

Understanding Underage Drinking in Peru: Determinants of Its Frequency and Intensity*

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ABSTRACT

Underage drinking is a serious problem worldwide. In the case of Peru, 50% of those who have ever used alcohol started doing so before the age of 13, and 90% before 16. In this study, we examine the correlations of frequency and intensity of underage drinking in Peru. We find that individual characteristics (smoking and carrying guns), exposure to traumatic events (sexual abuse and domestic violence), peer effects, and access to information are significantly correlated with drinking. This highlights the importance of addressing the problem in a comprehensive manner that includes students, parents, schools, and the government, especially considering that policies targeted at adolescents may have multiplier effects.

Keywords: health, alcohol, underage consumption, Peru

JEL codes: I12, I114.

Comprendiendo el consumo de bebidas alcohólicas por menores de edad en el Perú: determinantes de su frecuencia e intensidad

RESUMEN

El consumo de alcohol por menores de edad es un problema grave que afecta a todo el mundo. En el Perú, 50% de aquellos que consumieron alcohol alguna vez comenzó antes de los 13 años; y el 90%, antes de los 16. Examinamos las variables correlacionadas con la frecuencia e intensidad de consumo de menores de edad en el Perú. Encontramos que las características individuales (fumar y portar armas), la exposición a eventos traumáticos (como abuso sexual y violencia doméstica), los efectos de pares, y el acceso a la información, se correlacionaron significativamente con dichas decisiones. Este resultado subraya la importancia de abordar el problema de manera integral, incluyendo a los estudiantes escolares, los padres, las escuelas y el gobierno; en especial, si consideramos que las políticas dirigidas a los adolescentes pueden tener efectos multiplicadores.

Palabras clave: salud, alcohol, consumo de menores de edad, Peru

Códigos JEL Codes: I12, I14.

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INTRODUCTION

The harmful use of alcohol (HUA), defined as that which has detrimental health and social effects on the consumer, the people around him/her, and society as a whole (WHO, 2010), relates to the frequency of consumption and to the volume consumed on each occasion. The consequences of the HUA include the global burden of morbidity¹ (it ranks third among the risk factors for premature death and disability in the world) and mortality (approximately 2.5 million people worldwide died from causes related to the HUA in 2004, while 320 thousand of them were in the 15 to 29 years of age cohort) (WHO, 2010).

The negative effects of alcohol use are more dramatic in the case of young people (Bonnie & O'Connell, 2003; Coleman & Cater, 2005). At that stage of life it is associated with an increased risk of developing diseases such as cirrhosis, pancreatitis, hemorrhagic infarcts and some forms of cancer (Pons Diez & Berjano, 1999), and to a higher propensity to neurocognitive damage that adversely affects learning ability and intellectual development (Zeigler *et al.*, 2005). Alcohol consumption among adolescents is also associated with drug-related suicides and car accidents. As a depressant of the central nervous system, alcohol consumption slows cognitive functions (perception and judgment), motor functions (balance and reflexes) and emotional functions (judgment and maturity).² The National Institute on Alcohol Abuse and Alcoholism (NIAAA) (2006) estimates that in the United States, about 5,000 people below the age of 21 die per year as a result of drinking alcohol, including 1,900 in car accidents and 1,600 in homicides.

In addition to its immediate consequences, underage alcohol use has a strong correlation with harmful alcohol consumption in the future. According to the National Research Council (2003), 40% of people who begin drinking alcohol before the age of 15 become alcoholics later in life. This problem is seen to be particularly serious when we consider the number of people who engage in underage drinking; according to the National Institute of Health (NIH) (2010), in the United States 10.1 million adolescents consume alcohol, most of whom drink significant amounts on each occasion. Keng and Huffman (2010) show that such high-intensity consumption may have a negative wage premium later in life. Early alcohol consumption may also increase the likelihood of developing addictions to other substances (Pons Diez & Berjano, 1999).

In Australia, the Australian Medical Association (AMA) (2009) points out that by the age of 18, 50% of young people are already consuming alcohol in risky volumes. In

¹ The global burden of morbidity quantifies the total loss of healthy life as a result of premature mortality and morbidity due to a variety of diseases and injuries, and is measured through the Disability Adjusted Life Years (DALY) indicator.

² FISAC. Mexico. Oregon Research Institute in Eugene. Health and Children/News. http://www.salude-hijos.com/noticias_detalle.lasso?idcon=50.

Peru, the National Commission for Development and Life without Drugs (DEVIDA) (2011) has shown that the average adolescent starts drinking at the age of 13, and that 60% of those who consumed alcohol during the last month show a risky consumption pattern.

The negative externalities generated by underage alcohol use,³ as well as the nature of public good related to possession of information on its harmful effects, causes the competitive equilibrium to generate efficiency losses in society. In this context, government intervention, through appropriate public policies, may improve social welfare (Urrunaga *et al.*, 2009).⁴ Understanding the determinants of underage alcohol drinking may therefore contribute to the design of more effective public policies to mitigate its negative impact.

This article analyzes the determinants of underage drinking in Peru by estimating a consumption function which depends on individual, household and family characteristics, potential peer group effects, and the adolescent's environment. Our results show the significant impact of individual characteristics, as well as the influence of social and family environment on consumption, all of which points to the need for comprehensive intervention to tackle the problem successfully. This paper thus provides new evidence on this subject in Peru that sheds light on several potential policy interventions.

The remainder of the paper is organized as follows: Section 2 reviews the literature on the determinants and impact of underage alcohol use. Section 3 describes the data and methodology used in the analysis. Section 4 presents the econometric results. Section 5 concludes and discusses possible areas for public policy.

1. PREVIOUS STUDIES AND CONCEPTUAL FRAMEWORK

People who drink alcohol at an early age face an increased risk of adverse health outcomes, such as accidents and injuries, as well as exacerbated physiological sensitivity. In fact, alcohol consumption can cause neurological damage, inhibited brain development, and liver disease, among other illnesses, which may irreversibly alter the normal development of organs, muscles, bones, and the reproductive system (NIAAAH, 2006).

Furthermore, the age at onset of drinking not only affects the likelihood of injury, but also current and future drinking patterns (ICAP, 2009). Scientific evidence shows that young people are indeed more prone to drinking more heavily as compared to other age groups. They also have a greater propensity to engage in risky consumption

³ Negative externalities appear as a result of (i) the adoption of risky behaviors with potential negative effect on the rest of the society, (ii) the deterioration of public or private infrastructure; or (iii) the use of public resources to treat health damage generated by excessive alcohol consumption.

⁴ It is important, however, to compare the benefits and costs of intervention, in order to avoid so-called government failures.

and experimentation, as they are in a constant search for social acceptance and inclusion (Duarte *et al.*, 2007).

Similarly, excessive alcohol consumption leads to negative behavioral changes, including violence, property damage and third party damage, propensity to drink drive with the attendant risk of car accidents, and propensity to adopt risky sexual behaviors. All of these behaviors increase morbidity and mortality, and have negative effects on academic and work performance, which later result in losses to the individual and his/her environment.

Microeconomic theory may help explain underage alcohol consumption. Assuming rationality in people's decision-making, even in the context of risky and addictive behaviors, implies that people perform a cost-benefit analysis in a bid to maximize their utility levels. According to Tucker (2004), consumers of addictive substances may discount the value of its utility hyperbolically, thus giving considerably higher weight to immediate consumption in contrast with future (more distant) consumption. We can extend this explanation to the use of alcohol by teenagers. Additional insights for analyzing youth alcohol use are provided by Cueto *et al.* (2011), who claim that adolescents may suffer from excessive "myopia", thereby overvaluing the current benefits of their actions and undervaluing their future costs. Moreover, NIAAA (2006) cites their lower risk aversion as an additional explanation for underage alcohol use. These two effects combined may contribute to young people overlooking any information about the negative effects of alcohol abuse.

Building on the previous insights, we can assume adolescents' decision to use alcohol responds to a private cost-benefit analysis, where the costs include the monetary price required to obtain alcohol, transaction costs, current and future health risks, parental disapproval, loss of self-control, the negative effects on the formation of human capital (where applicable), etc.; while the benefits include the taste and flavor of the drink, the utility generated by being more sociable (recognition and leadership), as well as the positive physical sensations, such as an enhanced feeling of freedom and uninhibitedness.

Duarte *et al.* (2007) propose a utility function that depends on four sets of variables: an adolescent's individual characteristics (W), household characteristics determining the level of family acceptance (FA), peer characteristics (PA), and unobserved factors affecting individual utility and determining the consumption pattern, denoted by the letter " e " (this includes, for example, the psychological reaction to stressful events and personal failure). These variables are a function of alcohol consumption (A); leisure time (L); consumption of other goods, which are assumed to be a numeraire (X); the time devoted to study and to attend classes (S); and the attitudes and behavior accepted by peers (Z_p).

It is further assumed that the adolescent's individual characteristics (W) act through a weighting function (b) of the utility that is perceived by alcohol use, $V(A)$. Thus, the utility maximization problem is as follows:

$$\begin{aligned} \text{Max } U &= U(b(W) * V(A), PA(A, S, L, Z_p), FA(A, S, L), X, e) \\ \text{Subject to: } P_A * A + X &= I, \quad L + S = H, \end{aligned}$$

where I denotes the youth's income, P_A is alcohol price, and H represents the total time available (in hours). After solving this problem, we get the Marshallian demands for the goods included in the utility function:

$$X = X(P_A, I, W, Z_p, e)$$

$$A = A(P_A, I, W, Z_p, e)$$

$$S = S(P_A, I, W, Z_p, e)$$

$$L = L(P_A, I, W, Z_p, e)$$

It should be clear that the decision regarding the frequency of alcohol use is not necessarily influenced by the same determinants as the decision regarding consumption intensity. If this difference is empirically verified, the public policies that are needed to address each of these must differ (Lundborg, 2002).

The empirical evidence we discuss below stresses the importance of the aforementioned set of variables. Firstly, the youth's individual characteristics (e.g., sex, age, personality) influence the patterns of consumption in different ways. For instance, Nolen-Hoeksema (2004) finds that females are less likely to have alcohol-related problems than males, because, the author states, the former receive bigger social sanctions and face greater risks resulting from excessive alcohol use (e.g. reproductive problems, physical violence, sexual assault). Moreover, Patia (2003) notes that the early onset of alcohol consumption may increase future dependence on it. In the same vein, adolescents who were sexually or physically abused are more likely to consume alcohol excessively during their adulthood. This effect is particularly significant for women (McGowan & Rice, 2003).

Household characteristics (e.g., socioeconomic status or living in a home with a single parent) are also related to adolescents' behavior (Duarte *et al.*, 2007). Lundborg (2002)⁵ analyzes alcohol use as a function of: (i) parental willingness to give alcohol to their adolescent child; (ii) living in a single parent household; (iii) parental unemployment, and (iv) having received education about alcohol, tobacco and drugs. The author finds that parental willingness to provide alcohol to the adolescent reduces both the monetary (price) and non-monetary (psychological aspects) costs of consumption, thus increasing expected alcohol use.

⁵ Lundborg (2002) uses cross sectional data from a survey conducted to 833 individuals in Sweden, aged between 12 and 18 years, in order to analyze the determinants of alcohol consumption, frequency of consumption, intensity of consumption, and binge drinking.

McGowan and Rice (2003) state that family structure matters in the decision to use substances: an unstable family environment, defined as a home with the absence, migration or death of one or more parent is associated with an increased incidence of excessive use of alcohol and other drugs. Furthermore, having both parents living at home may provide more protective characteristics, constituting a barrier against alcohol use (Foxcroft & Lowe, 1991). These protective effects stand the test of time: family support and affection during adolescence leads to a lower probability of problematic alcohol consumption in adulthood (Galaif *et al.*, 2001).

The availability of information about the effects of alcohol use seems to be important as well. Lundborg (2002) points out that because adolescents tend to have higher future discount rates, education warning them about the future effects of drinking might not have a significant impact on their behavior. However, there is evidence of the effective impact of information campaigns on the effects of alcohol use, with messages tailored for different age groups, such as the “School Health and Alcohol Harm Reduction Project”, a successful program implemented in secondary schools in Australia, Ireland and Brazil.

Peers may also influence teenagers’ alcohol use, as they seek group acceptance on occasions in which alcohol is consumed (Duarte *et al.*, 2007). The existence of peer effects on alcohol use would allow multiplier effects from policy. Borsari and Carey (2001) review of the literature on peer effects in early years of higher education suggests that these effects operate through different channels, namely: greater access to alcohol, role models to follow, and social norms. The authors conclude that, in spite of the noticeable weight of peer effects on adolescents’ and young adults’ consumption patterns, more research is needed to better understand these effects.

In addition, traumatic events such as bullying may have long-term effects on the victims (Kaltiala-Heino *et al.*, 1999). D’Amico *et al.* (2009) conducted a logistic regression with self-reported data from adolescents aged between 11 and 14 from Southern California, finding a higher probability of alcohol use among victims of physical and psychological bullying: 2.89 and 1.62 times greater, respectively. Furthermore, women are more sensitive to such victimization than men (the effect on women is 3.65 times the effect on men). Dissatisfaction and school failure may also be related to drug consumption (Carrasco *et al.*, 2004).

The contribution of this paper is twofold. First, we expand the health literature on the determinants of alcohol use by analyzing the role of a wide set of variables that has mainly been analyzed separately elsewhere (the analysis for Peru is new). The wealth of our datasets allows us, for instance, to examine the role of peers and traumatic events on alcohol. Secondly, unlike most of the existing studies, we examine the determinants of alcohol use and intensity of use.

2. DATA AND METHODOLOGY

We use data from two surveys: the 3rd National Study on Prevention and Drug Use in Middle and High School Students, conducted by the National Commission for Development and Life without Drugs (DEVIDA) in 2009, and the Young Lives survey. The DEVIDA survey was applied to high school students living in towns and cities with over 30,000 people. The sample consisted of 57,850 students enrolled in public and private schools, and is representative at the national level. The Young Lives survey analyzes trends in adolescent poverty through a longitudinal study of four countries: Ethiopia, India, Peru and Vietnam. We use data from the largest cohort, whose members were 15 years old in the third round (2009). This database has 714 observations, and is representative at the national level.

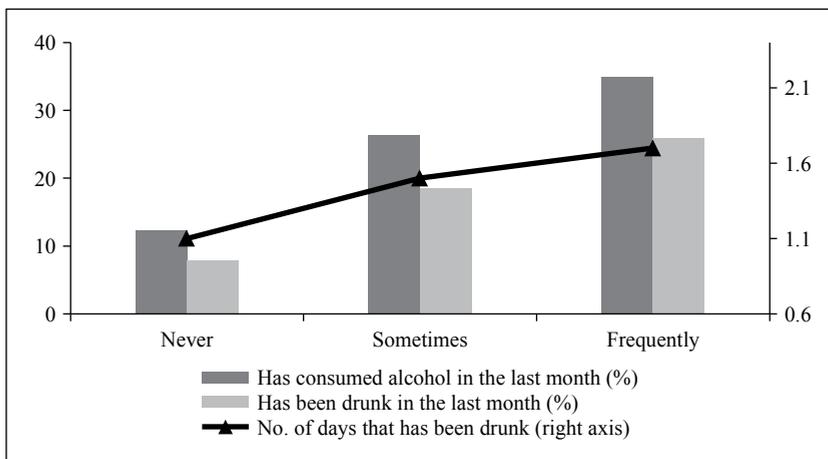
2.1. DESCRIPTIVE STATISTICS

Young Lives includes data from urban and rural areas, and reports that underage drinking is significantly higher in urban areas (37.2% versus 23.9% in rural areas). However, the frequency and intensity of consumption showed no statistically significant differences between the two areas.

Adolescent's individual characteristics. DEVIDA information shows sexual differences in alcohol use: males are more likely to use alcohol than females (17% versus 13%), and more likely to binge drink (11% versus 7%) for more days (1.4 versus 1.0). All such differences are statistically significant at conventional levels. DEVIDA also indicates that 50% of those who have ever consumed alcohol started before the age of 13, while 90% did so before the age of 16. These data also show that the rate of alcohol use and binge drinking during the month prior to the survey is twice as high when the adolescent has been sexually abused.

Characteristics of the household environment. The presence of domestic violence represents a traumatic experience that significantly affects the patterns of legal or illegal drug use. According to DEVIDA (2009), the proportion of students consuming alcohol in the past 30 days (relative to the survey date) is almost 2 times greater in the case of adolescents who have frequently witnessed abuse at home; similarly, the proportion of students who have been drunk in the past 30 days is 2 times greater, while the average number of days inebriated is 50% higher than those who have never witnessed violence at home (see Figure 1).

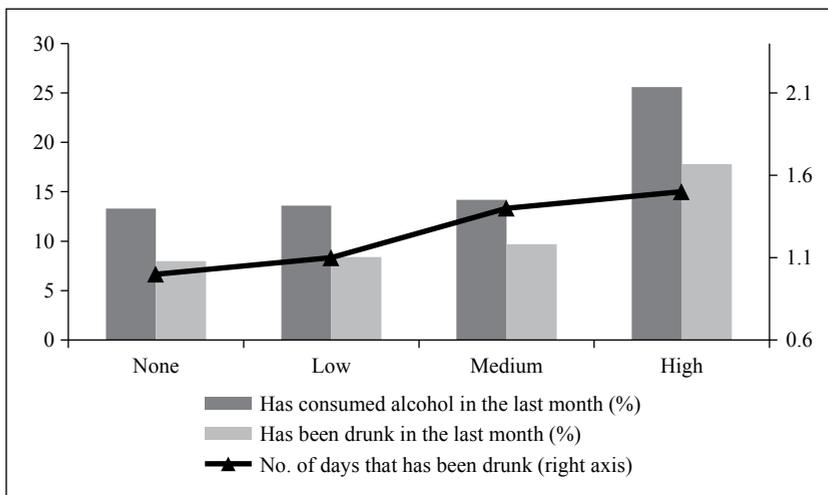
Figure 1. Alcohol use by school students, by presence of domestic violence at home



Source: DEVIDA (2009).

In the case of social vulnerability –defined as exposure to violence, crime, drug use, perception of insecurity, loss of confidence in the police’s ability to enforce order and security, among others – this has a negative impact on consumption habits, as shown in Figure 2.

Figure 2. Alcohol use by school students, by level of social vulnerability



Source: DEVIDA (2009).

Group acceptance. Group acceptance appears to be an important correlate of alcohol consumption among adolescents, and of the adoption of other related behaviors. Thus, having friends who regularly drink alcohol increases the likelihood of adopting the same

habit, as shown in Table 1. The frequency of alcohol use and the number of glasses consumed per occasion (intensity) also increase.

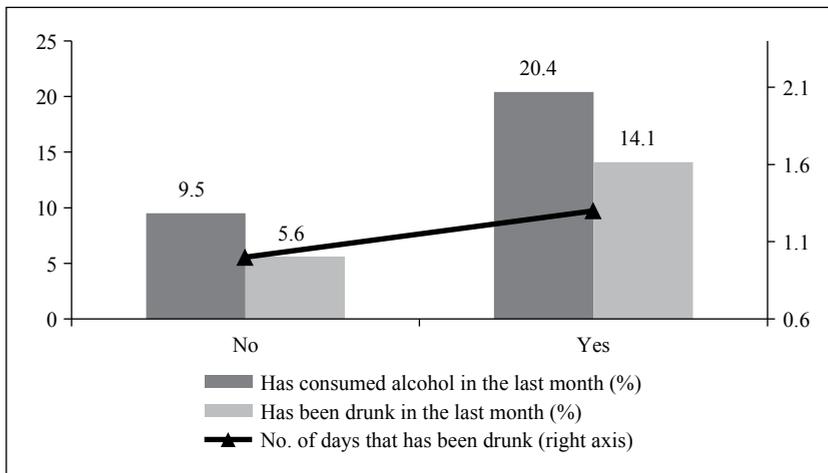
Table 1. Underage alcohol use, broken down by friends' drinking habits (%)

		How many of his/her friends drink?		
		None	Some	Almost all
Drinks alcohol regularly	No	94.3	62.5	19.8
	Yes	5.7	37.6	80.2
Frequency of alcohol use	Never	94.3	62.5	19.8
	Almost never	5.2	33.6	62.4
	At least once a month	0.6	4.0	17.8
Intensity of alcohol use	Doesn't drink alcohol	94.2	67.7	28.0
	Up to 2 glasses	5.8	28.7	49.0
	More than 2 glasses	0.0	3.7	23.0

Source: Young Lives (2009).

Moreover, the proportion of students who consumed alcohol or who got drunk in the past 30 days is considerably higher when they have friends with alcohol problems (see Figure 3). The difference is particularly significant in the latter case (getting drunk), where the proportion of school students that have been drunk is 2.5 times greater when friends have alcohol-consumption habits.

Figure 3. Alcohol use by existence of friends with alcohol problems



Source: DEVIDA (2009).

Finally, as shown in Table 2, those adolescents who are victims of bullying at school not only have a greater propensity to use alcohol, but also use it more frequently and in greater quantities. All these differences are statistically significant at conventional levels.

Table 2. Underage alcohol use, broken down by the occurrence of bullying (%)

		Victim of bullying?	
		No	Yes
Drinks alcohol regularly	No	77.3	59.3
	Yes	22.8	40.7
	Never	77.3	59.3
Frequency of alcohol use	Almost never	20.4	33.8
	At least once a month	2.4	6.9
	Doesn't drink alcohol	79.4	64.2
Intensity of alcohol use	Up to 2 glasses	16.8	28.9
	More than 2 glasses	3.8	7.0

Source: Young Lives (2009).

3. EMPIRICAL ESTIMATION OF MODEL

3.1. DATA FROM THE YOUNG LIVES

We estimate alcohol consumption functions to explain adolescents' behavior with respect to "frequency" and "intensity" of alcohol use. Our frequency of alcohol use variable takes the value of 0 if the adolescent does not use alcohol, and 1 if he/she almost never used it or if he/she uses it at least once a month.⁶ In the case of intensity of alcohol use, the dependent variable takes the value of 0 if the adolescent does not drink alcohol at all, and 1 if he/she drinks it at least a glass in a typical day of drinking.⁷

The high degree of correlation between the variables "frequency" and "intensity"⁸ suggests that both decisions may be taken jointly. We will therefore estimate the frequency and intensity equations simultaneously, using the seemingly unrelated regressions (SUR)

⁶ In the original database, the frequency variable takes 3 possible values: 0 if alcohol has never been consumed, 1 if it has almost never been consumed, and 2 if consumed at least once a month. However, using these variables in their original form (and hence, estimating multinomial models) complicates the interpretation of the coefficients and requires a sufficient number of observations for each category. We thus decided to merge the last two categories.

⁷ The frequency variable, therefore, is defined as alcohol consumption.

⁸ In the original database, the intensity variable takes 3 possible values: 0 if "alcohol is not consumed" is variable, 1 if up to 2 glasses per occasion are consumed, and 2 if more than 2 glasses are consumed on each occasion. The latter two categories have been merged.

model, which accounts for the serial correlation between the estimation errors of each equation. The empirical model is expressed as follows:

$$\text{Frequency} = \alpha X + \varepsilon$$

$$\text{Intensity} = \gamma Z + \epsilon$$

where $\text{Corr}(\varepsilon, \epsilon) \neq 0$. This system of equations is estimated by ordinary least squares (OLS), with a gain in the efficiency (lower variance) of the estimators compared to the case in which the two equations were estimated separately. A positive sign of α_1 (respectively, of γ_1), indicates that a unit increase (or from zero to one, if it is a dummy variable) in the variable X_1 (respectively, Z_1) increases the probability of using alcohol (respectively, of drinking at least a glass in a typical day of drinking) in α_1 percentage points (respectively, in γ_1 percentage points).

Intuitively, we should not expect the vector X , of correlates of the frequency of alcohol use, to be necessarily the same as the vector Z , of correlates of the intensity of alcohol use. Presumably, such intensity is related more to traumatic situations.

In the estimation variables reflecting individual characteristics, we include household characteristics, and characteristics of the environment in which the adolescent lives. We further include proxy variables for the provision of government social services (although not regarded as particularly relevant in the literature, this set of variables is included because it may capture the confidence and security the adolescent feels through access to certain social programs).⁹ For a full description of all variables, see Appendix 1.

The vector of explanatory variables relating to the intensity of alcohol use includes the set of variables described earlier, in addition to variables expected to affect only the intensity of alcohol use by the person's weight, height, relationship with their parents and their level of involvement.

3.2. DATA FROM DEVIDA

We will estimate probabilistic models of alcohol use and binge drinking. In the former case, the dependent variable is "having used alcohol in the past 30 days". We chose this variable instead of that indicating alcohol consumption in the past 12 months because it is a better indicator for current consumption, and it excludes those individuals who consumed at some point in the past but do not do so anymore (D'Amico *et al.*, 2009). For the binge drinking model, the dependent variable is "have you been drunk in the past 30 days, given that you have used alcohol during this time period". The full description of variables is presented in Appendix 2. We use a *Probit* model to estimate the determinants of alcohol consumption and binge drinking.

⁹ The Spearman's correlation coefficient, 0.87, is significant at 99%. It is worth mentioning that results are similar when we estimate these models separately using OLS.

4. RESULTS

4.1. FREQUENCY AND INTENSITY OF ALCOHOL USE

Table 3 reports only the coefficients of the statistically significant variables relating to the frequency (top panel) and intensity (bottom panel) of alcohol use from the Young Lives survey.¹⁰ Results, grouped as per the discussion in section 2, are as follows:

- *Individual characteristics*: age (each additional year equates to a 6 percentage point increase in alcohol use); performance in mathematics; frequency of smoking¹¹ which is one of the highest-impact variables on the probability of frequent drinking, at 30.8 percentage points; and gun ownership, related to a 19.9 percentage point increase in alcohol use).
- *Family characteristics*: having a university-educated mother is associated with higher alcohol use, probably because it is a key predictor of household income. On the other hand, those who reside in urban areas are more likely to use alcohol.
- *Environment and peer effects*: having friends who also consume alcohol and having suffered bullying increases the likelihood of alcohol use by 41.3 and 8.6 percentage points, respectively.

The variables that are significantly correlated with intensity of alcohol use include age, frequency of smoking—again, this is one of the most influential variables, with an impact of almost 35 percentage points—and gun ownership.¹² Weight, height, and indicators of late-age school entry and repetition have no effect, but mathematics performance does (it increases the likelihood by 0.3 percentage points).

Moreover, all the household variables correlated with frequency are also correlated with the intensity of alcohol use, with the exception of maternal education, having electricity at home, and residing in urban areas. Notably, the magnitude of the peer effect and bullying variables are similar in the case of alcohol use: they increase the intensity of consumption by 35.1 and 8.1 percentage points, respectively, as shown in Table 3.

¹⁰ A referee suggested that SIS and Juntos are proxies for poverty, and not of trust in the public sector. We think both scenarios are not incompatible.

¹¹ Appendix 3 shows the coefficients from all variables included in the regression.

¹² A referee raised a reasonable concern about the endogeneity of the variable “smokes”. Excluding this variable does not significantly alter the results, which suggests that, if such endogeneity exists, it may not be severe. Clearly, further work should provide an instrument for this variable.

Table 3. SUR model of decision regarding alcohol use frequency and intensity

	Coefficient	Standard Error
Frequency	0.3343 ***	0.0173
Age	0.0693 **	0.0332
Mathematics test results	0.0042 ***	0.0014
Smokes at least once a week	0.3080 ***	0.0482
Gun possession	0.1990 ***	0.0718
University-educated mother	0.1570 *	0.0874
Parents are married	-0.0854 *	0.0446
Home has electricity	-0.1750 ***	0.0820
Resides in urban area	0.0855 *	0.0518
Most friends use alcohol	0.4130 ***	0.0493
Was victim of bullying	0.0861 **	0.0368
Intensity	0.3041 ***	0.0171
Age	0.0684 **	0.0330
Mathematics test results	0.0034 **	0.0014
Smokes at least once a week	0.3420 ***	0.0477
Gun possession	0.1850 ***	0.0710
Parents are married	-0.1040 **	0.0441
Home has electricity	-0.1200	0.0811
Most friends use alcohol	0.3510 ***	0.0489
Was victim of bullying	0.0813 **	0.0365

Note: *** Significant at 99%. ** Significant at 95%. * Significant at 90%.

Source: Young Lives (2009).

In order to assess the joint effect of each group of variables—individual characteristics, household characteristics and home environment, peer effects, and government programs—we estimated the joint marginal impacts of those groups. As shown in Table 4, Panel A, individual and family characteristics significantly affect the rates of frequency and intensity of alcohol use, while the environment variables only affect frequency of consumption.

In an “ideal” context, defined as one in which the mother is university educated, the adolescent does not smoke or carry weapons, the parents are married, there are no family members smoking at home, his/her teachers at school do not employ corporal punishment, none of his/her best friends drink alcohol, and the adolescent has not suffered bullying or been beaten by a friend; there would be no alcohol use by adolescents; and therefore, the intensity would be zero. The figures shown in the Table 4, Panel B (0.069 and 0.019, respectively) are not statistically different from zero.

**Table 4. SUR Model: Frequency and intensity of alcohol use
(Reported: groups of variables and an ideal context)**

<i>Panel A</i>		
	Coefficient	Standard Error
Frequency	0.3343 ***	0.0173
Individual characteristics	0.2998 **	0.1166
Household characteristics	-2.1510 ***	0.6661
Peer effects	-1.8803 **	0.6653
Government programs	-2.0166 *	0.6670
Intensity	0.3041 ***	0.0171
Personal	0.3257 **	0.1277
Family	-1.9410 **	0.6910
Peer effects	-1.6839	0.6921
Government programs	-1.7641 *	0.6890
<i>Panel B: Ideal Context:</i>		
The mother is university educated, the adolescent does not smoke, does not carry a gun, the parents are married, no one smokes at home, teachers did not use corporal punishment against any student over the last week, none of his/her best friends took alcohol in the last week, the adolescent has not suffered bullying or has not been beaten by a friend.		
Frequency	0.0693	0.0598
Intensity	0.0195	0.0603

Note: *** Significant at 99%. ** Significant at 95%. * Significant at 90%.
Source: Young Lives (2009).

4.2. RESULTS FROM DEVIDA

Table 5 reports the marginal effects for each statistically significant variable (calculated at their mean levels). For the full estimation results, see Appendices 4 (drinking) and 5 (binge drinking). In the first model, the probability of consuming alcohol is 60.36%. In the second model, the probability of binge drinking is 64.72%.

Table 5. Probability of drinking and binge drinking

Variables	Model 1		Model 2	
	Drinking (Prob = 0.6036)	Std. Error	Binge Drinking (Prob = 0.6472)	Std. Error
Individual Characteristics				
Has been sexually abused	0.0801 ***	0.0161	0.0738 ***	0.0198
Age (years)	0.0654 ***	0.0046		
Age at onset of alcohol use (years)	-0.0374 ***	0.0032	-0.0063 *	0.0038
High risk of consuming frequently (perception)	-0.0471 ***	0.0109	-0.0634 ***	0.0138
Late-age school entry	-0.0323 *	0.0184		
Considers him/herself a failure	0.0478 ***	0.0112	0.0870 ***	0.0142
Sex	0.0176 *	0.0104	0.0528 ***	0.0136
Household Characteristics				
First time of consumption was with family	-0.0923 ***	0.0117		
Frequent domestic violence	0.0337 **	0.0131		
Head of household without education	-0.0255	0.0213	0.0801 **	0.0261
Head of household with primary education	-0.0249 ***	0.0184	0.0592 ***	0.0225
Head of household with secondary education	-0.0247 ***	0.0119	0.0360 **	0.0152
Brick-build home	-0.0380 **	0.01667	-0.0520 **	0.0208
High social vulnerability	0.0264 **	0.0107		
School Environment				
Drugs are sold at school	0.0510 ***	0.0147		
Information on drugs given at school	-0.0363 ***	0.0114	-0.0463 ***	0.0145
Peers				
Friends have alcohol problems	0.0314 ***	0.0104	-0.391 ***	0.0144
Friends would get upset if s/he was drunk	-0.0380 ***	0.0107	-0.1262 ***	0.0374
Peers are violent	0.0243 **	0.0116	0.0569 ***	0.0138

Note: *** Significant at 99%. ** Significant at 95%. * Significant at 90%.

Source: DEVIDA (2009).

Individual characteristics. As shown in Table 5, one of the most influential determinants in both models is whether the adolescent has ever been sexually assaulted: under this circumstance, an adolescent has a probability of using alcohol that is 8.0 percentage points above the average, and a 7.4 percentage point higher likelihood of getting drunk. Secondly, age plays a significant role. Each additional year of life increases the likelihood of using alcohol by 6.5 percentage points, though it does not seem to affect binge drinking. Moreover, delaying the age at onset of using alcohol by one year reduces the probability of consumption by 4 percentage points, and the probability of binge drinking by 1 percentage point.

The perception of the risks of using alcohol also matters: if the adolescent believes that frequent consumption is very risky, his/her likelihood of consumption and inebriation drops by 5 and 6 percentage points, respectively. Furthermore, the adolescent's self-perception of being a failure increases the probability of drinking and binge drinking by 5 and 9 percentage points, respectively. Along the same lines, late-age school entry increases the probability of drinking by 3 percentage points, and has no effect on inebriation. We also see that males are more likely to use and abuse alcohol.

Household characteristics. The environment in which alcohol was used for the first time is important, but only in the case of consumption: when the adolescent used alcohol with their families for the first time, their probability of consumption in the last 30 days is 9 percentage points lower.

On the other hand, the frequent occurrence of domestic violence increases the likelihood of consumption by 3 percentage points. Finally, living in a household with a high level of social vulnerability increases the probability of consumption by 2.6 percentage points. It is interesting to note that parental education affects consumption and inebriation differently.

Variables related to the peers acceptance. All of the variables related to peer acceptance proved to be statistically significant. Thus, if an adolescent has friends with alcohol-related problems, his/her probability of consumption increases by 3 percentage points, and the probability of binge drinking by 4 percentage points. Additionally, if his/her friends have a negative attitude towards excessive alcohol use, the probabilities of consumption and of binge drinking decrease by 4 and 12 percentage points, respectively. Finally, having violent peers at school increases the likelihood of drinking and inebriation by 2 and 6 percentage points, respectively.

Variables related to the school environment. The probability of drinking increases by 5 percentage points if drugs are being sold at school. Also, school campaigns against the use of legal and illegal drugs significantly reduce the likelihood of consumption and inebriation (by 4 percentage points). This latter result provides the basis for information campaigns at the school level.

5. CONCLUDING REMARKS

Three sets of variables are especially significant in influencing underage alcohol use in Peru: an adolescent's individual characteristics, peer effects and interaction with friends, and household characteristics. In particular, peer effects are substantial; having friends who use alcohol regularly, or have problems with alcohol, is positively correlated with the frequency and intensity of alcohol use. Interestingly, friends can also have a positive influence; having friends who are upset by seeing him/her drunk reduces the likelihood of alcohol use.

On the other hand, the negative correlation between age at onset of drinking and current alcohol use suggests the importance of policies that aim to delay the age at which individuals start drinking, as these may have significant effects on the consumption pattern. As pointed out by Patia (2003), the early onset of alcohol use increases dependence and alters brain development. We also found out that providing information to adolescents about the risks of alcohol use enables them to make better decisions in this regard. Therefore, devising effective information campaigns in schools regarding the negative consequences of alcohol use may be critical. The experience of the School Health and Alcohol Harm Reduction Project, successfully rolled out in secondary schools in Australia, Ireland and Brazil to provide students with information about the risks of alcohol use and the ways to deal with it, could be replicated in Peru.

The fact that the occurrence of underage alcohol use in Peru is greater in urban than in rural areas, together with the positive correlation of household characteristics associated with income levels, such as the mother's education, hints that higher-income households may show higher levels of underage alcohol use. Another interesting result is the link between cigarette smoking and alcohol use; which implies that measures to reduce alcohol consumption may also help reduce tobacco consumption by underage adolescents.

Our results provide support for the design of policy interventions that also focus on the household environment (an environment exposed to vulnerability and violence represents a risk factor for excessive alcohol use). Campaigns targeted at families, to prevent or detect these events at an early stage, are key in this regard. Our analysis shows that in an ideal context—where the mother has higher education, the adolescent does not smoke, does not carry a gun, his/her parents are married, no other family members smoke, teachers does not use corporal punishment at school, no friends who drink alcohol, and the adolescent is not bullied—the likelihood of alcohol consumption tends to be zero.

In summary, the evidence presented in this article highlights the need for a comprehensive intervention in order to reduce underage alcohol use at school, home, and network levels with the involvement of the government in three strategic sectors (education, health and social development). Such intervention should thus take into account aspects related to peer pressure, domestic violence, bullying at school, etc. Finally, it is crucial to improve the government's capacity to enforce the law, in order to get the desired outcomes.

APPENDICES

Appendix 1 Description of Variables (Young Lives, 2009)

Variable	Description	Values
<i>Independent Variables</i>		
Consumes alcohol, irrespective of regularity (consumed)	<i>Dummy</i> variable for the frequency of alcohol consumption	1: Consumes alcohol; 2: Does not consume alcohol
Alcohol consumption frequency (frequency)	Frequency of adolescent's alcohol consumption	0: Never; 1: Almost never / At least once a month
Intensity of alcohol consumption (intensity)	Amount consumed by adolescent on a typical drinking day	0: Do not drink alcohol; 1: Up to 2 glasses / 3 or more glasses
<i>Individual Characteristics of the Adolescent</i>		
Age (age)	Age of the adolescent	Years
Sex (sex)	Gender	0: Female; 1: Male
Size (height)	Size of the adolescent	Cm
Weight (Weight)	Weight of the adolescent	Kg
Results in mathematics test (rmath_co)	Centered at 300 with standard deviation 15	Continuous Variable: [242.90295,347 .95038]
Has ever failed a grade at school	<i>Dummy</i> variable for adolescent's grade. If s/he repeats a grade at least once, it is considered to have been repeated.	0: No; 1: Yes
Late-age school entry	Variable constructed based on age and grade level. The normative age starts at 6 years for the 1° grade. We considered 1 year of tolerance (6-7 years for the 1° grade, onwards).	0: No; 1: Yes
Hours devoted to study (Study_hours1) (Study_hours2) (Study_hours3)	Hours spent by the adolescent studying at home	0: Does not study at home 1: Up to 2 hours 2: 3 Or more hours
Expectations of improvement (Exp_improv1) (Exp_improv2) (Exp_improv3)	The adolescent feels that, if s/he works hard, s/he can overcome his expectations	0: In disagreement/more or less 1: Agree 2: Strongly agree
Type of school (Public school)	If the school attended is public or private	0: Other type of school; 1: Public school

Variable	Description	Values
Frequency of smoking (Freq_smoke1)	How often s/he consumes cigarettes	0: Almost never/ever; 1: At least once a month / At least once a week
The adolescent has possessed loaded weapon for at least a week (weapons)	Weapons such as knives	0: No 1: Yes
<i>Household Characteristics</i>		
Mother's education (Mother_educ1) (Mother_educ2) (Mother_educ3)	Mother's level of education	0: None, or sub- primary 1: Primary incomplete/complete and incomplete secondary 2: Higher incomplete / complete
Married parents (Married_parents)	Parents are married.	0: No; 1: Yes
People per room (people_room)	Household members by number of rooms in home	Continuous Variable: [0.29411766, 11]
Electricity	The home has electricity	0: No; 1: Yes
Walls materials (Wall_material)	Material of the house's walls	0: Mats/plastic sheets/adobe/quincha; 1: Brick/stone/iron/concrete
Relationship with parents (Rel_parents)	Parents believe they have a close relationship with the adolescent	0: No; 1: Yes
Parental involvement (invc_parents)	Parents know his/hers friends	0: No; 1: Yes
Smoke at home (smoke_home)	Someone smokes regularly at home	0: No; 1: Yes
Drinks at home (drink_home)	Someone in the household drinks at least once a week	0: No; 1: Yes
The adolescent has been beaten or physically hurt by someone in the family (beaten_family)		0: No; 1: Yes
Geographical Area (Urban)		0: Rural; 1: Urban
<i>Characteristics of the Environment</i>		
Teacher uses physical punishment to students at school (Teach_beats)		0: No; 1: Yes
Health establishments (Public_health)	Attends public health center	0: No; 1: Yes
Children enrolled at SIS ^{a/} (SIS)	The adolescent is registered at SIS	0: No; 1: Yes
Juntos Program (Juntos) ^{b/}	Someone in the household receives money from JUNTOS	0: No; 1: Yes

Variable	Description	Values
<i>Group Acceptance</i>		
Friends drink (friends_drink1)	How many of adolescent's best friends drink alcohol at least once a month	0: None/Some; 1: Almost all/All
Sense of belonging at school (Membership1)	Adolescent identifies with his/her school	0: In disagreement / more or less; 1: Agree/strongly agree
Bullying (Bullying)	Adolescent has been victim on three or more occasions of any of these situations in the school during the last year: 1, They called me names or insulted me; 2. They tried cause problems between me and my friends; 3. They grabbed my things without my permission; 4. They taunted me for some reason; 5. They made me feel uncomfortable by coming up very close to me or looking at me inappropriately; 6. They beat me; 7. I was physically assaulted in some way; 8. Tried to break or damage any of my things; 9. Refused to talk to me or other people do not talk to me	0: No; 1: Yes
Adolescent has been beaten or physically hurt by a friend (beaten_friend)		0: No; 1: Yes

a/ *Seguro Integral de Salud* (SIS) is a public health insurance program that aims to protect people not affiliated to any other insurance program (public or private), focusing on vulnerable, poor and extremely poor populations. b/ *Juntos* is a conditional cash transfer (CCT) program, which seeks to help to reduce poverty and improve human capital formation in poor households by requiring certain health, nutrition and education requirements in order to receive the cash transfer.

Appendix 2
Description of Variables
(DEVIDA, 2009)

Variable	Values
<i>Independent Variables</i>	
Has consumed alcohol at some point in their lives (cons_av)	0: No; 1: Yes
Alcohol has been consumed in the last month (cons_30d)	0: No; 1: Yes
Has been drunk in the last month (drunk30d)	0: No; 1: Yes
<i>Individual Characteristics of the adolescent</i>	
Sex (sex)	0: Female; 1: Male
Age (age)	Continuous variable
Age of smoking onset (starting_age)	Continuous variable
Type of school attended	0: Private; 1: Public
School Delay (Delay)	0: No; 1: Yes
Considers him/herself a failure (Failure)	0: No; 1: Yes
Has been sexually assaulted at some time in their life (agsexual)	0: No; 1: Yes
Perception of high risks from drinking (risk_drinking)	0: No; 1: Yes
Perception of high risk of drinking alcohol frequently (risk_frequent_drinking)	0: No; 1: Yes
<i>Household Characteristics</i>	
The house's walls are brick-built (brick)	0: No; 1: Yes
Frequent domestic violence (violence)	0: No; 1: Yes
Adolescent lives with both parents (both_parents)	0: No; 1: Yes
Educational level of household head (edu_level_households) (HH_Primary) (HH_Secondary) (HH_incsuperior) (HH_compsuperior)	1: No education or primary incomplete 2: Complete Primary 3: Complete Secondary 4: Higher Incomplete 5: Higher Complete
Level of social vulnerability (mid_high_social_vulnerability)	0: No; 1: Yes
Total number of persons per room (People_room)	Continuous Variable
First time of consumption with family (ft_family)	0: No; 1: Yes
<i>Characteristics of the Environment</i>	
Campaigns against the use of legal drugs in the regions (Campaigns_region)	0: No; 1: Yes

Variable	Values
Campaigns against the use of legal drugs in the district (Campaigns_district)	0: No; 1: Yes
Drugs are sold in school without further supervision (Drugs_School)	0: No; 1: Yes
The school offers its students information about the consequences of legal and illegal drug consumption (Info_school)	0: No; 1: Yes
Region (region1) (Region2) (Region3)	1: Metropolitan Lima 2: Callao 3: Provinces
<i>Group Acceptance</i>	
Classmates are violent (violent_classmates)	0: No; 1: Yes
Friends with alcohol problems (Friends_alcohol)	0: No; 1: Yes
Friends would get annoyed if they found him/her drunk (Friends_annoyed)	0: No; 1: Yes

Appendix 3
Frequency and Intensity of Alcohol Use
SUR - Young Lives (2009)

Seemingly unrelated regression						
Frequency	490	25	0.3780	0.3525	266.72	0,000
Intensity	490	34	0.3751	0.3273	248.65	0,000

Variable	(1) Frequency	(2) Intensity
Age	0.0693 ** (0.0332)	0.0684 ** (0.0330)
Sex	-0.0408 (0.0358)	-0.0271 (0.0377)
Height		-0.000603 (0.00190)
Weight		0.00155 (0.00148)
Rmath_co	0.00424 *** (0.00142)	0.00340 ** (0.00142)
Repeated		0.0325 (0.0241)
Late-age school entry		0.0149 (0.0234)
Study_hours2	-0.134 (0,115)	-0.0938 (0,113)
Study_hours3	-0.139 (0,117)	-0.0587 (0,116)
Exp_improv2	0.0624 (0.0772)	0.0747 (0.0765)
Exp_improv3	0.0355 (0.0829)	0.0621 (0.0820)
Public_school	0.0965 * (0.0503)	0.0574 (0.0501)
Freq_smoke1	0,308 *** (0.0482)	0,342 *** (0.0477)
Weapons	0,199 *** (0.0718)	0,185 *** (0.0710)
Mother_educ2	0.0932 (0.0721)	0,101 (0.0718)
Mother_educ3	0,157 * (0.0874)	0,101 (0.0876)

Variable	(1) Frequency	(2) Intensity
Married_parents	-0.0854 * (0.0446)	-0.104 ** (0.0441)
People_room	-0.0210 (0.0131)	-0.0244 * (0.0130)
Electricity	-0.175 ** (0.0820)	-0.120 (0.0811)
Wall_material	-0.0203 (0.0398)	-0.0263 (0.0395)
Rel_parents		-0.00382 (0.0361)
Invc_parents		-0.0109 (0.0211)
Smoke_home	0.0224 (0.0462)	0.00504 (0.0456)
Drink_home	0.0110 (0.0398)	0.0212 (0.0393)
Beaten_family		0.00946 (0.0222)
Urban	0.0855 * (0.0518)	0.0217 (0.0514)
Teach_beats	0.0316 (0.0441)	0.00260 (0.0438)
Public_health		0.0384 (0.0295)
SIS	0.0194 (0.0402)	-0.00243 (0.0399)
Juntos	-0.0256 (0.0641)	-0.0758 (0.0635)
Friends_drink1	0,413 *** (0.0493)	0,351 *** (0.0489)
Membership1		-0.0189 (0.0318)
Bullying	0.0861 ** (0.0368)	0.0813 ** (0.0365)
Beaten_friend	0.0885 * (0.0531)	0.0728 (0.0533)
Constant	-2.030 *** (0,670)	-1.788 *** (0,693)
No. Observations	490	490
R-squared	0,352	0,327

Note: Standard errors in parentheses. *** P<0.01, ** p<0.05, * p<0.1.

Appendix 4
Probability of Alcohol Use - DEVIDA (2009)

Number of obs.				9,947
Log Likelihood				-6,402.60
Wald chi2 (23)				542.63
Prob > chi2				0.000
Variable	Marginal Effects	Std. Error	Z	P>z
Sex	0.01768	0.01040	1.70	0.089
Public_school	0.00161	0.01165	0.14	0.890
Age	0.0654	0.00459	14.25	0.000
Risk_frequent_drinking	-0.0471	0.01092	-4.32	0.000
Starting_age	-0.0374	0.00325	-11.52	0.000
Late-age school entry	-0.0323	0.01846	-1.75	0.080
Agsexual	0.08014	0.01613	4.97	0.000
Failure	0.04784	0.01126	4.25	0.000
Brick	-0.0380	0.01667	-2.28	0.023
Violence	0.03375	0.0131	2.58	0.010
Both_parents	-0.0168	0.01051	-1.60	0.110
Ft_family	-0.0923	0.01172	-7.87	0.000
Mid_high_social_vulnerability	0.02637	0.01071	2.46	0.014
HH_nostudies	-0.0255	0.02135	-1.19	0.233
HH_Primary	-0.0249	0.01838	-1.35	0.176
HH_secondary	-0.0247	0.01192	-2.08	0.038
Drugs_School	0.05095	0.01474	3.46	0.001
Info_school	-0.0363	0.01138	-3.19	0.001
Violent_classmates	0.02434	0.01095	2.22	0.026
Friends_alcohol	0.03138	0.0104	3.02	0.003
Friends_annoyed	-0.0380	0.01068	-3.56	0.000
Region2	-0.0019	0.02742	-0.07	0.945
Region3	-0.0037	0.01491	-0.25	0.806

Appendix 5
Probability of binge drinking - DEVIDA (2009)

Number of obs					5,642
Log likelihood					-3,443.27
Wald chi2 (25)					465.80
Prob > chi2					0.000
Variable	Marginal Effects	Std. Error	Z		P>z
Sex	0.052763	0.01361	3.88		0.000
Grade	-0.00434	0.01231	-0.35		0.724
Public School	0.091022	0.01562	5.83		0.000
Age	0.01693	0.01146	1.48		0.140
Risk_frequent_drinking	-0.06336	0.01383	-4.58		0.000
Starting_age	-0.0063	0.00378	-1.67		0.096
Agsexual	0.073771	0.01984	3.72		0.000
Failure	0.086981	0.01419	6.13		0.000
Brick	-0.05202	0.02081	-2.50		0.012
Violence	0.021845	0.01684	1.30		0.194
Mid_high_social_vulnerability	0.021048	0.01386	1.52		0.129
Late-age school entry	0.047096	0.02967	1.59		0.112
People_room	0.003708	0.00564	0.66		0.511
HH_nostudies	0.080106	0.02612	3.07		0.002
HH_Primary	0.059191	0.0225	2.63		0.009
HH_secondary	0.036009	0.01525	2.36		0.018
Ft_family	0.02439	0.01871	1.30		0.192
Drugs_School	-0.04635	0.01457	-3.18		0.001
Info_school	0.023496	0.01413	1.66		0.096
Violent_classmates	0.056887	0.01375	4.14		0.000
Friends_alcohol	-0.03912	0.01442	-2.71		0.007
Friends_annoyed	-0.12623	0.03736	-3.38		0.001
Region2	-0.0964	0.01989	-4.85		0.000
Region3	0.052763	0.01361	3.88		0.000

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