"Unplugged": A school-based randomized control trial to prevent and reduce adolescent substance use in the Czech Republic

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Abstract

Background—The Czech Unplugged Study, inspired by the European Drug Addiction Prevention Trial, is a prospective, school-based, randomized controlled prevention trial designed to reduce the risk of alcohol, tobacco, inhalant, and illegal drug use in 6th graders in the Czech Republic. The intervention uses the comprehensive social influence model to affect alcohol and drug using norms among primary school students.

Methods—Descriptive statistics and chi-square analyses were used to assess differences between the experimental and control groups on demographic characteristics and study outcomes. Multilevel techniques were used to take the hierarchical structure of the data into account. Prevalence odds ratios using the Bonferroni correction were calculated to assess the differences between the experimental ($N = 914$) and control ($N = 839$) groups on each outcome 1, 3, 12, 15, and 24 months after the end of the intervention.

Results—Multilevel analysis using the Bonferroni correction showed statistically significant intervention effects at the final follow-up for any smoking (OR = 0.75, 99.2% CI 0.65–0.87), daily smoking (OR = 0.62, 99.2% CI 0.48–0.79), heavy smoking (OR = 0.48, 99.2% CI 0.28–0.81), any cannabis use (OR = 0.57 99.2% CI 0.42–0.77), frequent cannabis use (OR = 0.57, 99.2% CI 0.36–0.89), and any drug use (OR = 0.78, 99.2% CI 0.65–0.94).

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Conclusions—This study adds new evidence on the effectiveness of the Unplugged school-based prevention program for primary school students in the Czech Republic.

Keywords

Adolescent risk behaviors; Drug use; Prevention; Randomized controlled trial

1. Introduction

The development and implementation of school-based drug prevention interventions has been popular in the last four decades (Cuijpers, 2003). However, many of these interventions lack systematic evaluations of program effectiveness (Tobler et al., 2000; Cuijpers, 2002). Further, only a few school-based drug interventions are designed as randomized controlled trials (RCTs), often considered the gold standard for intervention research. The majority of the school-based RCTs are conducted in the United States (Faggiano et al., 2008a).

In response to the lack of non-U.S. school-based RCTs for drug use prevention and the need for culturally relevant prevention programs in the European Union, the European Drug Abuse Prevention (EU-Dap) trial was conducted as the first European mul-ticenter, randomized, school-based substance abuse prevention intervention. The first EU-Dap intervention, The Unplugged, was implemented during the 2004–05 school year in seven European countries ($N = 7079$, 12–14 years of age), including Sweden, Italy, Belgium, Spain, Germany, Greece, and Austria (Faggiano et al., 2007, 2008b). The EU-Dap trial used a four-arm design (three experimental arms consisting of the Basic Unplugged, Parent version, and Peer Groups version, and one control arm; Faggiano et al., 2007). Three months after the end of the intervention, significant reductions in daily tobacco use and episodes of drunkenness in the past 30 days were observed, and marginal statistical significance was observed for reductions in cannabis use in the past 30 days (Faggiano et al., 2008b). Fifteen months after the end of the intervention, statistically significant positive effects of the intervention were found for episodes of any or frequent drunkenness and marginal statistical significance for frequent cannabis use in the past 30 days (at the alpha 0.05 level; Faggiano et al., 2010).

The Unplugged prevention curriculum is based on the comprehensive social influence (CSI) model. Social influence programs are based on strengthening skills to resist social pressure, an identified risk factor for drug use (McGuire, 1961; Tobler, 1986) and focus on decision making, activism, and public commitment (Sussman et al., 2004). The CSI models are helpful for prevention interventions by further enhancing communication skills and assertiveness (Sussman et al., 2004).

The Czech Republic (CzR) was not involved in the EU-Dap Unplugged prevention trial. However, prevalence data from the CzR indicate there is a need for effective prevention interventions targeting alcohol, tobacco and other drug (ATOD) use among youth. The European School Survey Project on Alcohol and Other Drugs (ESPAD), a collaborative study of European Union (EU) States, monitors the prevalence of alcohol and drug use among youths in school every four years. According to the 2007 ESPAD data from 16 year old students, compared to 35 European countries the CzR had the highest prevalence of past

30 days use of marijuana and hashish (Czech 18%; EU 7%; USA 16.7%), alcohol (Czech 76%; EU 61%; USA 28.9%), and cigarettes (Czech 41%; EU 29%; USA 13.2%; Hibell et al., 2009; Johnston et al., 2011). However, other indicators of illegal drug use show the Czech prevalence is close to the EU average (Csemy et al., 2009).

Prior to the present study, there was no high quality school-based RCT of prevention intervention conducted in the CzR. Furthermore, there has only been one systematic evaluation of a school-based substance abuse prevention intervention in the CzR (Miovsky et al., 2006, 2007, 2011). There were no other attempts to provide scientifically sound evidence on the effectiveness of any universal prevention program in the CzR.

The present study examines the impact of a school-based RCT, modeled after the EU-Dap Unplugged trial, on alcohol, tobacco, marijuana, and other drug use among primary school students in the CzR.

2. Material and methods

2.1. Study design

The baseline assessment of substance use was conducted in September 2007 and the intervention took place during the 2007–2008 school year. There were five follow-up testing periods, one at the end and one at the beginning of each school year (6/2008, 9/2008, 6/2009, 9/2009, 6/2010).

The source population was students in the 6th grade, typically aged 11–13 years, from three regions in the CzR. Stratified random sampling was used to obtain a representative sample. Sample strata were based on the number of residents in the school area. Eighty schools, representative of schools in the three region areas, were randomized to either control or intervention arm. Five schools (6.3%) from the control arm withdrew before the baseline survey and were not replaced. There were no differences found between the schools that withdrew and participating schools.

2.2. Intervention

The Unplugged is an evidence-based intervention designed to delay drug initiation and suspend progression from early stage drug use to heavier drug use (van der Kreeft et al., 2009). The intervention targets all age-relevant substances of use and abuse, with a special focus on alcohol, tobacco, and marijuana. The intervention was delivered by trained teachers in twelve 45-min lessons over the course of one school-year. The design of the intervention has been described elsewhere (van der Kreeft et al., 2009). The Unplugged focuses on knowledge and attitudes (4 units), interpersonal skills (4 units), and intrapersonal skills (4 units). The Teacher's Handbook provides the teacher with information on how to deliver the intervention in the class settings. The handbook includes a brief description of each unit, objectives for the lesson, a list of materials needed for each activity, and tips that may help with the lesson. A suggested introduction to the lesson is also provided along with core activities (a detailed and concrete list of suggested activities), and recommended lesson conclusions. The Student's Workbook is a personal workbook for the student. It is made in color, and it contains ancillary activities to all the Unplugged units. The Unplugged

Teacher's Handbook and the Student's Workbook are available in several language versions, including English, and can be accessed at: http://www.eudap.net.

The present study used the 2007 revised version of the 'Modified Unplugged prevention intervention' (further referred to as Unplugged) for translation into Czech. In addition to translating into Czech, the Czech version of Unplugged had a new lesson order, changed graphics in student workbook, shortened lessons for easier implementation, and added innovative 'ice-breaker' activities in the Teacher's Handbook. The Czech adaptation of the Unplugged materials was carried out in collaboration with the CzR Unplugged research team and an advisory board of five students in the target age group and four primary school teachers (Adamkova et al., 2009).

All teachers assigned to the intervention arm received 2.5 h of technical information and training and underwent 12 h of theoretical and direct practical training in the Unplugged method (Adamkova et al., 2009). Training of teachers from the experimental group was carried out by master's degree-level trainers, with expertise in psychosocial techniques in school settings. Trainers received training from the master trainer of the EU-Dap Intervention Planning Group (van der Kreeft et al., 2009). Teachers in the experimental arm were assigned to one of four of the Regional Coordinators with whom they had monthly meetings to monitor the intervention fidelity (Jurystova et al., 2009). Teachers from the control arm received 2.5 h of technical issues information regarding the study collaboration.

Progress on the delivery of the Unplugged curriculum in the experimental arm was continuously tracked via internet-based questionnaires that were submitted by teachers after the completion of each lesson. Data on fidelity of the intervention delivery were further verified by the Regional Coordinators. All 12 lessons (100% of prevention program units) were delivered in all classes during the intervention period. If a student was absent the day the Unplugged lesson was delivered, there was a 5 min recapitulation in the following lesson. Teachers were trained to encourage the class to share the content of and their experiences from the lesson with students who were absent. Due to the anonymous nature of the study, absent students were not monitored.

It is compulsory for all schools in the CzR to carry out the 'Minimal Prevention Program' targeting ATOD use and other risk behaviors each year (Miovsky et al., 2007). Teachers from both the experimental and the control groups were instructed to monitor substance abuse prevention activities independent of the Unplugged using a standardized tool (Jurystova et al., 2009). No substantial interfering prevention activity was recorded (Adamkova et al., 2009).

2.3. Study population

The baseline testing included 1874 6th graders. At the final follow-up, data were collected from 1753 students, see Fig. 1. See Table 1 for a description of the sample and sample statistics for waves 1–6. One additional school from the control group was excluded because of high levels of missing data at baseline. Differences in the number of participants at each follow-up were due to temporary absences from school (mainly sickness), followed by very rare transitions to another class or another school. Race and ethnicity were not assessed due

to the lack substantive importance in the Czech population and general underreporting by participants (Miovska, 2005).

Written parental consents were received from 98.7% of all eligible children in participating schools. There were no inclusion criteria for students, with the exception of being in the 6th grade at the start of the study. Parents who did not send the parental consents with their child to school were asked to turn in their consents during parentsˇı evenings at schools. The high rates of positive parental consents received may be attributed to close collaboration with and explicit support from school administrators and the Czech Ministry of Education. The study was reviewed and approved by an independent ethics committee in the CzR and the Institutional Review Board at Johns Hopkins University Bloomberg School of Public Health in the United States.

2.4. Specific measures

For the baseline testing and all subsequent follow-ups a Czech version (Csemy et al., 2006) of the 2003 ESPAD (Hibell et al., 2004, 2009) questionnaire was used to collect the demographic and outcome data. The standardized questionnaire covered areas of licit and illicit drug use in student populations (lifetime, past year, and last 30 days prevalence), including onset of use, frequency of use, type of alcohol consumed, binge drinking, and drunkenness. Attitudes and beliefs towards substance use, sociodemographics (e.g., parents' education, estimated family income), and a psychosocial module (including scales of depression, anomie, or self-image) were also included in the standardized questionnaire (Csemy et al., 2006). Frequency (e.g., 1: never, 6: daily) and multiple choice questions were used. Additionally, a drug knowledge test, consisting of 21 multiple choice questions, one open question, and one matching question was added to the end of the questionnaire. The entire 16-page questionnaire included 72 core questions and 298 sub-questions.

The self-report questionnaires were completed under the supervision of a trained research assistant. Students were able to complete the questionnaire in less than 45 min (Miovska et al., 2008; Csemy et al., 2006). Unique participant codes were generated using the combination of selected letters of the participant's and the participant's motherˇıs names, and the participant's birth date. These codes allow researchers to match individual questionnaires across follow-ups and to protect the participants' confidentiality.

2.5. Outcomes

The primary outcomes of the prevention trial were self-reported any cigarette smoking in the past 30 days, daily cigarette smoking (defined as 6 or more cigarettes per day in the last 30 days), heavy cigarette smoking (smoked 20 or more cigarettes per day in the last 30 days), any drunkenness (defined as at least one episode of drunkenness in the last 30 days), frequent drunkenness (three or more episodes of drunkenness in the last 30 days), any cannabis use (any marijuana use in the last 30 days), frequent cannabis use (used marijuana 3 or more times in the last 30 days), and lifetime illegal drug use (ever used any of marijuana, heroin, amphetamine, ecstasy, LSD or hallucinogens, GHB or tranquilizers without a medical prescription). All outcome variables were collected at baseline and five subsequent waves of data collection.

2.6. Statistical methods

Descriptive statistics were used to compare participant demographic characteristics. Chi-square tests were used to identify significant differences between the experimental and control groups on demographic characteristics, tobacco, alcohol, and drug use. Because of the hierarchical structure of the data (students nested within either experimental or control schools), a multilevel modeling approach was also used. Generalized Estimating Equation (GEE) analysis was used to assess the differences between the experimental and control groups on each outcome (any cigarette smoking in the past 30 days, daily cigarette smoking in the past 30 days, heavy cigarette smoking in the past 30 days, any drunkenness in the past 30 days, frequent drunkenness in the past 30 days, any cannabis use in the past 30 days, frequent cannabis use in the past 30 days, lifetime any illegal drug use) across all waves, accounting for age, sex, family income status, and baseline prevalence of the outcomes. Bonferroni corrected prevalence odds ratios and their 99.2% confidence intervals were used to estimate differences between the experimental and control groups on the eight outcomes of interest at each wave. The absolute risk reduction (ARR) and number needed to treat (NNT) to prevent one additional event were also calculated. To assess the possible bias in students dropping out from the baseline interview to the final assessment, program effects were examined using Last Observation Carried Forward and Best-Case, Worst-Case scenario. The results did not change. Chi-square and t-tests were performed on demographic variables to assess the effect of missing data. All of the results were insignificant. Thus, it was concluded that missing data were completely at random. The GEE approach shows valid results when data are missing at random (Little and Rubin, 1987). Using non-imputed data leads to valid inferences when data are missing at random (Schafer, 1997). Therefore, non-imputed data were used. The analyses for this paper were conducted using SAS software, Version 9.1 (The SAS Institute Inc., 2007). We used a Bonferroni correction to account for multiple comparisons.

3. Results

Our primary focus is on the distal outcomes of the prevention trial; therefore, we emphasize data comparing the baseline and the final wave.

The results, using the Bonferroni correction, show no statistically significant differences in demographic characteristics (sex, age, family income level) between the experimental and the control groups at baseline period (Table 1). Table 2 shows differences in tobacco, alcohol, and drug use at baseline assessment period comparing the experimental and control groups. At baseline, the experimental group shows no statistically significant differences in substance use as compared to the control group, after the correction for number of tests.

Bonferroni corrected prevalence odds ratios for all waves are presented in Tables 3 (unadjusted) and 4 (adjusted). For the unadjusted results, a statistically significant effect of the Unplugged intervention (experimental group) at the final assessment was observed, for any smoking (OR = 0.75, 99.2% CI 0.57–0.99), indicating that those in the experimental group were 25% less likely to report any smoking as compared to the control group. A statistically significant effect of the intervention was also observed for daily smoking (OR = 0.65, 99.2% CI 0.43–0.97), heavy smoking (OR = 0.38, 99.2% CI 0.18–0.80), frequent

drunkenness (OR = 0.58, 99.2% CI 0.36–0.93), frequent cannabis use (OR = 0.48, 99.2% CI 0.23–0.99), and any drug use (OR = 0.69, 99.2% CI 0.51–0.92). Multilevel adjusted analyses showed statistically significant intervention effects at the final assessment for any smoking (OR = 0.75, 99.2% CI 0.59–0.95), daily smoking (OR = 0.60, 99.2% CI 0.38–0.96), heavy smoking (OR = 0.49, 99.2% CI 0.24–0.97), any cannabis use (OR = 0.56 99.2% CI 0.35–0.88), all in past 30 days. No effect was found for past 30 days any and frequent drunkenness, frequent cannabis use, and lifetime any drug use.

The absolute risk reduction (ARR) for the final wave is presented to show the decrease in risk of the experimental group as compared to the control group. The ARR ranged from 2.4% for any cannabis use to 6.2% for any smoking (the intervention had no effect on any drunkenness with ARR = 2.3 and any drug use with ARR = 7.2). The number needed to treat (NNT) to prevent one additional event is also presented. The NNT is the inverse of the ARR and indicates the number of participants needing to receive the intervention for one to benefit as compared to the control group. The NNT ranged from 16 for any smoking to 42 for any cannabis use.

4. Discussion

The Unplugged produced positive effects on reducing current tobacco and marijuana use in the target group and prevented increases in the lifetime prevalence of other drug use two years after the intervention was delivered. These results are encouraging, especially when taking into account the high prevalence rates of substance use among Czech adolescents (Hibell et al., 2009; WHO, 2008). There is an urgent need for effective drug education and prevention interventions like the Unplugged study. However, no effect of the intervention was found for current alcohol use in the target group and frequent cannabis use, and lifetime any drug use.

The Bonferroni correction is conservative. It may be of interest, using 95% significance level and not correcting for multiple comparisons, multilevel analyses showed statistically significant intervention effects at the final assessment for any smoking (OR = 0.73, 95% CI 0.58–0.92), daily smoking (OR = 0.62, 95% CI 0.41–0.93), frequent drunkenness (OR = 0.57, 95% CI 0.38–0.87), any cannabis use (OR = 0.67, 95% CI 0.46–0.97), frequent cannabis use (OR = 0.46, 95% CI 0.26–0.81), and any drug use (OR = 0.62, 95% CI 0.49–0.78). The results show marginal significance for heavy smoking (OR = 0.43, 95% CI 0.19–1.00, $p = 0.0513$), not presented in tables. Table 4 provides us with information on the 33-month effect of the intervention. We observe a delayed complex effect of the intervention, i.e. the effect is evident for four out of seven measured behavioral outcomes at the final wave as compared to the previous waves 2–5. For frequent smoking in past 30 days, we observe effect of the intervention beginning at wave 5, with the maintained effect carried to wave 6. However, for any smoking and any cannabis use we observe that wave 3 effect is carried forward. For heavy smoking, where there is no effect in wave 4, the effect is varying. The effect on recent frequent cannabis use has diminished between waves 4 and 5, during the time of 2-month long summer holidays.

The number needed to treat (NNT) is an easy to understand measure useful for decision making and translating research into practice (Cook and Sackett, 1995). For example, the NNT, the inverse of the ARR, indicates that the intervention would need to be delivered to about 16 children at moderate risk in order to prevent any smoking in one child in the next two years. The highest NNTs were found for any cannabis and frequent cannabis use (NNT = 42). In comparison, fewer individuals would need to be exposed to the intervention to prevent one event for any drug use (NNT = 14). However, any drug use was assessed as lifetime prevalence, a less sensitive indicator as compared to the past month use. At baseline, the average number of children in the classroom was 26. Thus, the teacher delivering the intervention was able to prevent one to two children from any smoking behaviors in one given class. Meanwhile, to prevent one child from any or frequent cannabis use would require having the intervention delivered in two classes. The NNT demonstrates the economical aspects of implementing universal prevention interventions in the school settings (Table 5). Future research on cost effectiveness of the Unplugged intervention is underway.

Forty years of research on effectiveness of universal school-based substance abuse prevention programs brings contradictory evidence (for systematic reviews see, e.g., Faggiano et al., 2008a; Cuijpers, 2003; Thomas and Perera, 2006), ranging from negative effects of the intervention (e.g., Sloboda et al., 2009) to moderate effects (e.g., Faggiano et al., 2010), to the more convincing results of the study presented. Porath-Waller et al. (2010) conducted meta-analysis of recent school-based prevention programs targeting cannabis use. The results showed that programs of longer duration (15 sessions), that are facilitated by individuals other than teachers, and that targeted high school students instead of middle-school students yield stronger effects (Porath-Waller et al., 2010). Despite these findings, the Unplugged intervention consisted of only 12 sessions and was delivered by the teacher. In part, we attribute these results to high program fidelity and partnerships with schools and teachers.

The intervention was not effective for any drunkenness and frequent drunkenness in past month. This specific result may reflect the social acceptability of heavy alcohol consumption in the CzR or be indicative of drunkenness being somewhat normative behavior for CzR adolescents (Cervenka, 2010). It is noteworthy that the Unplugged group had high levels of recent drunkenness at baseline, but at final follow-up converged to rates similar to the control group. Youth usually try alcohol for the first time at home in their parents' presence (Karmelitova and Tyc, 2003). First alcohol use for 75% of Czech youths occurs before the age of 12 (Lejckova and Csemy, 2006; Csemy et al., 2006). The prevalence of alcohol use among those in the present study is higher than the EU average of 61%. It is hypothesized that implementing intervention booster sessions may enhance the effect of the intervention (Cuijpers, 2002; Tobler et al., 2000; Botvin, 1983) and subsequently show improvements in tobacco and marijuana, not for recent alcohol use. The present study has several limitations worth noting. Eighty eligible schools were randomized into the experimental and control groups; five schools (6.3%) dropped out before the baseline survey but too late to be replaced. While we have not found any pattern showing differences between the schools that dropped out and those that remained the study, the reason obtained from one school in the control arm that dropped out was that school administrators (SAs) were disappointed by not being selected to receive the intervention and thus were unwilling to participate. This may

also be true for other schools that withdrew. In order to prevent other schools in the control arm from dropping out, immediate actions were implemented: (i) SAs were re-contacted and once again explained the role and importance of their school serving as a control; (ii) SAs were re-assured of training of one of their teachers in the Unplugged prevention intervention after the end of the study, free-of-charge; (iii) SAs were promised, after the end of the study, print-outs of one Unplugged Teacher's Handbook and Student's Workbooks for one class, free-of-charge. No other schools dropped out after this procedure was implemented. Additionally, one control school was excluded from the analysis due to high levels of missing baseline data. This action was taken since we controlled for baseline prevalence at the final assessment period (wave 6).

Prior to this effectiveness analysis, implementation and process evaluations (Adamkova et al., 2009; Jurystova et al., 2009) as well as a study of intervention fidelity (Jurystova and Miovsky, 2010) were conducted. Nevertheless, threats to external validity persisted. In the CzR, only one School Prevention Worker is assigned to each school. This teacher, trained in school-based prevention interventions, is responsible for methodological guidance in prevention of risk behaviors at his/her school, coordination of prevention activities within the school, and providing information and basic counseling. In the present trial there was one teacher who was trained to deliver the intervention in one class only in the entire school. This is far from reality in Czech schools where one teacher, assigned as a School Prevention Worker, has to deliver the intervention to all classes at his/her school. As a result of this limitation, a feasibility trial has been designed to test the feasibility and fidelity of delivering the intervention in more realistic settings – to determine if one teacher is capable of delivering the intervention to all 6th grade classes at their school during one school-year.

The outcome variables of interest are based on self-reported measures that may affect the validity of the data. Self-report data are often criticized due to the influence of social desirability, individuals' tendency to underreport or conceal behaviors that are viewed as harmful. Given the evidence in the literature supporting self-report data collection (O'Malley et al., 2000), the use of anonymous surveys in the present study was adequate. Further, the similarities in the prevalence of ATOD use in this sample as compared to EU prevalence further supports the use of self-report data collection methods for producing accurate estimates of substance use in this population.

Despite these limitations, the study has several strengths. The long-term randomized design of the study was a major strength. Further, the present study is only school-based randomized control trial ever conducted in the CzR. A very high success rate in obtaining parental consents (98.7%) was achieved. The success in obtaining parental consent likely resulted from (i) the recognition and official support from the Ministry of Education of the CzR; (ii) subsequent support from school administrators (SAs); (iii) "buy-in" from teachers who SAs designated to assist the study research group; (iv) teachers demonstrated above average dedication in executing study-related tasks; and (v) SAs and teachers highlighted the importance of the study to parents.

Targeting interventions to younger children, prior to experimentation with ATOD (Dawson et al., 2008; Grant and Dawson, 1998; Grant, 1998; Pitkänen et al., 2005), may delay the

onset of ATOD use among youth. The mean age of students at baseline in the experimental arm in the present study was 11.8 years. While the outcomes of the present study support delivering the intervention in the 6th grade, the high prevalence of some ATOD behaviors among this population would suggest delivering the intervention prior to 6th grade may be beneficial. Furthermore, the intensity and the frequency of use (e.g., heavy smokers in the sample) may play a significant role in prevention. It is likely that youth have specific drug and alcohol use trajectories (e.g., Brook et al., 2008; Karp et al., 2005; Park et al., 2000). Students within these class trajectories may have different demands and prevention needs. Previous research also shows that the effectiveness of prevention interventions may be gender and age specific (Vigna-Taglianti et al., 2009). Additional statistical analyses are needed to explore the sex specific effects of the Unplugged intervention and ATOD use trajectories among youth.

The Unplugged intervention shows evidence of effectiveness of a school-based intervention for substance use prevention for primary school students in the CzR. The findings presented here contribute to the growing body of evidence of the need to systematically evaluate school-based interventions. The Czech Unplugged prevention trial lays the foundation for evidence-based and effective universal substance abuse prevention programs to help decrease the high prevalence of tobacco and marijuana use among Czech adolescents.

Acknowledgments

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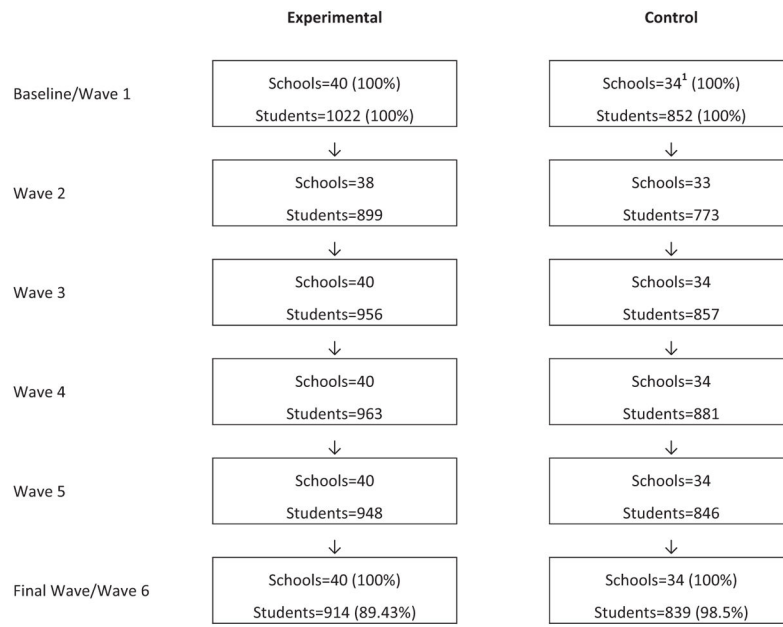
Fig. 1.
Schools and students in the experimental or control group at each measurement point.

Table 1

Characteristics of the study sample.

Characteristic	Baseline/Wave 1 Sept. 2007		Wave 2 June 2008		Wave 3 Sept. 2008		Wave 4 June 2009		Wave 5 Sept. 2009		Wave 6 June 2010		Experimental[a]		Control[a]		Chi Sq
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	p-Value
Sex																	
Male	944	50.4	854	51.1	918	50.6	938	50.9	920	51.3	903	51.5	510	49.9	434	50.9	n.s[b]
Female	927	49.5	815	48.7	894	49.3	905	49.1	873	48.7	848	48.4	510	49.9	417	48.9	
Missing	3	0.2	3	0.2	1	0.1	1	0.1	1	0.1	2	0.1	2	0.2	1	0.1	
Mean age (SD) [Range]	11.38 (0.56) [10–14]		12.12 (0.56) [10–15]		12.37 (0.55) [11–16]		13.14 (0.57) [10–16]		13.39 (0.58) [10–16]		14.14 (0.55) [13–16]		11.38 (0.57) [10–14]		11.38 (0.54) [10–13]		n.s[c]
Missing	13	0.7	7	0.4	4	0.2	4	0.2	3	0.2	7	0.4	4	0.4	9	1.1%	–
Family Income Level																	n.s
Low	118	6.3	121	7.2	141	7.8	160	8.7	155	8.6	183	10.4	73	7.1	45	5.3	
Moderate	1298	69.3	1099	65.7	1182	65.2	1156	62.7	1089	60.7	1045	59.6	706	69.1	592	69.5	
High	425	22.7	431	25.8	473	26.1	505	27.4	517	28.8	501	28.6	226	22.1	199	23.4	
Missing	33	1.8	21	1.3	17	0.9	23	1.2	33	1.8	24	1.4	17	1.7	16	1.9	
Total	1874	100	1672	100	1813	100	1844	100	1794	100	1753	100	1022	100	852	100	–

[a] At baseline.

[b] Not significant at the bonferroni corrected p-value of p < 0.008.

[c] t-Test comparing mean age. Not significant at the bonferroni corrected p-value of p < 0.008.

Table 2

Study sample behavioral characteristics.

Characteristic	Baseline/Wave 1 Sept. 2007		Wave 2 June 2008		Wave 3 Sept. 2008		Wave 4 June 2009		Wave 5 Sept. 2009		Wave 6 June 2010		Experimental[a]		Control[a]		Chi Sq
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*p*-Value
Smoked cigarettes in last 30 days																	
No	1704	90.9	1445	86.4	1455	80.3	1415	76.7	1307	72.9	1202	68.6	917	89.7	787	92.4	n.s[b]
Yes	162	8.6	223	13.3	354	19.5	419	22.7	476	26.5	542	30.9	98	9.6	64	7.5	
Missing	8	0.4	4	0.2	4	0.2	10	0.5	11	0.6	9	0.5	7	0.7	1	0.1	
Smoked 6 or more cigarettes per day over the last 30 days																	
No	1848	98.6	1627	97.3	1733	95.6	1710	92.7	1625	90.6	1551	88.5	1002	98.0	846	99.3	n.s[b]
Yes	18	1.0	41	2.5	76	4.2	124	6.7	158	8.8	193	11.0	13	1.3	5	0.6	
Missing	8	0.4	4	0.2	4	0.2	10	0.5	11	0.6	9	0.5	7	0.7	1	0.1	
Smoked 20 or more cigarettes per day over the last 30 days																	
No	1864	99.5	1652	98.8	1785	98.5	1787	96.9	1732	96.5	1681	95.9	1015	99.3	849	99.6	n.s[b]
Yes	2	0.1	16	1.0	24	1.3	47	2.5	51	2.8	63	3.6	0	0.0	2	0.2	
Missing	8	0.4	4	0.2	4	0.2	10	0.5	11	0.6	9	0.5	7	0.7	1	0.1	
At least one episode of drunkenness over the last 30 days																	
No	1584	84.5	1391	83.2	1481	81.7	1391	75.4	1327	74.0	1156	65.9	844	82.6	740	86.9	n.s[b]
Yes	279	14.9	271	16.2	325	17.9	439	23.8	447	24.9	576	32.9	170	16.6	109	12.8	
Missing	11	0.6	10	0.6	7	0.4	14	0.8	20	1.1	21	1.2	8	0.8	3	0.4	
Three or more episodes of drunkenness over the last 30 days																	
No	1829	97.6	1612	96.4	1747	96.4	1735	94.1	1648	91.9	1587	90.5	990	96.9	839	98.5	n.s[b]
Yes	34	1.8	50	3.0	59	3.3	95	5.2	126	7.0	145	8.3	24	2.3	10	1.2	
Missing	11	0.6	10	0.6	7	0.4	14	0.8	20	1.1	21	1.2	8	0.8	3	0.4	
Any marijuana use in the last 30 days																	
No	1789	95.5	1607	96.1	1728	95.3	1735	94.1	1634	91.1	1599	91.2	961	94.0	828	97.2	n.s[b]
Yes	17	0.9	32	1.9	53	2.9	87	4.7	131	7.3	127	7.2	13	1.3	4	0.5	
Missing	68	3.6	33	2.0	32	1.8	22	1.2	29	1.6	27	1.5	48	4.7	20	2.3	

	Baseline/Wave 1 Sept. 2007		Wave 2 June 2008		Wave 3 Sept. 2008		Wave 4 June 2009		Wave 5 Sept. 2009		Wave 6 June 2010		Experimental[a]		Control[a]		Chi Sq
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*p*-Value
Used marijuana 3 or more times in the last 30 days																	
No	1804	96.3	1633	97.7	1757	96.9	1791	97.1	1708	95.2	1666	95.0	973	95.2	831	97.5	n.s[b]
Yes	2	0.1	6	0.4	24	1.3	31	1.7	57	3.2	60	3.4	1	0.1	1	0.1	
Missing	68	3.6	33	2.0	32	1.8	22	1.2	29	1.6	27	1.5	48	4.7	20	2.3	
Ever used any of marijuana, heroin, amphetamine, ecstasy, LSD or hallucinogens, GHB or tranquilizers without medical prescription																	
No	1741	92.9	1489	89.1	1580	87.1	1500	81.3	1420	79.2	1286	73.4	935	91.5	806	94.6	n.s[b]
Yes	102	5.4	168	10.0	218	12.0	330	17.9	358	20.0	451	25.7	63	6.2	39	4.6	
Missing	31	1.7	15	0.9	15	0.8	14	0.8	16	0.9	16	0.9	24	2.3	7	0.8	
Total	1874	100	1672	100	1813	100	1844	100	1794	100	1753	100	1022	100	852	100	–

[a] at baseline.

[b] n.s = not significant at the bonferroni corrected *p*-value of *p* < 0.008.

Table 3

Unadjusted odds ratios by wave, Bonferroni corrected.

	Baseline/Wave 1			Wave 2			Wave 3		
	Odds ratio	99.2% CI	Bonferroni *p*-value	Odds ratio	99.2% CI	Bonferroni *p*-value	Odds ratio	99.2% CI	Bonferroni *p*-value
During the past 30 days									
Any smoking	1.31	0.84–2.05	0.1037	0.92	0.63–1.35	0.5714	0.76	0.55–1.04	0.0197
Daily smoking	2.20	0.54–8.91	0.1367	0.10	0.43–2.31	0.9877	0.68	0.36–1.27	0.0984
Heavy smoking	–	–	–	0.28	0.06–1.32	0.0295	0.29	0.08–1.03	0.0098
Any drunkenness	1.37	0.96–1.94	0.0183	1.24	0.87–1.77	0.1085	0.91	0.66–1.26	0.4254
Frequent drunkenness	2.03	0.74–5.56	0.0612	1.19	0.55–2.57	0.5506	0.80	0.40–1.62	0.4069
Any Cannabis	2.80	0.61–12.82	0.0727	0.66	0.25–1.71	0.2463	0.28	0.12–0.66	<0.0001 *
Frequent Cannabis	0.85	0.02–36.60	0.9112	0.43	0.04–4.25	0.3249	0.30	0.08–1.04	0.0100
Lifetime									
Any drug use	1.39	0.80–2.43	0.1137	1.12	0.73–1.74	0.4768	0.88	0.60–1.30	0.3901

	Wave 4			Wave 5			Wave 6		
	Odds ratio	99.2% CI	Bonferroni *p*-value	Odds ratio	99.2% CI	Bonferroni *p*-value	Odds ratio	99.2% CI	Bonferroni *p*-value
During the past 30 days									
Any smoking	0.81	0.60–1.09	0.0572	0.79	0.59–1.05	0.0262	0.75	0.57–0.99	0.0055 *
Daily smoking	0.66	0.40–1.09	0.0284	0.53	0.34–0.83	0.0002 *	0.65	0.43–0.97	0.0045 *
Heavy smoking	0.80	0.36–1.75	0.4468	0.44	0.20–0.97	0.0057 *	0.38	0.18–0.80	0.0006 *
Any drunkenness	1.06	0.80–1.42	0.5730	1.06	0.79–1.42	0.5913	0.90	0.69–1.18	0.3087
Frequent drunkenness	1.17	0.67–2.05	0.4639	0.86	0.52–1.40	0.3998	0.58	0.36–0.93	0.0022 *
Any Cannabis	0.63	0.35–1.14	0.0380	0.67	0.41–1.08	0.0267	0.70	0.43–1.15	0.0566
Frequent Cannabis	0.57	0.21–1.53	0.1311	0.86	0.42–1.75	0.5658	0.48	0.23–0.99	0.0076 *
Lifetime									
Any drug use	0.87	0.63–1.20	0.2531	0.85	0.62–1.16	0.1669	0.69	0.51–0.92	0.0006 *

*
Represents statistically significant odds ratio. Statistically significant if *p* < 0.008. CI changed to 99.2% to account for the bonferroni correction.

Table 4

Multilevel odds ratios by wave, Bonferroni corrected.

	Baseline/Wave 1			Wave 2			Wave 3			Wave 4			Wave 5			Wave 6		
	Odds ratio	99.2% CI	Bonferroni p-value	Odds ratio	99.2% CI	Bonferroni p-value	Odds ratio	99.2% CI	Bonferroni p-value	Odds ratio	99.2% CI	Bonferroni p-value	Odds ratio	99.2% CI	Bonferroni p-value	Odds ratio	99.2% CI	Bonferroni p-value
During the past 30 days																		
Any smoking	1.35	0.86–2.14	0.0802	0.83	0.59–1.16	0.1391	0.74	0.56–0.97	0.0037*	0.75	0.57–0.97	0.0036*	0.75	0.58–0.97	0.0029*	0.75	0.59–0.95	0.0013*
Daily smoking	2.05	0.50–8.47	0.1779	0.91	0.48–1.74	0.7008	0.67	0.39–1.16	0.0547	0.65	0.38–1.12	0.0356	0.60	0.37–0.96	0.0042*	0.60	0.38–0.96	0.0036*
Heavy smoking	–	–	–	0.25	0.05–1.21	0.0194	0.28	0.08–0.92	0.0047*	0.53	0.23–1.20	0.0385	0.51	0.27–0.99	0.0077*	0.49	0.24–0.97	0.0059*
Any Drunkenness	1.39	0.97–1.99	0.0143	1.05	0.82–1.36	0.5815	0.96	0.73–1.25	0.6523	0.95	0.75–1.20	0.5316	0.96	0.76–1.21	0.6516	0.94	0.75–1.17	0.4309
Frequent drunkenness	2.02	0.73–5.58	0.0670	1.11	0.57–2.15	0.6784	0.91	0.51–1.64	0.6765	0.95	0.59–1.52	0.7550	0.92	0.60–1.41	0.6097	0.80	0.54–1.19	0.1448
Any Cannabis	2.09	0.43–10.19	0.2193	0.62	0.26–1.47	0.1412	0.35	0.20–0.63	<0.0001*	0.46	0.30–0.75	<0.0001*	0.52	0.32–0.85	0.0004*	0.56	0.35–0.88	0.0006*
Frequent Cannabis	0.06	0.0001–61.23	0.2771	0.27	0.03–2.32	0.1067	0.31	0.11–0.87	0.0026*	0.42	0.19–0.97	0.0057*	0.62	0.32–1.20	0.0545	0.56	0.31–1.02	0.0105
Lifetime																		
Any drug use	1.36	0.77–2.41	0.1482	0.94	0.69–1.28	0.5963	0.86	0.65–1.13	0.1478	0.83	0.63–1.10	0.0785	0.83	0.62–1.09	0.0719	0.77	0.58–1.02	0.0127

*
Statistically significant odds ratio. Statistically significant if p < 0.008. CI changed to 99.2% to account for the bonferroni correction.

Table 5

Past 30 days and lifetime outcomes, Bonferroni corrected.

	Baseline prevalence		Experimental[a]	Control[a]	ARR[b]	NNT[c]
	% Experimental	% Control	n/N	n/N	%	n
During the past 30 days						
Any smoking	9.6	7.5	256/910	286/834	6.2	16
Daily smoking	1.3	0.6	82/910	111/834	4.3	23
Heavy smoking	0.0	0.2	19/910	44/834	3.2	31
Any drunkenness	16.6	12.8	291/905	285/827	2.3	43
Frequent drunkenness	2.3	1.2	58/905	87/827	4.1	24
Any Cannabis	1.3	0.5	56/902	71/824	2.4	42
Frequent Cannabis	0.1	0.1	21/902	39/824	2.4	42
Lifetime						
Any drug use	6.2	4.6	204/906	247/831	7.2	14

[a] n represents the number of participants at wave 6 that have the event. N represents the number of participants responding to the question.

[b] Absolute risk reduction.

[c] Number needed to treat.