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

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Abstract

Institutional information does not seem to prevent drug experimentation. We use Add Health panel data (1994-1996) to examine risky behaviour by adolescents (the consumption of tobacco, alcohol and marijuana). We find that such behaviours are correlated with the (lagged) behaviour of three peer groups: others in the same school year; others one school year higher than the individual in the same school; and the individual's friends. Peer group effects are strongest within sexes. However girls do also follow boys, while boys are only little affected by their female peers. We also find evidence of non-linearities in peer group effects.

JEL Classification Codes: C23, D12, Z13.
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1 Introduction

Recent survey results on adolescent drug consumption are impressive. US figures show that in 2002 half of 12th-graders had tried cannabis in their life, 57% had tried cigarettes, and more than 75% had tried alcohol (Monitoring the Future Study, www.drugabuse.gov).[1] In this context, the efficacy of public policies such as safety campaigns and police intervention in schools can be questioned with regard to 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 whether such risky behaviour results 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 paper's 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 peer group influence in the consumption of cannabis, alcohol and tobacco. The Add Health data is panel, which allows us to avoid some of the endogeneity problems that have dogged the empirical literature. We consider three peer groups: those in the same school year; those in the school year immediately above; and friends. As such we are able to identify both the behaviour which is most influencable, and the most pertinent peer group.

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 preferences 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

[1] Figures for other Western countries are similar

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).

Empirical evidence of concern about one's own position relative to others has been uncovered using both econometric (Clark and Oswald, 1996; Clark, 2003) and experimental (Zizzo and Oswald, 2001; Fehr and Schmidt, 2003) methods. A related literature has considered learning from others' behaviour under uncertainty (see Kuhn and Gu, 1999, with respect to strikes, and Clark and Étilé, 2002, with respect to smoking).

The empirical implementation of social interaction models 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 (students in the same school year within the school) that is at least partly exogenous, and by using lagged values of others' consumption behaviour.

A standard empirical equation describing social interactions is:

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

Here Y_i^t is the behaviour of individual i at period t; X_i^t are the other individual characteristics of i and of her 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. In this paper, we use lagged values of reference group behaviour, so that $\overline{Y}_j = \overline{Y}_j^{t-1}$: adolescents' behaviour at t is correlated with average reference group behaviour one year earlier.[2]

We model both the consumption level of and participation in tobacco, alcohol, cannabis and frequency of drunkenness by adolescents. Reference group participation rates are, *a priori*, better observed than the level of consumption by adolescents. As such, we expect the probit participa-

[2]We can also instrument the current value of peer group consumption to avoid measurement errors. This yields qualitatively similar results.

tion equation version of (1) to yield sharper results that its consumption analogue.

Our approach has some similarities to 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 analyse three reference groups: other adolescents in the same school year; adolescents in the same school who are one school year higher; and the individual's friends (if they are interviewed). We estimate both Tobit consumption and Probit participation equations for each reference group.[3] Last, in the optic of unobserved individual heterogeneity, we also look at the transition from non-participation to participation for the sub-sample who do not consume at time $t-1$.[4]

3 Data

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 covers health and related behaviours of adolescents who are in school. It was carried out in three parts.

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 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.[5]

[3]The summary figures for these behaviours in our data are presented in table 1.

[4]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.

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

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 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 Social Interaction Regression Results

Table 2 presents the full results for one of our estimations: the influence of lagged same school year participation on the individual's own participation. The key interaction variables appear in the first two rows, and show that peer group and own participation are significantly correlated for all four of the behaviours examined.

Tables 3 and 4 summarise all of our interaction results for participation and consumption respectively. Each of these tables presents results with respect to four types of behaviour: smoking, drinking, drunkenness and smoking marijuana. The Tobit consumption equations use lagged average peer group consumption as an explanatory variable, while the Probit participation equations control for the lagged peer group participation rate. 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 these lagged values partly alleviates the identification problem. For ease of presentation, only the estimated coefficients on the peer group effects, split by sex, are presented: the other explanatory variables are the same as in Table 2, and are listed at the foot of each table[6].

There are three main results. The first is that Probit estimations yield more significant coefficients than do the Tobit consumption equations. The adolescent "econometrician" probably has more accurate information regarding peer group members' participation than their consumption. This is less obvious for friends, which is the group that individuals can observe the most easily. The second is that there are slightly more significant coefficients when friends are considered as the reference group (bottom panel of table 3); however, in terms of size of the estimated coefficients (and therefore the strength of the social interaction), there is little to choose between

[6]The results for these other control variables show that use of cigarettes, alcohol and marijuana is more widespread for adolescent males, whites, recent movers, and older schoolchildren. The participation rate is also 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.

the two. Third, in general, young females have more significant coefficients than young males (except for the influence of friends). One interpretation is that young females are more easily influenced with respect to the behaviours under consideration here.

Our first reference group consists of those who are in the same school year. The refers to students who are one school year higher than the respondent. It is worth noting that this second type of peer group potentially bypasses the endogeneity problem, as the consumption of older adolescents can be argued to be little affected by the behaviour of their younger colleagues. Our third peer group consists of the individual's friends.

We are interested in differences between adolescent males and females in the role of social influence on risky behaviour. In all of the estimations, we see that, depending on the behaviour under consideration, adolescents are influenced by other boys, other girls or by 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 tables show that the majority of own-sex peer group effects are significant. For example, consider alcohol consumption/participation when the reference group is the same school year (tables 4 and 3). This is significantly positively correlated with the lagged average alcohol consumption/participation rate, for young males by male peer group, and for young females by female peer group. Across all three peer and all four 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 males and young females.

A question of interest is then 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 3). Adolescent females' behaviour is significantly correlated at the one per cent level with that of adolescent males for eight of the twelve peer groups. However, there is somewhat less evidence that boys follow girls in this way: only two of the twelve female peer group variables are significant at the one per cent level in the regressions for adolescent males.

We note that the peer group effects from those who are one school year higher are not nec-

essarily the most significant (although one needs to be wary of comparing the size of estimated coefficients across equations) [7]. The results with respect to this reference group are of particular interest, however, as we can argue that this is the most exogeneous of the peer groups that we consider.

The individual's friends, on the other hand, are very endogeneous. We therefore expect the correlations here to be particularly strong, and this turns out to be the case. Contrary to the results from other peer groups, we do not observe any major differences between the Tobit and Probit estimations here. One explanation is that adolescents are better able to observe the average consumption of their friends than they are of observing the average consumption of all others in the same school year. The friends results in Tables 4 and 3 can be argued to be unsurprising as we choose friends who have the same characteristics or tastes as us. Last, we note that the estimated coefficients on friends' behaviour are not remarkably higher than those estimated for other, more exogenous, peer groups, whereas an endogeneity argument would have these former to be strongly biased upwards.[8]

5 Further Results and Extensions

In this section we present four extensions of our main result: that risky behaviours by American adolescents seem to be subject to strong peer group effects

5.1 Consumption and participation

It is possible that reference group average consumption and reference group participation do not reflect the same phenomena, and will not have the same effect on individual behaviour. Table 5 presents an empirical test of this hypothesis, whereby both peer group consumption

[7] The results are similar if we use students who are two school years higher than the respondent as the reference group, or if we use all students who are in a higher school year than the respondent.

[8] We also re-estimated our main equations including a school fixed effects. This led to mixed results. However, the identification of a peer group effect requires substantial variation of the peer group term within the school, otherwise the school fixed effect becomes collinear with peer group behaviour. This variation is obviously limited when we use the same school year as the peer group. There is far more variation when friends are considered as the peer group, and it is in fact in this case that the estimated interactions are the strongest even when school fixed effects are introduced. As an alternative to fixed effects, we can specify errors which are correlated within schools: this in no way changed the qualitative results.

and participation are introduced into participation equation.[9]. The reference group here is same school year. The results are unambiguous, and confirm our earlier reading of Tables 3 and 4: in a head-to-head fight, peer group participation is a far more important determinant of individual behaviour than is peer group average consumption. This latter is only rarely significant when the peer group participation rate is controlled for. Again, we believe that this may well reflect the accuracy of the information which is available to adolescents concerning their peer group's behaviour.

5.2 Transitions from abstinence to consumption

The first of these extensions concerns the transition to consumption. In the light of the criticisms that can always be applied to what are essentially cross-section regressions (although with a lagged explanatory variable), it is of interest to appeal directly to the panel aspect of the Add Health data, and examine changes in consumption status. In table 6, we select (without treatment of selection bias) those who did not consume at time $t-1$ (In-Home I). One can argue that adolescents who do not consume are less easily influenced than others. In this sense, the bias in the estimation of peer group effects would be downwards. The results show that, over the whole sample, the behaviour of males in the peer group is the most important in determining transitions. Specifically, there is no evidence of cross-sex peer group influence in the transition to consumption, and the own-sex peer group effect is far stronger for males than for females.

5.3 Threshold effects

The empirical literature on social interactions has mostly retained a linear specification for peer group behaviour. Table 7 suggests that this simple specification may be misleading. We divide reference group participation up into four categories: 0-25%; 25-50%; 50-75%; and 75-100%. The modal category is either 0-25% or 25-50%, depending on the behaviour considered, and there are relatively few observations in the top category (see Appendix Table 1). Table 7 presents the results from probit participation equations, as in Table 3, with peer group participation now measured by three dummy variables (the omitted category is 0-25%).

[9]The qualitative results are identical in the consumption equation

The estimated coefficients on the peer group participation dummies reveal some significant non-linearities. This is perhaps best seen by comparing the coefficient on the 25-50% dummy with its counterpart for the 50-75% group. If the social interaction effect is linear, then we would expect the latter to be two-thirds larger than the former (compare the midpoints: 62.5/37.5=1.67). While this restriction holds (statistically) for adolescent females (for the female peer group), this is not the case for adolescent males. The estimated coefficient on the 50-75% male peer group dummy is twice as large as that on the 25-50% dummy in the case of smoking participation; for drinking participation the ratio is three to one. This suggest substantial convexities in the interactions between adolescent males.

5.4 Who's under the influence?

In the last extension we seek to identify certain demographic groups which are more influencable than others. Our results above have already hinted that adolescent females may be more reactive to peer group behaviour than adolescent males.

As our sample is homogeneous in terms of many demographic characteristics (apart from sex), the two results we report here refer to parents' characteristics (obtained from interviews with the parents, rather than reported by the adolescents themselves). Our first hypothesis is that the children of smokers may be less receptive to the behaviour of others at school. This turns out to be the case, especially for adolescent males, whose smoking participation is statistically independent of the participation rate of others in the same school year. A second test concerned parents' income. Here we split the sample in two based on parents' total income in 1994; the median value is around $38 000. Here we find that the children of richer parents are more susceptible to peer group behaviour in terms of cigarette smoking, although no differences appear with respect to the other behaviours. We believe that the identification of demographic groups which are more reactive to social pressure is an important subject for future research.

6 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 evaluate correlations with three 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. We also identify peer group effects in transition probits for moving from abstinence to consumption. 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 young males are (statistically) indifferent to young females (except for drunkenness).

Comparing marginal effects across regressions allows us to identify the behaviours for which peer group effects are the largest, and which peer group exerts the most influence. We find that alcohol participation is the most influenced by the reference group, and that those in the same school year within the same school are the most salient peer group (except for smoking participation).

Further results suggest that others' participation is a far stronger predictor of individual behaviour than others' consumption, and that some demographic groups are more influencable than others (the children of non-smokers, and, to some extent, children from richer households). Last, we present some evidence of non-linearities in peer group influence, whereby a peer group with 50% of smokers may have more than twice the influence of a peer group with 25% of smokers.

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. The dynamics of consumption behaviour, especially with respect to risky behaviours by the young, would seem to be an important topic for further research.

Appendix Table

Table 1. Distribution of Peer Group participation rates. Wave 1.

Participation rate	Tobacco	Alcohol	Drunkenness	Marijuana
Male peer group				
[0-25%]	55.52	25.67	29.42	80.19
]25-50%]	37.91	42.96	40.95	19.11
]50-75%]	6.24	26.66	25.75	0.66
]75-100%]	0.33	4.71	3.88	0.04
N	19536	19582	19295	19468
Female peer group				
[0-25%]	57.84	22.33	25.30	88.52
]25-50%]	34.15	46.93	46.56	10.99
]50-75%]	7.72	27.29	24.94	0.45
]75-100%]	0.29	3.45	3.20	0.04
N	19494	19530	19196	19477

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Tables

Table 1: Consumption and participation in the Add Health "In-Home" waves

	"In-Home I"			"In-Home II"		
	Mean	**Std. Dev.**	**N**	**Mean**	**Std. Dev.**	**N**
PARTICIPATION (%)						
Tobacco during the last 30 days						
All	26.06	0.439	20038	31.95	0.466	14542
Young Males	26.65	0.442	9902	32.71	0.469	7070
Young Females	25.49	0.435	10136	31.23	0.463	7472
Alcohol during the last 365 days						
All	40.99	0.491	20124	36.62	0.481	14593
Young Males	40.94	0.491	9949	36.50	0.481	7086
Young Females	41.04	0.491	10175	36.73	0.482	7507
Drunkenness during the last 365 days						
All	39.05	0.487	19482	35.74	0.479	14392
Young Males	39.09	0.487	9646	35.59	0.478	6985
Young Females	39.01	0.487	9836	35.88	0.479	7407
Marijuana during the last 30 days						
All	14.39	0.351	19949	16.04	0.367	14374
Young Males	16.34	0.369	9831	17.84	0.383	6955
Young Females	12.49	0.330	10118	14.35	0.350	7419
CONSUMPTION						
Tobacco during the last 30 days						
All	40.13	128.5	19981	50.86	146.3	14506
Young Males	45.15	141.4	9868	55.30	157.6	7045
Young Females	35.23	114.5	10113	46.67	134.7	7462
Alcohol during the last 365 days						
All	96.72	381.4	19678	103.1	386.7	14206
Young Males	129.3	467.6	9670	136.3	452.3	6865
Young Females	65.20	269.7	10008	72.09	309.9	7341
Drunkenness during the last 365 days						
ll	9.874	38.99	20087	11.79	43.92	14563
Young Males	13.08	46.15	9924	15.51	50.71	7070
Young Females	6.739	30.07	10163	8.289	36.02	7493
Marijuana during the last 30 days						
All	1.612	8.988	19938	1.850	9.379	14372
Young Males	2.218	11.47	9820	2.577	12.12	6953
Young Females	1.024	5.553	10118	1.168	5.632	7419

Table 2: Probit participation equation with reference group (same school year) participation rate, full estimation

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**
ADOLESCENT								
Male peer group	0.540**	(0.120)	0.696**	(0.105)	0.747**	(0.104)	0.809**	(0.178)
Female peer group	0.451**	(0.125)	0.353**	(0.114)	0.322**	(0.110)	0.655**	(0.188)
Female	-0.003	(0.036)	0.050†	(0.030)	0.050†	(0.029)	-0.128**	(0.044)
Age	0.465**	(0.170)	0.473**	(0.155)	0.541**	(0.161)	0.606**	(0.199)
Age^2	-0.014**	(0.005)	-0.013**	(0.005)	-0.015**	(0.005)	-0.019**	(0.006)
Recent mover	0.109*	(0.045)	0.034	(0.039)	0.039	(0.039)	0.041	(0.045)
White	*Reference*							
Black	-0.650**	(0.053)	-0.388**	(0.043)	-0.433**	(0.049)	-0.103*	(0.047)
Hispanic	-0.048	(0.076)	-0.042	(0.063)	-0.038	(0.069)	0.274**	(0.094)
Asian	-0.177*	(0.078)	-0.418**	(0.072)	-0.430**	(0.074)	-0.182†	(0.101)
Native	0.093	(0.126)	-0.031	(0.134)	-0.065	(0.147)	-0.215	(0.176)
Other origin	-0.091	(0.056)	-0.028	(0.053)	-0.035	(0.055)	0.138*	(0.063)
One parent	0.054	(0.043)	0.040	(0.032)	0.069*	(0.033)	0.129**	(0.034)
Weekly earnings (100$)	11.371**	(1.883)	8.194**	(1.982)	8.022**	(2.036)	10.990**	(1.929)
PARENT								
Age	0.000	(0.002)	0.004†	(0.002)	0.004*	(0.002)	0.003	(0.003)
Born in USA	0.186**	(0.070)	0.051	(0.052)	0.050	(0.055)	0.347**	(0.070)
Public assistance	0.103	(0.065)	-0.094	(0.060)	-0.108	(0.066)	0.083	(0.058)
Work outside home	0.040	(0.046)	0.084†	(0.046)	0.081†	(0.048)	0.069	(0.063)
Unemployed	0.140†	(0.083)	0.139*	(0.067)	0.113	(0.074)	0.148	(0.098)
Full-time work	0.087†	(0.049)	0.008	(0.041)	0.006	(0.043)	0.047	(0.048)
PTA member	-0.060	(0.039)	0.043	(0.030)	0.053†	(0.031)	-0.016	(0.037)
Income (10$)	-0.017	(0.044)	0.051*	(0.024)	0.061*	(0.025)	0.019	(0.032)
No money problems	-0.101*	(0.040)	0.032	(0.043)	0.030	(0.047)	0.034	(0.055)
Alcohol consumption	0.000	(0.000)	0.001**	(0.000)	0.001**	(0.000)	0.001†	(0.000)
Tobacco participation	0.172**	(0.042)	0.100**	(0.032)	0.121**	(0.033)	0.156**	(0.035)
SCHOOL								
Private	-0.101	(0.078)	-0.008	(0.087)	0.001	(0.087)	-0.031	(0.075)
Rural area	0.040	(0.045)	-0.067	(0.048)	-0.073	(0.046)	-0.049	(0.042)
Suburban area	*Reference*							
Urban area	-0.083†	(0.045)	0.003	(0.042)	0.001	(0.041)	-0.081†	(0.046)
Small	0.023	(0.066)	-0.014	(0.065)	-0.028	(0.064)	-0.049	(0.058)
Medium	0.037	(0.041)	0.070†	(0.039)	0.057	(0.038)	-0.065	(0.040)
Large	*Reference*							
West	-0.079†	(0.046)	0.035	(0.052)	0.036	(0.055)	0.265**	(0.046)
Mid-West	0.051	(0.047)	0.097*	(0.045)	0.087†	(0.045)	0.129*	(0.051)
South	*Reference*							
North-East	0.063	(0.059)	0.154**	(0.059)	0.163**	(0.058)	0.245**	(0.057)
Constant	-4.870**	(1.377)	-5.441**	(1.284)	-6.100**	(1.325)	-6.839**	(1.592)
N	8562		8645		8280		8465	
LL	-4998.78		-5364.299		-5061.122		-3471.157	
$\chi^2_{(32)}$	1208.193		900.457		939.281		501.185	

Standard errors adjusted for clustering on school.

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

Table 3: Probit participation equation with reference group participation rate

Variable	Tobacco Coef.	Tobacco (S.E.)	Alcohol Coef.	Alcohol (S.E.)	Drunkenness Coef.	Drunkenness (S.E.)	Marijuana Coef.	Marijuana (S.E.)
REFERENCE GROUP: THE SAME SCHOOL YEAR								
All sample								
Male peer group	0.540**	(0.120)	0.695**	(0.104)	0.747**	(0.104)	0.808**	(0.178)
Female peer group	0.450**	(0.124)	0.353**	(0.114)	0.321**	(0.109)	0.654**	(0.188)
N	8562		8645		8280		8465	
Young males								
Male peer group	0.733**	(0.161)	0.830**	(0.144)	0.933**	(0.141)	0.976**	(0.244)
Female peer group	0.099	(0.168)	0.250	(0.156)	0.155	(0.156)	0.236	(0.314)
N	4223		4268		4086		4152	
Young females								
Male peer group	0.351†	(0.185)	0.579**	(0.144)	0.581**	(0.149)	0.613†	(0.324)
Female peer group	0.767**	(0.165)	0.448**	(0.153)	0.477**	(0.151)	1.026**	(0.304)
N	4339		4377		4194		4313	
REFERENCE GROUP: ONE SCHOOL YEAR HIGHER								
All sample								
Male peer group	0.207	(0.146)	0.409**	(0.101)	0.445**	(0.106)	0.596**	(0.205)
Female peer group	0.360*	(0.146)	0.349**	(0.117)	0.329**	(0.114)	0.462*	(0.181)
N	7625		7647		7522		7508	
Young males								
Male peer group	0.021	(0.151)	0.372*	(0.156)	0.409*	(0.162)	0.282	(0.288)
Female peer group	0.289†	(0.166)	0.273†	(0.156)	0.298†	(0.167)	0.389	(0.254)
N	3788		3797		3729		3715	
Young females								
Male peer group	0.393†	(0.227)	0.448**	(0.112)	0.479**	(0.118)	0.913**	(0.309)
Female peer group	0.443*	(0.221)	0.433**	(0.135)	0.375**	(0.131)	0.541†	(0.280)
N	3837		3850		3793		3793	
REFERENCE GROUP: FRIENDS								
All sample								
Male peer group	0.590**	(0.064)	0.376**	(0.056)	0.418**	(0.059)	0.662**	(0.086)
Female peer group	0.634**	(0.067)	0.344**	(0.056)	0.357**	(0.059)	0.596**	(0.125)
N	3222		3219		3171		3176	
Young males								
Male peer group	0.678**	(0.095)	0.470**	(0.080)	0.540**	(0.083)	0.830**	(0.111)
Female peer group	0.404**	(0.102)	0.191†	(0.098)	0.205†	(0.109)	0.523**	(0.158)
N	1590		1589		1563		1565	
Young females								
Male peer group	0.479**	(0.071)	0.299**	(0.086)	0.314**	(0.085)	0.456†	(0.239)
Female peer group	0.845**	(0.106)	0.481**	(0.061)	0.474**	(0.062)	0.703**	(0.165)
N	1632		1630		1608		1611	

Standard errors adjusted for clustering on school.

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

Other variables: Adolescent: Female, Age, Age^2, Recent mover, White (Ref.), Black, Hispanic, Asian, Native, Other origin, One parent, Weekly earnings (100$); **Parent**: Age, Born in USA, Public assistance, Work outside home, Full-time work, Unemployed, PTA member, Income (10$), No money problems, Alcohol consumption, Tobacco participation; **School**:Private, Urban area, Suburban area (Ref.), Rural area, Small, Medium, Large (Ref.), West, Mid-West, South (Ref.), North-East.

Table 4: Tobit consumption equation with reference group average consumption

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**
REFERENCE GROUP: THE SAME SCHOOL YEAR								
All sample								
Male peer group	0.425**	(0.117)	0.228**	(0.072)	0.277*	(0.118)	0.150	(0.141)
Female peer group	0.505**	(0.137)	0.149	(0.119)	0.264	(0.188)	0.910**	(0.305)
N	8517		8258		8626		8462	
Young males								
Male peer group	0.526**	(0.177)	0.438**	(0.123)	0.403*	(0.187)	0.337	(0.231)
Female peer group	0.376†	(0.216)	-0.017	(0.218)	0.141	(0.296)	1.118*	(0.490)
N	4195		4032		4256		4148	
Young females								
Male peer group	0.300*	(0.153)	0.043	(0.078)	0.153	(0.141)	-0.032	(0.149)
Female peer group	0.607**	(0.172)	0.256*	(0.119)	0.391†	(0.222)	0.591†	(0.328)
N	4322		4226		4370		4314	
REFERENCE GROUP: ONE SCHOOL YEAR HIGHER								
All sample								
Male peer group	0.116	(0.094)	0.097*	(0.045)	0.074	(0.088)	0.122	(0.172)
Female peer group	0.371**	(0.123)	0.188	(0.133)	0.466**	(0.154)	0.340†	(0.200)
N	7601		7445		7637		7509	
Young males								
Male peer group	-0.034	(0.146)	0.077	(0.079)	0.035	(0.149)	-0.243	(0.315)
Female peer group	0.312†	(0.188)	0.108	(0.234)	0.503*	(0.324)	0.582†	(0.316)
N	3771		3676		3791		3715	
Young females								
Male peer group	0.248*	(0.121)	0.116*	(0.046)	0.107	(0.099)	0.279†	(0.148)
Female peer group	0.453**	(0.161)	0.284*	(0.138)	0.473*	(0.192)	0.033	(0.212)
N	3830		3769		3846		3794	
REFERENCE GROUP: FRIENDS								
All sample								
Male peer group	0.561**	(0.052)	0.203**	(0.036)	0.291**	(0.059)	0.275**	(0.067)
Female peer group	0.653**	(0.069)	0.096†	(0.054)	0.363**	(0.089)	0.809**	(0.174)
N	3210		3126		3214		3176	
Young males								
Male peer group	0.687**	(0.077)	0.295**	(0.057)	0.425**	(0.090)	0.305**	(0.095)
Female peer group	0.590**	(0.117)	-0.016	(0.140)	0.490*	(0.224)	0.853**	(0.278)
N	1583		1532		1587		1565	
Young females								
Male peer group	0.385**	(0.068)	0.079†	(0.044)	0.097	(0.072)	0.256**	(0.084)
Female peer group	0.696**	(0.079)	0.126**	(0.046)	0.278**	(0.077)	0.625**	(0.136)
N	1627		1594		1627		1611	

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

Other variables: see table 3

Table 5: Probit participation equation with reference group (same school year) participation rate and average consumption (/100)

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**
ALL SAMPLE								
Participation rates								
Male peer group	0.565**	(0.140)	0.653**	(0.103)	0.779**	(0.109)	0.967**	(0.207)
Female peer group	0.382*	(0.158)	0.335*	(0.131)	0.342**	(0.118)	0.712**	(0.276)
Average consumption								
Male peer group	-0.021	(0.044)	0.018	(0.016)	-0.158	(0.165)	-0.985†	(0.581)
Female peer group	0.053	(0.058)	-0.001	(0.027)	-0.076	(0.232)	-0.828	(1.692)
N	8542		8461		8276		8461	
YOUNG MALES								
Participation rates								
Male peer group	0.806**	(0.183)	0.702**	(0.149)	0.977**	(0.145)	1.088**	(0.285)
Female peer group	0.033	(0.206)	0.234	(0.160)	0.209	(0.162)	-0.047	(0.420)
Average consumption								
Male peer group	-0.047	(0.058)	0.048*	(0.020)	-0.230	(0.210)	-0.820	(1.014)
Female peer group	0.068	(0.076)	0.002	(0.033)	-0.251	(0.292)	2.699	(2.385)
N	4212		4151		4083		4148	
YOUNG FEMALES								
Participation rates								
Male peer group	0.346	(0.225)	0.610**	(0.154)	0.596**	(0.161)	0.804*	(0.361)
Female peer group	0.694**	(0.214)	0.445*	(0.188)	0.467**	(0.164)	1.481**	(0.413)
Average consumption								
Male peer group	-0.006	(0.071)	-0.008	(0.022)	-0.051	(0.233)	-1.001	(0.729)
Female peer group	0.047	(0.083)	-0.007	(0.041)	0.054	(0.335)	-5.287*	(2.616)
N	4330		4310		4193		4313	

Standard errors adjusted for clustering on school.

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

Other variables: see table 3

Table 6: Probit transition participation equation with reference group (same school year) participation rate

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**
All sample								
Male peer group	0.540*	(0.159)	0.428**	(0.161)	0.507**	(0.159)	0.581*	(0.230)
Female peer group	0.450*	(0.135)	0.063	(0.144)	-0.001	(0.143)	0.172	(0.239)
N	6419		5270		5196		7401	
Young males								
Male peer group	0.676**	(0.207)	0.585**	(0.204)	0.715**	(0.197)	0.853**	(0.273)
Female peer group	-0.091	(0.198)	0.121	(0.216)	0.025	(0.232)	-0.588†	(0.350)
N	3153		2615		2574		4152	
Young females								
Male peer group	0.097	(0.246)	0.265	(0.241)	0.306	(0.249)	0.291	(0.400)
Female peer group	0.598**	(0.205)	0.022	(0.199)	-0.018	(0.202)	0.836*	(0.354)
N	3266		2655		2622		3802	

Standard errors adjusted for clustering on school.

Notes: Significance levels: †=10%; $*$=5%; $**$=1%

Other variables: see table 3

Table 7: Probit participation equation with reference group (same school year) threshold participation rate

	Tobacco		Alcohol		Drunkenness		Marijuana	
Variable	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**	**Coef.**	**(S.E.)**
All sample								
Male 0-25%				*Reference*				
Male 25-50%	0.074	(0.045)	0.066	(0.046)	0.077†	(0.044)	0.020	(0.070)
Male 50-75%	0.207**	(0.066)	0.241**	(0.056)	0.318**	(0.050)	0.443*	(0.194)
Male 75-100%	-0.182	(0.446)	0.371**	(0.094)	0.357**	(0.098)	*Dropped*	
Female 0-25%				*Reference*				
Female 25-50%	0.129**	(0.047)	0.148**	(0.050)	0.121**	(0.046)	0.045	(0.046)
Female 50-75%	0.244**	(0.076)	0.217**	(0.064)	0.176**	(0.065)	0.373**	(0.114)
Female 75-100%	0.301	(0.331)	0.345**	(0.115)	0.291**	(0.108)	*Dropped*	
N	8562		8645		8280		8464	
Young males								
Male 0-25%				*Reference*				
Male 25-50%	0.137*	(0.063)	0.099	(0.075)	0.198**	(0.064)	0.055	(0.096)
Male 50-75%	0.275**	(0.099)	0.285**	(0.082)	0.424**	(0.071)	0.426†	(0.256)
Male 75-100%	0.436	(0.633)	0.428**	(0.131)	0.535**	(0.132)	*Dropped*	
Female 0-25%				*Reference*				
Female 25-50%	0.021	(0.050)	0.066	(0.061)	0.049	(0.056)	0.149	(0.091)
Female 50-75%	0.083	(0.104)	0.127	(0.083)	0.088	(0.083)	-0.116	(0.208)
Female 75-100%	0.327	(0.261)	0.207	(0.167)	0.113	(0.156)	*Dropped*	
N	4223		4268		4086		4151	
Young females								
Male 0-25%				*Reference*				
Male 25-50%	0.017	(0.054)	0.035	(0.064)	-0.031	(0.060)	-0.026	(0.091)
Male 50-75%	0.136	(0.098)	0.204**	(0.078)	0.228**	(0.071)	0.419	(0.355)
Male 75-100%	-0.693**	(0.128)	0.351**	(0.124)	0.207†	(0.119)	*Dropped*	
Female 0-25%				*Reference*				
Female 25-50%	0.225**	(0.067)	0.220**	(0.077)	0.187*	(0.077)	-0.073	(0.116)
Female 50-75%	0.386**	(0.O94)	0.293**	(0.088)	0.256**	(0.094)	0.584**	(0.122)
Female 75-100%	*Dropped*		0.476**	(0.133)	0.474**	(0.129)	*Dropped*	
N	4335		4377		4194		4313	

Standard errors adjusted for clustering on school.

Notes: Significance levels: $\dagger$=10%; $*$=5%; $**$=1%

Other variables: see table 3