"IT WASN'T ME, IT WAS THEM!" A STUDY OF SOCIAL INFLUENCE IN RISKY BEHAVIOUR BY ADOLESCENTS *

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Abstract

Institutional information does not seem sufficient to prevent drug experimentation by adolescents. A key question is therefore how adolescents decide to experiment with drugs, or, in general, adopt risky behaviours. We use the Add Health panel dataset (1994-1996) to show that risky behaviour by adolescents (the consumption of tobacco, alcohol and marijuana) is correlated with (lagged) behaviour in three different peer groups: others in the same school year; others in the same school who are one school year higher than the individual; and the individual's friends. Peer group effects are strongest within sexes. However boys do also follow girls, while girls are only little affected by what their male peers do.

preliminary version, comments welcome.

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1 Introduction

Recent survey results on adolescent drug consumption are impressive (Beck *and al.*, 2000). At the age of 17, half of all adolescents have tried cannabis, 40% smoke cigarettes every day, and more than 50% have been drunk at least once in their life.[1] In this context, one can call into question the efficacy of public policies such as safety campaigns and police intervention in schools in the prevention or reduction of psychotrope consumption. Institutional information (laws and prevention) do not seem to prevent (legal or illegal) drug experimentation and continuing use by adolescents.

We therefore ask which variables predict the use of psychotropes by adolescents. In particular, we ask to what extent such risky behaviour result from the observation of and interaction with others who consume. Our starting hypothesis is that adolescents' preferences are sensitive to the behaviour of their peers (in this case, other adolescents in the same school). It is likely that the strength of this influence depends on the individual's sex and the sex composition of his or her peer group. We use American data from the Add Health survey (1994-1996) to evaluate the strength of this link in the consumption of cannabis, alcohol and tobacco.

2 Social Interactions

This paper draws on the literature on social influence and non-market interactions. One of the first authors to use the concept of interdependent preference rigorously was Duesenberry (1967). Becker (1974) article appeals to social interactions in the context of the family. Pollak (1976) explicitly introduces a general form of interdependent preferences, whereby individual demand functions include the consumption of other societal members, weighted by the strength of the attachment that the individual feels for them. In general, research on "peer pressure" or interactions includes the behaviour of the peer group as an argument of the individual's utility function, and hence of his or her behaviour (Akerlof, 1980; Case and Katz, 1991; Clark and Oswald, 1998; Evans *and al.*, 1992; Glaeser *and al.*, 1996; Kandel and Lazear, 1992). Clark (2002) shows that reported levels of subjective well-being amongst the unemployed are higher in regions and households with higher unemployment rates. Behavioural models with learning from others' behaviour have recently been applied to strike behaviour (Kuhn and Gu, 1999) and cigarette consumption (Clark and Étilé, 2002).

The empirical implementation of models of social interaction is problematic for at least three reasons. First, there is no general agreement on who constitutes the peer or reference group. Second, only few datasets contain information which allow the behaviour of any defined peer group to be measured. Third, there is a major problem of the identification of social interaction effects, as discussed by Manski (1993, 1995, 2000). In this paper, we are able to avoid some of these criticisms by using a reference group (the school year in the school) that is at least partly exogenous, and by using lagged values and instrumented values of others' consumption behaviour.

A standard equation for estimating social interactions is as follows:

$$Y_i^t = \alpha + \beta X_i^t + \theta \overline{Y}_j + \epsilon_i^t, \qquad j \neq i; \tag{1}$$

where Y_i^t is the consumption of individual i at period t; X_i^t are the other individual characteristics of i and of his environment (in our case, the school); $\overline{Y}_j$ is reference group behaviour (NOT including individual i), and ϵ_i^t is an error term.

[1] Figures for other Western countries are similar

We use two kinds of approach for this study: *(1)* Lagged value of a reference group behaviour. In this case $\overline{Y}_j = \overline{Y}_j^{t-1}$, the average behaviour of the peer group at time $t-1$. Thus, the adolescents' behaviour at t is a function of average behaviour of the reference groups in which they were at $t-1$; *(2)* instrumented value of the reference group behaviour. There is on average 11 months between the two interviews, thus the lagged value is too far in the past to reflect an instantaneous link between reference group and adolescent behaviours. However, at time t, the instantaneous correlation produces an endogeneity bias. Thus, in this case, $\overline{Y}_j = \overline{\hat{Y}}_j^t$, the average predicted behaviour of reference group at time t. Where:

$$\hat{Y}_j^t = \alpha' + \beta' X_j^t + \theta' \overline{Y}_j^{t-1} + \nu_j^t. \tag{2}$$

The adolescents' behaviour at t is a function of average predicted behaviour of the reference groups in which they are at t, and prediction depend on adolescents of reference group characteristics at t and their behaviour at $t-1$.[2]

This paper will use the above equation to model the consumption and participation in consumption of tobacco, alcohol, cannabis and frequency of drunkenness by adolescents. Participation is, a priori, better observed than level of consumption by adolescents. The latter may know if another adolescent consumes or not, but it is more difficult to observe how much he consumes. The initial reference group will be other adolescents at the same school year.

Our approach has some similarities with that of Gaviria and Raphael (2001), who use a sample of tenth-graders from the National Education Longitudinal Study (NELS). They show that the consumption of other students in the same school is strongly correlated with the individual's consumption. This conclusion is robust to the instrumentation of reference group consumption, controls for school characteristics, and estimation on sub-samples designed to split adolescents up by their susceptibility to be influenced by others (whether they moved school recently or not).

We use two other reference groups: adolescents in the same school who are one school year higher and identified friends of the individuals. We carry out two estimations (lagged value and instrumented value) by behaviour (for consumption -Tobit estimation- and for participation -Probit estimation-) and by reference group. We also study the transition from non-participation to participation for the sub-sample who do not consume at time $t-1$.[3]

3 Data

We use the Add Health panel dataset (1994-1996) to model possible links between risky behaviour by adolescents (the consumption of tobacco, alcohol and marijuana) and the same behaviours in peer groups. Three peer groups are examined: others in the same school year; others in the same school who are one school year higher than the individual; and the individual's friends.

The Add Health survey (National Longitudinal Study of Adolescent Health) comprises a stratified sample of 80 high schools and 52 middle schools from the U.S.. The sample is representative of American schools with respect to region, urbanisation, school type, ethnicity, and school size. The survey deals health and related behaviours of adolescents who are in school. It was designed to explore the causes of risky behaviour in the light of the social context. The survey was carried out in three parts.

[2] All estimated behaviours are split by sex, we make one prediction for young males and one prediction for young females.

[3] This is not without its problems, as the sample of non-participants at time $t-1$ is non-random. Good instruments are required to model the subsequent selection bias.

The first, short, survey, called the In-School survey (September 1994 - April 1995) covered 90118 adolescents in 164 schools. The second, called In-Home I (April 1995 - December 1995), comprised long interviews with 20745 adolescents who are representative of those sampled in the In-School survey. These adolescents' parents were also interviewed. Last, the In-Home II survey (April 1996 - August 1996) repeated these long interviews with 14738 of the adolescents from In-Home I.[4]

In this paper, we use the In-Home I and In-Home II surveys. Two waves of survey data are not enough to estimate rational addiction models, but they do enable us to use lagged values (and predicted values) of reference group consumption (In-Home I) in the estimating equation for individual consumption behaviour (from In-Home II). This is one of the strong points of the dataset used.

4 Results

We just present results on peer group coefficient, split by sex (the list of other variables is presented below each table[5]). Tables 1, 3 and 5 present results of the consumption Tobit with average consumption of the reference group. Tables 2, 4 and 6 present results of the participation Probit with the participation rate of the reference group. Each table presents our main results for interactions with respect to four types of behaviour: smoking, drinking, drunkenness and smoking marijuana. Two sets of regression results are presented in each table. In the first, the lagged level of consumption (participation) in the peer group (i.e. that from In-Home I) is used as an explanatory variable. The use of lagged values partly alleviates the identification problem. In the second, the present value of consumption (participation) in the peer group is instrumented using information on lagged peer group consumption (participation), peer group characteristics, and their parents' characteristics. Note that this estimation is carried out at the individual level, and then aggregated to produce the aggregate predicted value for peer group consumption (participation).[6]

There are three main results from these tables. The first is that Probit estimations give more significant coefficients than Tobit estimation. An adolescent probably knows better if another adolescent consumes or not rather than how much he consumes. The adolescent "econometrician" observes more easily participation than consumption. This is less obvious for friends, which is the group that individuals can observe the most easily. The second is that there is slightly more significant coefficients when friends are considered as the reference group (table 6); however, in terms of size of the estimated coefficients (and therefore the strength of the social interaction), there is little to choose between the two. Third, in general, young females have more significant coefficients than young males (except for the friends). It is therefore possible that they are more easily influenced.

In the school environment, we choose to take as first reference group those who are in the same school year. The other reference group in the school is students who are one school year higher than the respondent. It is worth noting that this type of peer group (those one school year higher than the individual and in the same school) potential bypasses the endogeneity problem, as the consumption of older adolescents may be argued to be little affected by the behaviour of their younger colleagues. We can take another peer group with individual's friends. We consider

[4]Full details of the Add Health data are available at http://www.cpc.unc.edu/projects/addhealth.

[5]These other variables show that consumption of cigarettes, alcohol and marijuana are higher for adolescent boys, whites, recent movers, and older schoolchildren. They are equally higher for children from one-parent families and for those who have greater disposable income. Many of the control variables for parents' and school characteristics are significant.

[6]We do not present these results, but we make one preliminary estimation by sex.

this as a first extension of the initial reference group.

A second extension refers to the way in which adolescent boys and girls interact. We are interested in differences between young boys and young girls in the role of social influence on risky behaviour. In all sample estimations, we see that, depending on behaviour, adolescents are influenced by other boys, other girls or both. It is natural to ask whether this effect depends on the sex of respondent. In other words, do boys follow boys and girls follow girls?

The majority of own-sex peer group effects are significant. For example, consider alcohol consumption/participation if reference group is the same school year (tables 1 and 2). This is significantly positively correlated with lagged and instrumented average alcohol consumption / alcohol participation rate, for young males by male peer group, and for young females by female peer group. Across all three peer and all for behaviours (Probit estimations), almost all of the twelve peer group effects are positive and significant at the five per cent level or better, for both young boys and young girls.

A question of interest is whether there is any evidence of cross-sex influence, i.e. do boys follow girls or girls follow boys? There are significant sex differences in this context. We consider Probit estimation for this problem because participation is better observed by adolescents than consumption level (tables 2, 4 and 6). Adolescent females' behaviour is significantly correlated with that of adolescent males for twelve of the twelve peer group effect in lagged values estimations (five in instrumented values estimations). This is particularly true with respect to alcohol and drunkenness (significant with both lagged and instrumented values). However, there is less evidence that boys follow girls in this way: ten of the twelve peer group effect in lagged values estimations (only one in instrumented values estimations) are significant here.

Those who are one school year higher is not the most influential peer group,[7] but it is interesting because it is probably the most exogeneous reference group that student can have in a school.

Friends is an endogeneous peer group (tables 5 and 6), because adolescents choose them. We expect this correlate to the strong and we find this is so. Contrary to other peer groups, we do not observe real differences between Tobit and Probit estimations. One reason can be that an adolescent observe better the consumption of his friends than the consumption of other in the same school. If we consider lagged values, boys are systematically influenced by boys and girls are systematically influenced by girls, it is the same for cross-sex interaction (in Probit estimation). Friends are an interesting peer group but the results are not surprising because we choose friends that have the same characteristics or tastes as us. In addition, the estimated coefficients for friends' behaviour are not hugely higher than those for other more exogenous peer groups, whereas an endogeneity argument would have these former to be seriously biased upwards.

The last extension is transition to consumption. In table 7, we select (without treatment of selection bias) those who do not consume in $t-1$ (In-Home I). If they do not consume, it can be because they are less easily influenced than others. In this sense, the bias tends towards "zero". In all samples, the male peer group seems to be more influent than the female peer group (for lagged values and instrumented values). Transition to participation of young males are influenced by participation of other young males. This fact is more readable with the lagged value than with the instrumented value. Transition to participation of young Females (with lagged values as with instrumented values) are influenced by male peer group in alcohol and drunkenness participation, and female peer group in tobacco and marijuana participation. Here we find the only significant negative coefficient for the female peer group. An increase in female predicted participation at t

[7] We do not have better results with students who are in two school year higher than respondent, and with students who are in a higher school year than respondent.

would have a negative influence on transition to participation of young males for this behaviour. The marginal effect of this fact is -0.360 (if the female predicted participation increases by 1%, the probability that young males take part in consumption decreases by 0.36%). We should bear in mind that marijuana use is likely subject to serious measurement error.

To conclude, we present the marginal effects of peer group participation when the reference group is the same school year (table 8). Generally, when the two peer group coefficients are significant, the male peer group allocates a higher marginal effect than the female peer group (except for the tobacco, drunkenness and marijuana in young female, lagged values estimations). And, when the coefficients are significant, instrumentation give a higher marginal effect than the lagged value. The male peer group has the highest marginal effect for marijuana participation in young male, instrumented values estimation. When other males in the same school year increase their participation of 1%, the probability that a young male takes part in consumption increases by 0.54%

5 Conclusion

This paper has contributed to the empirical literature on social interactions. We have used the Add Health survey to show that four different types of "risky behaviours" (smoking, drinking, drunkenness, and marijuana use) are to an extent determined by what others in the peer group do. Our use of panel data has allowed us to circumvent part of the omnipresent endogeneity problem by using lagged values of peer group consumption. In addition, the particularly rich dataset has allowed us to control for not only parents' characteristics but also some school characteristics, avoiding some of the omitted variable problems that have dogged previous estimates.

We have information on the behaviour of different adolescents within the same school. This has allowed us to measure four plausible peer groups: the same school year within the school, those one school year higher than the respondent within the same school, and the respondent's friends.

We find significant peer group effects for all four behaviours, and for all three peer groups. Peer group effects are stronger within sexes than between sexes: boys mainly follow boys and girls mainly follow girls. There is some evidence of cross-sex interactions, however, which are not symmetric between the sexes. Whereas girls follow boys (notably for alcohol and drunkenness), outside of the circle of friends boys are (statistically) indifferent to girls (except for the drunkenness).

Comparing marginal effect (table 8 [8]) across regressions allows us to identify for which products peer group effects are the largest, and which peer group exerts the most influence. We find that alcohol participation has the highest marginal effects and drunkenness participation is the most influenced by what other do, and that those in the same school year within the same school are the most salient peer group (except for the tobacco participation).

The pervasiveness of such interactions has at least one important policy implication. Any policy impact on consumption, whether positive or negative, will be amplified through peer group effects. As such it is not enough to evaluate the a targeted policy by its impact on the target group: there will likely be significant spillovers. As such, the dynamics of consumption behaviour, especially by the young, would seem to be an important topic for further research.

[8] We do not present tables with marginal effect for other reference groups.

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Tables

Table 1: Tobit consumption equations with same school year as reference group, average consumption

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**
All sample - lagged value								
Male peer group	0.401**	(0.119)	0.236**	(0.073)	0.263*	(0.103)	0.143	(0.137)
Female peer group	0.506**	(0.140)	0.166	(0.120)	0.251	(0.167)	1.006**	(0.326)
N	8399		8153		8511		8347	
All sample - instrumentation								
Male peer group	0.240*	(0.112)	0.368*	(0.157)	0.627**	(0.220)	0.809	(0.809)
Female peer group	0.550**	(0.121)	0.953**	(0.279)	0.984**	(0.327)	0.863	(0.723)
N	7644		7444		7736		7612	
Young Males - lagged value								
Male peer group	0.495**	(0.179)	0.469**	(0.125)	0.375*	(0.160)	0.243	(0.226)
Female peer group	0.283	(0.220)	0.065	(0.221)	0.120	(0.264)	1.378**	(0.536)
N	4124		3969		4187		4078	
Young Males - instrumentation								
Male peer group	0.118	(0.167)	0.535†	(0.276)	0.669*	(0.329)	1.275	(0.884)
Female peer group	0.432**	(0.192)	1.088*	(0.529)	0.799	(0.534)	-0.481	(1.380)
N	3733		3619		3786		3710	
Young Females - lagged value								
Male peer group	0.277†	(0.156)	0.023	(0.079)	0.128	(0.126)	0.019	(0.144)
Female peer group	0.676**	(0.177)	0.251*	(0.121)	0.346†	(0.200)	0.531	(0.341)
N	4275		4184		4324		4269	
Young Females - instrumentation								
Male peer group	0.352*	(0.150)	0.229	(0.157)	0.516†	(0.284)	0.247	(0.495)
Female peer group	0.616**	(0.153)	0.731**	(0.261)	1.039**	(0.383)	1.129†	(0.623)
N	3911		3825		3950		3902	

Significance levels : †=10%; ∗=5%; ∗∗=1%

Other variables:

Adolescent: Female, Age, Age^2, Recent mover, White (Ref.), Black, Hispanic, Asian, Other origin, One parent, Weekly earnings (100$);

Parent: Female, Age, Born in USA, Public assistance, Education (8 dummies), Work outside home, Full-time work, Unemployed, PTA member, Income (100$), No money problems, Alcohol consumption, tobacco participation;

School: Private, Urban area, Suburban area (Ref.), Rural area, Small-sized, Medium-sized, Big-sized (Ref.), West, Mid-West, South (Ref.), North-East.

Table 2: Probit participation equations with same school year as reference group, participation rate

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**
All sample - lagged value								
Male peer group	0.601**	(0.125)	0.811**	(0.102)	0.804**	(0.123)	0.736**	(0.193)
Female peer group	0.384**	(0.121)	0.314**	(0.106)	0.641**	(0.121)	0.678**	(0.211)
N	8399		8153		8511		8347	
All sample - instrumentation								
Male peer group	0.301	(0.248)	1.167**	(0.295)	1.293**	(0.285)	1.657**	(0.645)
Female peer group	0.853**	(0.216)	0.651*	(0.292)	0.774*	(0.312)	0.966†	(0.520)
N	7646		7447		7738		7618	
Young Males - lagged value								
Male peer group	0.804**	(0.177)	1.013**	(0.147)	1.039**	(0.173)	0.879**	(0.262)
Female peer group	-0.001	(0.172)	0.141	(0.152)	0.600**	(0.168)	0.316	(0.303)
N	4124		3969		4187		4078	
Young Males - instrumentation								
Male peer group	0.159	(0.347)	1.272**	(0.426)	1.470**	(0.393)	2.344**	(0.878)
Female peer group	0.474	(0.320)	0.600	(0.427)	0.561	(0.447)	-0.220	(0.775)
N	3734		3620		3786		3710	
Young Females - lagged value								
Male peer group	0.399*	(0.181)	0.623**	(0.144)	0.575**	(0.178)	0.559†	(0.288)
Female peer group	0.741**	(0.175)	0.468**	(0.150)	0.688**	(0.180)	0.988**	(0.299)
N	4275		4184		4324		4269	
Young Females - instrumentation								
Male peer group	0.432	(0.361)	1.066**	(0.412)	1.121**	(0.422)	0.843	(0.973)
Female peer group	1.154**	(0.298)	0.686†	(0.403)	0.906*	(0.445)	1.865*	(0.731)
N	3912		3827		3952		3908	

Significance levels : †=10%; ∗=5%; ∗∗=1%

Other variables:

Adolescent: Female, Age, Age^2, Recent mover, White (Ref.), Black, Hispanic, Asian, Other origin, One parent, Weekly earnings (100$);

Parent: Female, Age, Born in USA, Public assistance, Education (8 dummies), Work outside home, Full-time work, Unemployed, PTA member, Income (100$), No money problems, Alcohol consumption, tobacco participation;

School: Private, Urban area, Suburban area (Ref.), Rural area, Small-sized, Medium-sized, Big-sized (Ref.), West, Mid-West, South (Ref.), North-East.

Table 3: Tobit consumption equations with students one school year higher as reference group

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**
All sample - lagged value								
Male peer group	0.096	(0.097)	0.093*	(0.045)	0.070	(0.076)	0.096	(0.167)
Female peer group	0.418**	(0.127)	0.189	(0.137)	0.427**	(0.139)	0.436*	(0.208)
N	7497		7351		7536		7408	
All sample - instrumentation								
Male peer group	-0.031	(0.083)	0.269†	(0.141)	0.313†	(0.181)	0.565	(0.473)
Female peer group	0.308*	(0.131)	0.113	(0.282)	0.020	(0.326)	0.118	(0.651)
N	6341		6195		6357		6289	
Young Males - lagged value								
Male peer group	-0.071	(0.149)	0.069	(0.079)	0.019	(0.127)	-0.246	(0.304)
Female peer group	0.234	(0.193)	0.043	(0.238)	0.409†	(0.211)	0.705*	(0.331)
N	3709		3620		3730		3653	
Young Males - instrumentation								
Male peer group	-0.123	(0.125)	0.184	(0.253)	0.623*	(0.293)	1.031	(0.836)
Female peer group	0.277	(0.198)	0.549	(0.504)	-0.565	(0.519)	0.069	(1.099)
N	3119		3033		3125		3075	
Young Females - lagged value								
Male peer group	0.224†	(0.124)	0.118*	(0.047)	0.101	(0.087)	0.240	(0.146)
Female peer group	0.583**	(0.165)	0.343*	(0.143)	0.494**	(0.174)	0.090	(0.223)
N	3788		3731		3806		3755	
Young Females - instrumentation								
Male peer group	0.050	(0.110)	0.333*	(0.139)	0.143	(0.218)	0.038	(0.426)
Female peer group	0.300†	(0.173)	-0.238	(0.277)	0.473	(0.392)	0.011	(0.614)
N	3222		3162		3232		3214	

Significance levels : $\dagger$: 10% $*$: 5% $**$: 1%

Other variables:

Adolescent: Female, Age, Age^2, Recent mover, White (Ref.), Black, Hispanic, Asian, Other origin, One parent, Weekly earnings (100$);

Parent: Female, Age, Born in USA, Public assistance, Education (8 dummies), Work outside home, Full-time work, Unemployed, PTA member, Income (100$), No money problems, Alcohol consumption, tobacco participation;

School: Private, Urban area, Suburban area (Ref.), Rural area, Small-sized, Medium-sized, Big-sized (Ref.), West, Mid-West, South (Ref.), North-East.

Table 4: Probit participation equations with students one school year higher as reference group

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**
All sample - lagged value								
Male peer group	0.295**	(0.109)	0.368**	(0.089)	0.631**	(0.101)	0.529**	(0.185)
Female peer group	0.327**	(0.116)	0.274**	(0.097)	0.348**	(0.105)	0.504**	(0.175)
N	7497		7351		7536		7408	
All sample - instrumentation								
Male peer group	0.354†	(0.207)	1.073**	(0.257)	1.158**	(0.236)	0.679	(0.503)
Female peer group	-0.077	(0.197)	0.064	(0.261)	-0.198	(0.253)	-0.288	(0.451)
N	6341		6213		6375		6294	
Young Males - lagged value								
Male peer group	0.144	(0.159)	0.387**	(0.129)	0.626**	(0.144)	0.250	(0.257)
Female peer group	0.161	(0.165)	0.363**	(0.138)	0.360*	(0.147)	0.433†	(0.240)
N	3709		3620		3730		3653	
Young Males - instrumentation								
Male peer group	0.088	(0.297)	1.238**	(0.367)	1.531**	(0.345)	0.944	(0.684)
Female peer group	-0.149	(0.272)	-0.010	(0.372)	-0.566	(0.360)	-0.314	(0.624)
N	3119		3043		3135		3079	
Young Females - lagged value								
Male peer group	0.434**	(0.154)	0.368**	(0.125)	0.622**	(0.143)	0.793**	(0.272)
Female peer group	0.506**	(0.167)	0.201	(0.136)	0.367*	(0.153)	0.583*	(0.261)
N	3788		3731		3806		3755	
Young Females - instrumentation								
Male peer group	0.615*	(0.294)	1.068**	(0.365)	0.995**	(0.337)	0.165	(0.775)
Female peer group	-0.049	(0.291)	0.020	(0.373)	0.034	(0.364)	-0.403	(0.666)
N	3222		3170		3240		3215	

Significance levels : $\dagger$: 10% $*$: 5% $**$: 1%

Other variables:

Adolescent: Female, Age, Age^2, Recent mover, White (Ref.), Black, Hispanic, Asian, Other origin, One parent, Weekly earnings (100$);

Parent: Female, Age, Born in USA, Public assistance, Education (8 dummies), Work outside home, Full-time work, Unemployed, PTA member, Income (100$), No money problems, Alcohol consumption, tobacco participation;

School: Private, Urban area, Suburban area (Ref.), Rural area, Small-sized, Medium-sized, Big-sized (Ref.), West, Mid-West, South (Ref.), North-East.

Table 5: Tobit consumption equations with friends as reference group

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**
All sample - lagged value								
Male peer group	0.588**	(0.053)	0.208**	(0.038)	0.246**	(0.051)	0.294**	(0.067)
Female peer group	0.677**	(0.073)	0.115*	(0.057)	0.331**	(0.078)	0.874**	(0.191)
N	3104		3021		3108		3071	
All sample - instrumentation								
Male peer group	0.777**	(0.092)	0.094	(0.117)	0.249	(0.171)	0.251†	(0.148)
Female peer group	0.571**	(0.109)	0.078	(0.197)	0.604†	(0.328)	1.310**	(0.487)
N	2803		2736		2809		2781	
Young Males - lagged value								
Male peer group	0.728**	(0.079)	0.306**	(0.058)	0.356**	(0.077)	0.301**	(0.091)
Female peer group	0.574**	(0.123)	-0.004	(0.151)	0.440*	(0.193)	1.041**	(0.310)
N	1532		1482		1536		1514	
Young Males - instrumentation								
Male peer group	0.966**	(0.125)	0.159	(0.179)	0.343	(0.234)	0.312†	(0.186)
Female peer group	0.513*	(0.212)	-0.155	(0.387)	0.592	(0.577)	1.595*	(0.721)
N	1411		1370		1415		1394	
Young Females - lagged value								
Male peer group	0.438**	(0.071)	0.085†	(0.046)	0.082	(0.065)	0.275**	(0.090)
Female peer group	0.720**	(0.083)	0.143**	(0.049)	0.245**	(0.069)	0.622**	(0.151)
N	1572		1539		1572		1557	
Young Females - instrumentation								
Male peer group	0.531**	(0.145)	0.065	(0.151)	0.147	(0.263)	-0.763	(0.689)
Female peer group	0.573**	(0.117)	0.126	(0.192)	0.352	(0.359)	1.095*	(0.557)
N	1392		1366		1394		1387	

Significance levels : † : 10% * : 5% ** : 1%

We include the number of male friends and the number of female friends as control variables:

The number of female friends is negative and significant (5%) for all tobacco consumption (instrumented);

The number of female friends is negative and significant (5%) for male marijuana consumption (lagged);

The number of female friends is negative and significant (10%) for male marijuana consumption (instrumented);

The number of male friends is negative and significant (1%) for female tobacco consumption (lagged);

The number of female friends is negative and significant (5%) for female tobacco consumption (instrumented);

The number of female friends is positive and significant (10%) for female alcohol consumption (lagged);

The number of female friends is positive and significant (5%) for female drunkenness (lagged);

The number of male friends is negative and significant (5%) for female drunkenness (instrumented).

Other variables:

Adolescent: Female, Age, Age^2, Recent mover, White (Ref.), Black, Hispanic, Asian, Other origin, One parent, Weekly earnings (100$);

Parent: Female, Age, Born in USA, Public assistance, Education (8 dummies), Work outside home, Full-time work, Unemployed, PTA member, Income (100$), No money problems, Alcohol consumption, tobacco participation;

School: Private, Urban area, Suburban area (Ref.), Rural area, Small-sized, Medium-sized, Big-sized (Ref.), West, Mid-West, South (Ref.), North-East.

Table 6: Probit participation equations with friends as reference group

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**
All sample - lagged value								
Male peer group	0.629**	(0.071)	0.405**	(0.062)	0.585**	(0.069)	0.708**	(0.091)
Female peer group	0.677**	(0.072)	0.342**	(0.061)	0.505**	(0.071)	0.609**	(0.109)
N	3104		3021		3108		3071	
All sample - instrumentation								
Male peer group	0.695**	(0.152)	0.042	(0.138)	0.369*	(0.165)	0.849*	(0.334)
Female peer group	0.427**	(0.147)	-0.007	(0.129)	0.155	(0.186)	1.173**	(0.331)
N	2803		2736		2809		2781	
Young Males - lagged value								
Male peer group	0.716**	(0.094)	0.468**	(0.087)	0.647**	(0.095)	0.851**	(0.122)
Female peer group	0.433**	(0.109)	0.185†	(0.096)	0.325**	(0.109)	0.579**	(0.162)
N	1532		1482		1536		1514	
Young Males - instrumentation								
Male peer group	0.985**	(0.195)	0.189	(0.177)	0.479*	(0.208)	1.566**	(0.428)
Female peer group	0.287	(0.226)	0.039	(0.206)	0.262	(0.293)	1.004*	(0.476)
N	1411		1370		1415		1394	
Young Females - lagged value								
Male peer group	0.587**	(0.113)	0.388**	(0.094)	0.559**	(0.107)	0.556**	(0.152)
Female peer group	0.875**	(0.100)	0.459**	(0.081)	0.646**	(0.097)	0.710**	(0.156)
N	1572		1539		1572		1557	
Young Females - instrumentation								
Male peer group	0.268	(0.270)	0.106	(0.238)	0.282	(0.297)	-0.471	(0.616)
Female peer group	0.480*	(0.205)	-0.152	(0.175)	-0.063	(0.258)	1.437**	(0.490)
N	1392		1366		1394		1387	

Significance levels : † : 10% * : 5% ** : 1%

We include the number of male friends and the number of female friends as control variables:

The number of female friends is negative and significant (10%) for all tobacco participation (instrumented);

The number of female friends is negative and significant (5%) for all marijuana participation (instrumented);

The number of male friends is positive and significant (10%) for male alcohol participation (instrumented);

The number of female friends is negative and significant (5%) for male marijuana participation (lagged);

The number of female friends is negative and significant (10%) for male marijuana participation (instrumented);

The number of male friends is negative and significant (10%) for female tobacco participation (lagged);

The number of female friends is negative and significant (10%) for female tobacco participation (instrumented);

The number of male friends is negative and significant (10%) for female alcohol participation (lagged).

The number of male friends is negative and significant (10%) for female drunkenness participation (instrumented).

Other variables:

Adolescent: Female, Age, Age^2, Recent mover, White (Ref.), Black, Hispanic, Asian, Other origin, One parent, Weekly earnings (100$);

Parent: Female, Age, Born in USA, Public assistance, Education (8 dummies), Work outside home, Full-time work, Unemployed, PTA member, Income (100$), No money problems, Alcohol consumption, tobacco participation;

School: Private, Urban area, Suburban area (Ref.), Rural area, Small-sized, Medium-sized, Big-sized (Ref.), West, Mid-West, South (Ref.), North-East.

Table 7: Probit transition equations with students with same school year as reference group, participation rate

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**	**Coef.**	**(Sd. Er.)**
All sample - lagged value								
Male peer group	0.469**	(0.163)	0.579**	(0.149)	0.717**	(0.164)	0.558*	(0.236)
Female peer group	0.254	(0.157)	0.043	(0.152)	0.295†	(0.161)	0.173	(0.264)
N	6407		4636		6254		7295	
All sample - instrumentation								
Male peer group	0.190	(0.323)	0.929*	(0.429)	1.038**	(0.374)	1.393†	(0.785)
Female peer group	0.741**	(0.276)	0.546	(0.420)	0.401	(0.401)	0.299	(0.642)
N	5984		4361		5844		6753	
Young Males - lagged value								
Male peer group	0.653**	(0.228)	0.555**	(0.215)	0.910**	(0.232)	0.808*	(0.324)
Female peer group	-0.079	(0.227)	0.144	(0.219)	0.405†	(0.227)	-0.553	(0.384)
N	3140		2256		3015		3515	
Young Males - instrumentation								
Male peer group	-0.233	(0.449)	0.853	(0.621)	1.032*	(0.512)	2.117†	(1.097)
Female peer group	0.376	(0.405)	0.559	(0.628)	0.290	(0.587)	-2.134*	(0.987)
N	2923		2124		2817		3253	
Young Females - lagged value								
Male peer group	0.279	(0.240)	0.607**	(0.210)	0.505*	(0.236)	0.296	(0.352)
Female peer group	0.569*	(0.226)	-0.036	(0.216)	0.209	(0.236)	0.802*	(0.371)
N	3267		2380		3239		3780	
Young Females - instrumentation								
Male peer group	0.557	(0.481)	1.141†	(0.602)	0.980†	(0.558)	0.757	(1.162)
Female peer group	0.995**	(0.384)	0.533	(0.575)	0.460	(0.582)	1.538†	(0.867)
N	3061		2237		3027		3500	

Significance levels : † : 10% * : 5% ** : 1%

Other variables:

Adolescent: Female, Age, Age^2, Recent mover, White (Ref.), Black, Hispanic, Asian, Other origin, One parent, Weekly earnings (100$);

Parent: Female, Age, Born in USA, Public assistance, Education (8 dummies), Work outside home, Full-time work, Unemployed, PTA member, Income (100$), No money problems, Alcohol consumption, tobacco participation;

School: Private, Urban area, Suburban area (Ref.), Rural area, Small-sized, Medium-sized, Big-sized (Ref.), West, Mid-West, South (Ref.), North-East.

Table 8: Marginal effects from Table 2's Probit participation equations with same school year as reference group, participation rate

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**dF/dx**	**(Sd. Er.)**	**dF/dx**	**(Sd. Er.)**	**dF/dx**	**(Sd. Er.)**	**dF/dx**	**(Sd. Er.)**
All sample - lagged value								
Male peer group	0.205**	(0.043)	0.316**	(0.040)	0.268**	(0.041)	0.166**	(0.043)
Female peer group	0.131**	(0.041)	0.122**	(0.041)	0.214**	(0.040)	0.153**	(0.047)
N	8399		8153		8511		8347	
All sample - instrumentation								
Male peer group	0.102	(0.082)	0.452**	(0.114)	0.419**	(0.092)	0.359**	(0.139)
Female peer group	0.283**	(0.071)	0.252*	(0.113)	0.250*	(0.101)	0.209†	(0.112)
N	7646		7447		7738		7618	
Young Males - lagged value								
Male peer group	0.279**	(0.061)	0.394**	(0.057)	0.358**	(0.059)	0.216**	(0.064)
Female peer group	-0.0006	(0.059)	0.054	(0.059)	0.206**	(0.058)	0.077	(0.074)
N	4124		3969		4187		4078	
Young Males - instrumentation								
Male peer group	0.053	(0.117)	0.489**	(0.164)	0.486**	(0.130)	0.545**	(0.204)
Female peer group	0.159	(0.108)	0.231	(0.164)	0.185	(0.148)	-0.051	(0.175)
N	3734		3620		3786		3710	
Young Females - lagged value								
Male peer group	0.133*	(0.060)	0.244**	(0.056)	0.184**	(0.057)	0.113†	(0.058)
Female peer group	0.247**	(0.058)	0.183**	(0.059)	0.221**	(0.057)	0.199**	(0.060)
N	4275		4184		4324		4269	
Young Females - instrumentation								
Male peer group	0.140	(0.117)	0.416**	(0.161)	0.352**	(0.132)	0.165	(0.191)
Female peer group	0.374**	(0.096)	0.267†	(0.157)	0.284*	(0.139)	0.366*	(0.143)
N	3912		3827		3952		3908	

Significance levels : †=10%; ∗=5%; ∗∗=1%

Note: Significant level are come from the test of underlying coefficient.

Other variables:

Adolescent: Female, Age, Age^2, Recent mover, White (Ref.), Black, Hispanic, Asian, Other origin, One parent, Weekly earnings (100$);

Parent: Female, Age, Born in USA, Public assistance, Education (8 dummies), Work outside home, Full-time work, Unemployed, PTA member, Income (100$), No money problems, Alcohol consumption, tobacco participation;

School: Private, Urban area, Suburban area (Ref.), Rural area, Small-sized, Medium-sized, Big-sized (Ref.), West, Mid-West, South (Ref.), North-East.