family members	17	1.3	1.88 (1.59–2.16)
	Strangers	10	0.8	1.91 (1.41–2.40)
	Other	20	1.5	1.92 (1.66–2.17)
Medical history		1,255		
,	Nowhere	830	66.4	1.85 (1.81–1.89)
	Pediatrician	137	10.9	1.80 (1.69–1.91)
	Psychologist	44	3.5	1.64 (1.45–1.84)
	Other specialist	36	2.9	2.06 (1.78-2.33)
	GGZ	60	4.8	1.78 (1.60–1.97)
	Youth Care	94	7.5	1.86 (1.73–1.99)
	Other	54	4.3	1.72 (1.52–1.92)

BAC was 1.84 g/l (CI: 1.81 to 1.88). Mean time of reduced consciousness was 2.90 hours (CI: 2.59 to 3.22) (Table 1).

Mean BAC for every subgroup is shown in Table 2. Univariate correlation coefficients of the variables are presented in Table 3. Boys had a significantly higher BAC than girls (1.93 g/l vs. 1.76 g/l, *p*-value = 0.0001). BAC significantly correlated with age (Pearson's r = 0.182, *p*-value = 0.0001).

Educational level was correlated with BAC (*p*-value = 0.037). Mean BAC was high in the adolescents who only worked (2.13 g/l), those attending special education (1.96 g/l) and those with a higher educational level (1.92 g/l). Lowest BAC was found in patients attending preliminary school (1.54 g/l).

Adolescents who had dropped out of school had a higher BAC than those who had only repeated once or had never repeated a class (1.96 g/l, vs. 1.76 g/l vs. 1.86 g/l, respectively), but the differences were not significant (*p*-value = 0.162).

Of the demographic variables that were considered in the analysis, the family-related variables did not attribute significantly to BAC. Children raised in traditional families, foster care, orphanages, independent living situation, or other compositions (divorced, single parents) did not attribute significantly to BAC (*p*-value = 0.737). Having siblings (a brother or brothers or a sister or sisters) or not did not correlate with BAC (*p*-value = 0.116). The position within the family (oldest, youngest, or not-oldest/not-youngest) was not related to BAC, either (*p*-value = 0.481). Parental involvement, measured by asking patients if their parents were aware of the exact amount of alcohol they drank, was not significantly associated with BAC (*p*-value = 0.174).

Other demographic factors of interest were religion and cultural background. Neither religion nor cultural background showed a significant relation with BAC (p-value = 0.533, p-value = 0.363, respectively).

Considering medical history, those who had attended a psychologist had the lowest BAC (1.64 g/l). This variable correlated significantly with BAC (*p*-value = 0.066).

Characteristics of alcohol use were associated with increased BAC. Place of consumption (at home, at a friend's

home, in public places, at work) correlated significantly with BAC (*p*-value = 0.042). BAC was highest when consumption took place on vacation (2.28 g/l) or in a cantina (2.01 g/l).

Place of purchase also correlated significantly with BAC (*p*-value = 0.012). If alcohol was purchased in a liquor store, BAC was highest (2.20 g/l), compared with obtainment at a bar or restaurant (1.79 g/l), supermarket (1.78 g/l), at home (1.85 g/l), or at a friend's home (1.86 g/l).

General alcohol use during the week was 0.20 glasses per day (CI: 0.10 to 0.29). In the weekend, this increased to 2.92 glasses per day (CI: 2.63 to 3.21). Alcohol consumption during the week was not significantly correlated with BAC at admittance (Pearson's r = 0.022, *p*-value = 0.600), whereas alcohol use in the weekend was (Pearson's r = 0.160, *p*-value = 0.0001).

Table 3. Results of Univariate and Multivariate Analysis of Explanatory Variables with Outcome Blood Alcohol Concentration (BAC) (g/l)

	Universite	Multivorioto
Variable	<i>p</i> -value	nviullivariale
Vallabio	p value	p value
Age (years)	0.0001 ^a	0.001
Gender	0.0001 ^b	0.000
Family situation	0.737 ^c	
Position family	0.481 ^d	
Siblings	0.116 ^d	
Parental involvement	0.174	
Religion	0.533 ^d	
Cultural background	0.363 ^c	
Educational level	0.037 ^c	0.006
School performance	0.162 ^c	
Place of purchase	0.012 ^c	0.495
Place of consumption	0.042 ^d	0.069
Persons present	0.643 ^c	
Age of first drink	0.001 ^a	0.096
Alcohol use during the week	0.600 ^a	
Alcohol use during the weekend	0.0001 ^a	0.091
Medical history	0.066 ^c	
-		

^aPearson's correlation.

^bMann–Whitney.

^cKruskal Wallis.

^dANOVA.

The mean age of first alcoholic drink was 13.5 years (CI: 13.3 to 13.7). Age of first alcoholic drink was associated significantly with BAC (Pearson's r = 0.115, *p*-value = 0.001).

Multivariate Analysis

Outcome of multivariate analysis is shown in Table 3. A general linear model was used for multivariate analysis of the significant explanatory variables age, gender, educational level, place of purchase, place of consumption, age of first alcoholic drink and alcohol use during the weekend. Age (*p*-value = 0.001) as well as gender (*p*-value = 0.0001) continued to be associated with BAC.

Educational level (*p*-value = 0.006) was also significant. Analysis of parameters' estimates showed that preuniversity educational level (*p*-value = 0.047) and work (*p*-value = 0.005) accounted for the significance of educational level. The R^2 was 0.160, and the adjusted R^2 was 0.115.

No significant correlation with BAC was found for the remaining factors, place of obtainment (*p*-value = 0.495), place of consumption (*p*-value = 0.069), age of first alcoholic drink (*p*-value = 0.096), and alcohol use during the weekend (*p*-value = 0.091).

DISCUSSION

This study shows that BAC was higher in males and rose with age in alcohol-intoxicated adolescents admitted to the hospital because of reduced consciousness. More surprisingly, higher educational level was also significantly associated with increased BAC levels, while the role of parents' involvement and family composition was not associated with higher BAC.

Our findings are in line with earlier studies describing a gender difference in sensitivity to alcohol (Baraona et al., 2001; Bouthoorn et al., 2011b; Zeiner et al., 1983). The male adolescents admitted with a higher BAC had consumed larger amounts of alcohol before they became unconscious. BAC directly represents the amount of alcohol consumed, as the number of glasses drunk can be calculated from the ethanol concentration using the equation of Widmark (1981). Independent of gender differences, alcohol concentration in blood is directly related to level and duration of unconsciousness (Lamminpaa, 1995). Although this finding is not new, admitted male adolescents can be targeted for strategies to change their drinking behavior.

Higher BAC in relation to age may also be explained by a decreased sensitivity to alcohol, caused by more frequent alcohol use. In comparison with adults, adolescents eliminate alcohol at the same rate, whereas younger children process alcohol more rapidly (Lamminpaa et al., 1993). According to Silvers and colleagues (2003) a chronic intermittent alcohol drinking pattern (binge drinking) leads to a better and thereby faster metabolic tolerance of alcohol in rats.

However, neurological effects between adults and adolescents differ. The severe toxicity by ethanol, manifesting in coma, occurs in lower BACs in children than in adults (Lamminpaa et al., 1993). In another animal study, bingedrinking adolescents reacted differently to alcohol in comparison with adults, specifically hippocampal function was altered (Tokunaga et al., 2006). Although younger adolescents have a lower BAC, they should be warned for the risk of passing out and other possible unwanted neurological effects.

In contrast to previous studies, we found that higher educational participation was related to higher BACs and therefore to increased alcohol use. The Dutch secondary school system contains 3 major educational levels, prevocational, general secondary, and preuniversity, which take 4, 5, and 6 years, respectively. Therefore, patients with higher educational levels were older, but multivariate analysis corrected for this factor. Not many studies address the clinically evaluated adolescents with alcohol use. Binge drinking appeared to be more confined to the lower educated, although heavy drinking was more common among better educated women than among lower educated women (Helasoja et al., 2007). In general, risky health behavior is more often related to lower socioeconomic position (Drieskens et al., 2010). In adults, according to a Danish study on the effect of education on health behavior, higher education appears to have a suppressive effect on the variability of smoking and alcohol use (negative health behavior) (Johnson et al., 2011). Another north European study concluded that socioeconomic circumstances during childhood particularly influenced educational level and therefore health in adulthood (Kestila et al., 2009).

Although our data are restricted by the age range of the patients, our patient group does not fit the general observation that associates risky health behavior with lower educational levels. Besides the higher educated adolescents, adolescents who worked instead of going to school were also admitted with higher BAC levels. These findings may be explained by social and economic availability of alcohol, which are known risk factors for alcohol use (Institute, 2005; Spijkerman et al., 2008). Higher educated adolescents could have access, for example, at home, to stronger liquor instead of more readily available and cheaper beer. This should be further analyzed.

From a health-promotion point of view, campaigns against alcohol abuse have had little success. Although they are targeted toward the young, they are possibly overshadowed by marketing and political strategies (Wakefield et al., 2010). Our results could indicate that it is time for a shift in focus. Alcohol intoxication among adolescents is not confined to the lower educated, and it is the higher educated whom are admitted with a higher BAC. Differentiated campaigns, directed toward more specific subgroups, can be tried out to gain an effect.

Other possible predictors and background variables turned out not to be significantly associated with BAC. Interestingly, the role of parents' involvement and family composition was not associated with higher BAC, while evidence exists for their influence on health and drinking behavior (van der Vorst et al., 2006; Windle et al., 2010). This may be explained by inaccurate measurement by insufficient discrimination of subgroups. An improved questionnaire is currently in use to investigate these possible risk factors more thoroughly.

Another possible explanation may be a form of selection bias due to the fact that only binge-drinking adolescents were included. Perhaps, there is a more prominent difference to be found between drinking and nondrinking adolescents or between moderate and binge-drinking adolescents. However, as the ESPAD study demonstrated, up to 85% of adolescents in the Netherlands consume alcohol (Hibell et al., 2009).

One of the strengths of this study is the large number of included patients. The registration system used was designed in 2007, and since then, the total cohort has been growing, due to increasing numbers of adolescents admitted to hospital with an alcohol related issue. Moreover, the hospital participation rate and the high response rate ascertain a good representation of the population of adolescents with alcohol intoxication.

A possible limitation of this study may be that not all the reports had been filled in completely, which might have caused random errors in statistical analysis, as well as systematic bias. Measurement bias could have played a role as well, due to the use of questionnaires which have not been validated and are based on an interview by the physician. This could inhibit providing certain information. However, the questionnaire was designed to collect information in particular on demographic information and not to psychosocially screen more delicate subjects. Most questions are also considered in the anamnesis with patients and their parents. Self-report questionnaires are considered a valid tool in many studies, and clinical decisions are based on patients' answers. Another drawback is that not all possible risk factors for general alcohol use are taken into account. Familial predisposition, psychiatric disorders, and other drug abuse are factors that could play a role. As mentioned, an improved questionnaire is currently in use, which contains these factors.

The multivariate model used in this study cannot predict so much as explain the existence of certain risk groups for severe alcohol use within the adolescent population that is clinically visible. In spite of an academic discussion on the interpretation of explained variances, it is worth mentioning that we found a 0.160 R^2 . In other words, about 16% of the high BAC in intoxicated adolescents can be explained by age, gender, and educational level. If we are able to design targeted campaigns here, alcohol related harm in youth would be decreased significantly. Also, family treatment, (short) motivational enhancement therapy, and behavioral therapy could be used to decrease alcohol and substance use (Caria et al., 2011). A promising attempt in the Netherlands was established in the form of an individualized follow-up program in the outpatient department of pediatrics and child psychology. As these adolescents are admitted to the pediatric ward, alcohol intoxication is not only a societal, but also a medical problem. More insight into who these children are is necessary for their treatment. Boys, older adolescents, and higher educated or working adolescents could be targeted for specific intervention strategies.

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