

Supplemental Material

Frequency of alcohol consumption across adolescence and binge drinking in young adulthood

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Table S1. Study variables and their derivations, Nicotine Dependence in Teens study (Canada)

Covariate	Data collected in cycle(s)	Item(s)	Response choices	Recorded
Mother university-educated	1-4	How much education has your mother had?	Did not finish high school, high school graduate, vocational or technical school, CEGEP, completed university, other, don't know	Mother university-educated (no, yes)
Single-parent family	1-4	This chart asks about the adults with whom you live. Check the box if you live with the person...If you live in more than one household (part time with your Mom and part time with your Dad), check ALL the boxes that apply (i) biologic mother, (ii) biologic father, (iii) step-mother, (iv) step-father, (v) aunt(s), (vi) uncle(s), (vii) grandmother(s), (viii) grandfather(s), (ix) other(s) (name them)	no, yes (for each person)	Living with only one biological parent (yes, no)
Parents' smoking	1	Parent questionnaire: At the present time, do you smoke cigarettes...?	daily, occasionally, not at all	Parent smoking (yes, no)
Language spoken at home	1-4	What language do you speak most often at home? Check one box.	English, French, English and French, Other (specify)	French (yes, no)
Depressive symptoms	1	During the past 3 months how often have you: (i) felt too tired to do things (ii) had trouble going to sleep or staying asleep (iii) felt unhappy, sad or depressed (iv) felt hopeless about the future (v) felt nervous or tense (vi) worried too much about things	never, rarely, sometimes, often	
Impulsivity	14	How true are each of the following statements for you: (i) I often do things without stopping to think, (ii) I am an impulsive person, (iii) I often talk quickly, before thinking	not at all true, a little true, somewhat true, pretty true, very true	

Novelty-seeking	14	<p>things out, (iv) I often get involved in things I later wish I could get out of, (v) I need to use a lot of self-control to keep out of trouble, (vi) I often get into trouble because I do things without thinking, (vii) I get carried away by new and exciting ideas, but I don't think of the possible problems</p> <p>Here are some things people may say about themselves. How true are each of the following statements for you: (i) I often try new things just for fun or thrills, even if most people think it is a waste of time, (ii) when nothing new is happening, I usually start looking for something that is exciting, (iii) I can usually get people to believe me, even when what I'm saying isn't quite true, (iv) I often do things based on how I feel at the moment, (v) I sometimes get so excited that I lose control of myself, (vi) I like it when people can do whatever they want, without strict rules and regulations, (vii) I often follow my instincts, without thinking through all the details, (viii) I can do a good job of "stretching the truth" when I'm talking to people, (ix) I change my interests a lot, because my attention often shifts to something else</p>	<p>not at all true, a little true, somewhat true, pretty true, very true</p>
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References:

- Deschesnes M. Life Style of Youth in Secondary Schools in Outaouais [in French]. Hull, Quebec, Canada: Public Health Directorate, Regional Directorate of Health and Social Services; 1997.
- Kandel DB, Davies M. Epidemiology of depressive mood in adolescents: an empirical study. *Archives of general psychiatry* 1982;39(10):1205-12.
- Eysenck SB, Eysenck HJ. The place of impulsiveness in a dimensional system of personality description. *British journal of clinical psychology* 1977;16(1):57-68.

Table S2. Patterns of missingness^a for selected covariates in regression models from cycles 1 to 4 in the Nicotine Dependence in Teens study (Canada)

a. Language spoken at home

Cycle 1	Cycle 2	Cycle 3	Cycle 4	Frequency
X	X	X	X	493
X	X	X		615
X	X		X	18
X	X			22
X		X	X	22
X		X		17
X			X	1
X				6
	X	X	X	7
	X	X		24
	X			2
		X		3
			X	1
				20

b. Parent(s) smoke

Cycle 1	Cycle 2	Cycle 3	Cycle 4	Frequency
X	X	X	X	476
X	X	X		594
X	X		X	25
X	X			29
X		X	X	23
X		X		20
X			X	2
X				7
	X	X	X	10
	X	X		27
	X			3
		X		5
			X	1
				29

c. Friend(s) smoke

Cycle 1	Cycle 2	Cycle 3	Cycle 4	Frequency
X	X	X	X	491
X	X	X		608
X	X		X	19
X	X			24
X		X	X	22
X		X		20
X			X	1
X				6
	X	X	X	8
	X	X		25
	X			3
		X		3
			X	1
				20

d. Single-parent family

Cycle 1	Cycle 2	Cycle 3	Cycle 4	Frequency
X	X	X	X	488
X	X	X		614
X	X		X	20
X	X			22
X		X	X	22
X		X		17
X			X	1
X				5
	X	X	X	10
	X	X		25
	X			2
		X		3
			X	1
				21

^a An empty cell means that the variable was not reported at that cycle

Table S3. Bayes factor and average class probabilities for group-based trajectory models

Model	Bayes Factor	Average Posterior Probabilities									
		Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Group 9	Group 10
2-group		0.96	0.97								
3-group	1954.27	0.91	0.91	0.95							
4-group	615.83	0.83	0.89	0.88	0.91						
5-group	578.74	0.85	0.87	0.85	0.89	0.88					
6-group	228.09	0.82	0.88	0.87	0.83	0.81	0.87				
7-group	161.39	0.81	0.82	0.85	0.83	0.77	0.76	0.86			
8-group	56.38	0.81	0.83	0.84	0.75	0.75	0.83	0.84	0.85		
9-group	127.57	0.77	0.86	0.80	0.76	0.84	0.80	0.73	0.81	0.85	
10-group	73.76	0.77	0.84	0.79	0.82	0.78	0.80	0.73	0.84	0.84	0.84

Table S4. ANOVA and chi-square post-hoc pairwise comparisons (Tukey and Holm procedures^a) of sample characteristics across adolescent alcohol use trajectory groups (N=1293) in the Nicotine Dependence in Teens study (Canada)

a. Sex (Male)

1	2	1 vs. 2	p-value
Late triers	Decreasers		1.00
Late triers	Late escalators		1.00
Late triers	Early slow escalators	1 > 2	0.00
Late triers	Steady drinkers		1.00
Late triers	Early rapid escalators	1 > 2	0.00
Late triers	Early frequent drinkers		0.61
Decreasers	Late escalators		0.13
Decreasers	Early slow escalators	1 > 2	0.00
Decreasers	Steady drinkers		0.09
Decreasers	Early rapid escalators	1 > 2	0.00
Decreasers	Early frequent drinkers	1 > 2	0.04
Late escalators	Early slow escalators		0.18
Late escalators	Steady drinkers		1.00
Late escalators	Early rapid escalators		0.05
Late escalators	Early frequent drinkers		1.00
Early slow escalators	Steady drinkers		0.11
Early slow escalators	Early rapid escalators		1.00
Early slow escalators	Early frequent drinkers		0.13
Steady drinkers	Early rapid escalators	1 > 2	0.02
Steady drinkers	Early frequent drinkers		1.00
Early rapid escalators	Early frequent drinkers	2 > 1	0.02

b. Age

1	2	1 vs. 2	p-value
Late triers	Decreasers		0.99
Late triers	Late escalators		1.00
Late triers	Early slow escalators		0.88
Late triers	Steady drinkers		1.00
Late triers	Early rapid escalators		1.00
Late triers	Early frequent drinkers	2 > 1	<.001
Decreasers	Late escalators		0.95
Decreasers	Early slow escalators		0.57
Decreasers	Steady drinkers		1.00
Decreasers	Early rapid escalators		1.00
Decreasers	Early frequent drinkers		0.06
Late escalators	Early slow escalators		0.99
Late escalators	Steady drinkers		0.99
Late escalators	Early rapid escalators		1.00
Late escalators	Early frequent drinkers	2 > 1	<.001
Early slow escalators	Steady drinkers		0.78
Early slow escalators	Early rapid escalators		0.79
Early slow escalators	Early frequent drinkers	2 > 1	<.001
Steady drinkers	Early rapid escalators		1.00
Steady drinkers	Early frequent drinkers	2 > 1	0.00
Early rapid escalators	Early frequent drinkers	2 > 1	0.00

c. Mother's education (University educated)

1	2	1 vs. 2	p-value
Late triers	Decreasers		1.00
Late triers	Late escalators		0.42
Late triers	Early slow escalators		1.00
Late triers	Steady drinkers		0.43
Late triers	Early rapid escalators		1.00
Late triers	Early frequent drinkers		0.93
Decreasers	Late escalators		1.00
Decreasers	Early slow escalators		1.00
Decreasers	Steady drinkers		1.00
Decreasers	Early rapid escalators		1.00
Decreasers	Early frequent drinkers		1.00
Late escalators	Early slow escalators		1.00
Late escalators	Steady drinkers		1.00
Late escalators	Early rapid escalators		1.00
Late escalators	Early frequent drinkers		1.00
Early slow escalators	Steady drinkers		1.00
Early slow escalators	Early rapid escalators		1.00
Early slow escalators	Early frequent drinkers		1.00
Steady drinkers	Early rapid escalators		1.00
Steady drinkers	Early frequent drinkers		1.00
Early rapid escalators	Early frequent drinkers		1.00

d. Single-parent family

1	2	1 vs. 2	p-value
Late triers	Decreasers		1.00
Late triers	Late escalators		1.00
Late triers	Early slow escalators		1.00
Late triers	Steady drinkers		1.00
Late triers	Early rapid escalators		1.00
Late triers	Early frequent drinkers		1.00
Decreasers	Late escalators		1.00
Decreasers	Early slow escalators		1.00
Decreasers	Steady drinkers		1.00
Decreasers	Early rapid escalators		1.00
Decreasers	Early frequent drinkers		1.00
Late escalators	Early slow escalators		1.00
Late escalators	Steady drinkers		1.00
Late escalators	Early rapid escalators		1.00
Late escalators	Early frequent drinkers		1.00
Early slow escalators	Steady drinkers		1.00
Early slow escalators	Early rapid escalators		1.00
Early slow escalators	Early frequent drinkers		1.00
Steady drinkers	Early rapid escalators		1.00
Steady drinkers	Early frequent drinkers		1.00
Early rapid escalators	Early frequent drinkers		1.00

e. Language spoken at home (French)

1	2	1 vs. 2	p-value
Late triers	Decreasers		0.14
Late triers	Late escalators		0.41
Late triers	Early slow escalators		0.38
Late triers	Steady drinkers		1.00
Late triers	Early rapid escalators		0.38
Late triers	Early frequent drinkers		1.00
Decreasers	Late escalators		1.00
Decreasers	Early slow escalators		1.00
Decreasers	Steady drinkers	1 > 2	0.04
Decreasers	Early rapid escalators		1.00
Decreasers	Early frequent drinkers		1.00
Late escalators	Early slow escalators		1.00
Late escalators	Steady drinkers		0.14
Late escalators	Early rapid escalators		1.00
Late escalators	Early frequent drinkers		1.00
Early slow escalators	Steady drinkers		0.11
Early slow escalators	Early rapid escalators		1.00
Early slow escalators	Early frequent drinkers		1.00
Steady drinkers	Early rapid escalators		0.11
Steady drinkers	Early frequent drinkers		0.54
Early rapid escalators	Early frequent drinkers		1.00

f. Baseline alcohol use

1	2	1 vs. 2	p-value
Late triers	Decreasers	2 > 1	<.001
Late triers	Late escalators	2 > 1	<.001
Late triers	Early slow escalators	2 > 1	0.00
Late triers	Steady drinkers	2 > 1	<.001
Late triers	Early rapid escalators	2 > 1	<.001
Late triers	Early frequent drinkers	2 > 1	<.001
Decreasers	Late escalators	1 > 2	<.001
Decreasers	Early slow escalators	1 > 2	<.001
Decreasers	Steady drinkers	2 > 1	0.02
Decreasers	Early rapid escalators	1 > 2	0.01
Decreasers	Early frequent drinkers	2 > 1	<.001
Late escalators	Early slow escalators		0.05
Late escalators	Steady drinkers	2 > 1	<.001
Late escalators	Early rapid escalators	2 > 1	0.00
Late escalators	Early frequent drinkers	2 > 1	<.001
Early slow escalators	Steady drinkers	2 > 1	<.001
Early slow escalators	Early rapid escalators	2 > 1	<.001
Early slow escalators	Early frequent drinkers	2 > 1	<.001
Steady drinkers	Early rapid escalators	2 > 1	<.001
Steady drinkers	Early frequent drinkers	2 > 1	0.00
Early rapid escalators	Early frequent drinkers	2 > 1	<.001

g. Parents smoke

1	2	1 vs. 2	p-value
Late triers	Decreasers		0.30
Late triers	Late escalators		1.00
Late triers	Early slow escalators		1.00
Late triers	Steady drinkers		1.00
Late triers	Early rapid escalators		0.24
Late triers	Early frequent drinkers	2 > 1	0.00
Decreasers	Late escalators		0.31
Decreasers	Early slow escalators		1.00
Decreasers	Steady drinkers		1.00
Decreasers	Early rapid escalators		1.00
Decreasers	Early frequent drinkers		1.00
Late escalators	Early slow escalators		1.00
Late escalators	Steady drinkers		1.00
Late escalators	Early rapid escalators		0.26
Late escalators	Early frequent drinkers	2 > 1	0.01
Early slow escalators	Steady drinkers		1.00
Early slow escalators	Early rapid escalators		1.00
Early slow escalators	Early frequent drinkers		0.24
Steady drinkers	Early rapid escalators		1.00
Steady drinkers	Early frequent drinkers		0.24
Early rapid escalators	Early frequent drinkers		1.00

h. Friends smoke

1	2	1 vs. 2	p-value
Late triers	Decreasers	2 > 1	0.02
Late triers	Late escalators		1.00
Late triers	Early slow escalators		0.15
Late triers	Steady drinkers	2 > 1	<.001
Late triers	Early rapid escalators	2 > 1	<.001
Late triers	Early frequent drinkers	2 > 1	<.001
Decreasers	Late escalators	1 > 2	0.03
Decreasers	Early slow escalators		0.89
Decreasers	Steady drinkers		0.37
Decreasers	Early rapid escalators		0.57
Decreasers	Early frequent drinkers	2 > 1	<.001
Late escalators	Early slow escalators		0.25
Late escalators	Steady drinkers	2 > 1	<.001
Late escalators	Early rapid escalators	2 > 1	<.001
Late escalators	Early frequent drinkers	2 > 1	<.001
Early slow escalators	Steady drinkers	2 > 1	0.01
Early slow escalators	Early rapid escalators	2 > 1	0.02
Early slow escalators	Early frequent drinkers	2 > 1	<.001
Steady drinkers	Early rapid escalators		1.00
Steady drinkers	Early frequent drinkers	2 > 1	<.001
Early rapid escalators	Early frequent drinkers	2 > 1	<.001

i. Depressive symptoms

1	2	1 vs. 2	p-value
Late triers	Decreasers		0.91
Late triers	Late escalators		1.00
Late triers	Early slow escalators		1.00
Late triers	Steady drinkers		0.24
Late triers	Early rapid escalators		0.42
Late triers	Early frequent drinkers	2 > 1	<.001
Decreasers	Late escalators		0.86
Decreasers	Early slow escalators		0.81
Decreasers	Steady drinkers		0.97
Decreasers	Early rapid escalators		1.00
Decreasers	Early frequent drinkers		0.18
Late escalators	Early slow escalators		1.00
Late escalators	Steady drinkers		0.23
Late escalators	Early rapid escalators		0.40
Late escalators	Early frequent drinkers	2 > 1	0.00
Early slow escalators	Steady drinkers		0.13
Early slow escalators	Early rapid escalators		0.27
Early slow escalators	Early frequent drinkers	2 > 1	<.001
Steady drinkers	Early rapid escalators		1.00
Steady drinkers	Early frequent drinkers		0.60
Early rapid escalators	Early frequent drinkers		0.33

j. Impulsivity

1	2	1 vs. 2	p-value
Late triers	Decreasers		0.11
Late triers	Late escalators		0.35
Late triers	Early slow escalators	2 > 1	0.00
Late triers	Steady drinkers	2 > 1	0.00
Late triers	Early rapid escalators	2 > 1	<.001
Late triers	Early frequent drinkers	2 > 1	<.001
Decreasers	Late escalators		0.99
Decreasers	Early slow escalators		1.00
Decreasers	Steady drinkers		0.96
Decreasers	Early rapid escalators		0.35
Decreasers	Early frequent drinkers		0.22
Late escalators	Early slow escalators		0.84
Late escalators	Steady drinkers		0.42
Late escalators	Early rapid escalators	2 > 1	0.02
Late escalators	Early frequent drinkers	2 > 1	0.01
Early slow escalators	Steady drinkers		0.99
Early slow escalators	Early rapid escalators		0.32
Early slow escalators	Early frequent drinkers		0.19
Steady drinkers	Early rapid escalators		0.83
Steady drinkers	Early frequent drinkers		0.65
Early rapid escalators	Early frequent drinkers		1.00

k. Novelty-seeking

1	2	1 vs. 2	p-value
Late triers	Decreasers		0.04
Late triers	Late escalators		0.10
Late triers	Early slow escalators	2 > 1	<.001
Late triers	Steady drinkers	2 > 1	0.00
Late triers	Early rapid escalators	2 > 1	<.001
Late triers	Early frequent drinkers	2 > 1	<.001
Decreasers	Late escalators		1.00
Decreasers	Early slow escalators		1.00
Decreasers	Steady drinkers		1.00
Decreasers	Early rapid escalators		0.48
Decreasers	Early frequent drinkers		0.39
Late escalators	Early slow escalators		0.90
Late escalators	Steady drinkers		0.96
Late escalators	Early rapid escalators		0.07
Late escalators	Early frequent drinkers		0.05
Early slow escalators	Steady drinkers		1.00
Early slow escalators	Early rapid escalators		0.50
Early slow escalators	Early frequent drinkers		0.40
Steady drinkers	Early rapid escalators		0.42
Steady drinkers	Early frequent drinkers		0.33
Early rapid escalators	Early frequent drinkers		1.00

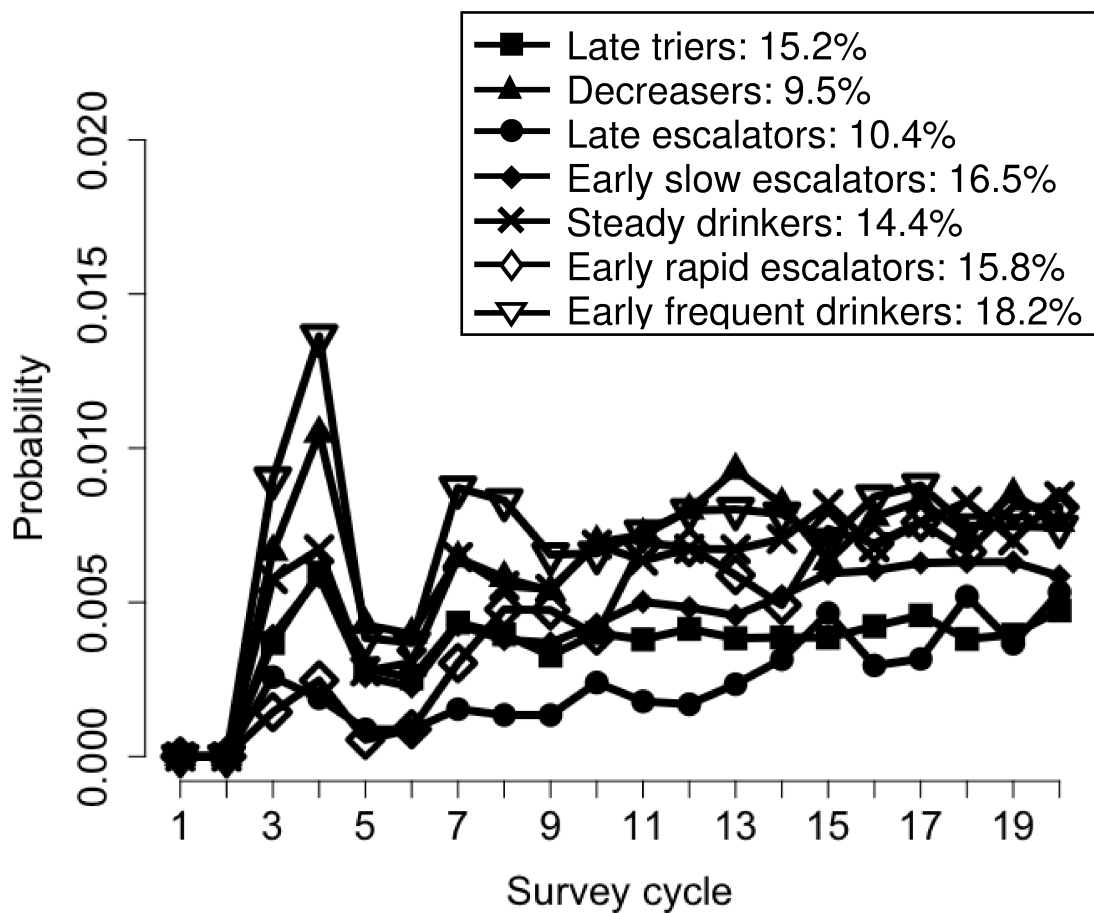
^aThe following R packages were used to estimate the Tukey (normal continuous variables), Holm (categorical variables), and Tukey/Nemenyi (non-normal continuous variables) post-hoc tests:

Tukey and Holm: Hothorn, T., Bretz, F., and Westfall, P. (2008). Simultaneous Inference in General Parametric Models. *Biometrical Journal* 50(3), 346--363.

Tukey/Nemenyi: Pohlert, T. (2018). PMCMRplus: Calculate Pairwise Multiple Comparisons of Mean Rank Sums Extended. R package version 1.4.1.

<https://CRAN.Rproject.org/package=PMCMRplus>

Figure S1. Estimated probability of loss-to-follow-up by trajectory group in the Nicotine Dependence in Teens study (Canada)



Note: At each cycle, data on participants' age, sex, mother university-educated, and single-parent family from the previous cycle were used to predict loss-to-follow-up.

Table S5. T-test and chi-square values from models comparing baseline characteristics among participants with binge drinking data in young adulthood (n=840) and participants lost-to-follow-up in high school (n=435), Nicotine Dependence in Teens study (Canada)

	With Binge Data (n=840)	Without Binge Data (n=453)	p-value
Male, %	46.0	54.1	0.011
Age [year, mean(SD)]	12.7 (0.5)	12.9 (0.7)	< 0.001
Mother university-educated, %	44.9	42.2	0.597
Single-parent family, %	8.5	11.6	0.131
French spoken at home, %	32.3	27.1	0.362
Baseline alcohol use, %	41.6	47.0	0.111
Parents smoke, %	37.8	41.6	0.244
Friends smoke, %	35.2	41.1	0.063
Depressive symptoms [mean(SD)]	2.1 (0.6)	2.1 (0.6)	0.813
Impulsivity [mean(SD)]	2.3 (0.9)	2.4 (1.0)	0.558
Novelty-seeking [mean(SD)]	2.9 (0.8)	2.9 (0.9)	0.946

^a For each activity, the participant reported number of days per week (1-7) on which he/she participated in that activity for 5 minutes or more at one time. This variable represents the mean number of days across all activities

