

Trends in the co-occurrence of tobacco and cannabis use in 15-year-olds from 2002 to 2010 in 28 countries of Europe and North America

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Background: Cannabis and tobacco use frequently co-occur. Adolescents who consume both substances experience more respiratory distress and psychosocial problems and are less likely to stop compared with those who use either tobacco or cannabis alone. This study examined time trends in tobacco and cannabis use among 15-year-olds in Europe and North America between 2002 and 2010. **Methods:** Twenty-eight countries were included and merged into six regions based on their welfare systems. Adolescents ($n = 142\,796$) were divided in four 'user groups': 'no-users', 'tobacco and cannabis users', 'tobacco-only users' and 'cannabis-only users'. Prevalence rates are reported by study-wave and region. Logistic regressions with study wave as independent variable were used to study trends in the user groups and regions. Interaction effects between time and gender were considered. **Results:** Overall, tobacco use, and concurrent tobacco and cannabis use decreased by 3 and 3.7%, respectively, but prevalence rates varied by region. Only in North America, an interaction effect between time and gender was found in tobacco and cannabis users. **Conclusions:** Although this study demonstrates a decrease in tobacco and cannabis use in most regions, it also shows that the use of both substances is related. Therefore, studying the co-occurring use of tobacco and cannabis is necessary.

Introduction

Despite legislation and prevention initiatives, substantial groups of adolescents smoke tobacco and/or use cannabis. Across Europe and North America, 18% of 15-year-olds smoke tobacco weekly or more frequently, and 13% use cannabis regularly (Health Behaviour in School-aged Children (HBSC) 2009/2010).¹ Adolescents are often motivated by the desire to experience the mood enhancing effects of these substances, to project a 'cool' adult-like image, or to adjust to peer norms.² However, tobacco use remains a leading cause of preventable death³ and frequently inhaling cannabis smoke's high concentration of tar, can lead to increased heart rate and blood pressure, and impaired respiratory function.⁴ Moreover, people using both substances have an elevated risk of respiratory distress, psychosocial problems and poorer cessation outcomes than users of each substance separately.^{5,6}

Several mechanisms can explain the co-occurrence of tobacco and cannabis use.⁷ First, the use of cigarettes may serve as a gateway for cannabis use (gateway hypothesis) or cannabis use can increase the risk of using tobacco (reverse gateway hypothesis). Second, tobacco and cannabis users may share a common vulnerability, which can be either genetically based (directly or indirectly, through a predisposition to externalizing problems) or environmentally based (low parental monitoring or support, negative peer influences, high availability of substances, media exposure). Third, smoking either substance may function as a trigger to use the other as the same set of behaviours is involved: lighting, inhaling, disposing of the end

of the cigarette/joint. Last, cannabis and tobacco are in fact often used in concert, as most youth use cannabis by smoking 'joints' containing tobacco.⁸

In most studies,^{1,9,10} trends in tobacco use and cannabis use are studied separately. Studying the joint use of these substances is necessary to capture the whole picture of tobacco and cannabis use. This study sets out to explore time trends in concurrent tobacco and cannabis use among 15-year-olds in Europe and North America over the school-years 2001/2002, 2005/2006 and 2009/2010, further referred to as 2002, 2006 and 2010.

Methods

Sample

This report contains data on 15-year-old boys and girls. Only countries that have data on the use of both tobacco and cannabis from the HBSC survey years 2002, 2006 and 2010 were included in the analyses. The countries were collated into six regional groups based on their current welfare system as described by Richter et al.¹¹: Northern European countries (social-democratic: Denmark, Finland, Greenland), 'Bismarckian' countries (conservative: Austria, Belgium, France, Germany, the Netherlands, Switzerland), Anglo-Saxon countries (liberal: Ireland, UK), Southern countries ('southern' system: Greece, Italy, Portugal, Spain, Former Yugoslav Republic of Macedonia), Eastern European countries (countries in transition: Croatia, Czech Republic, Estonia, Hungary, Latvia,

Lithuania, Poland, Russia, Ukraine, Slovenia) and North America (Canada, and the USA).

Measures

Current smoking: 'How often do you smoke at present?' Response options: 'Every day', 'At least once a week but not every day', 'Less than once a week', 'I do not smoke'. Respondents indicating that they smoked at least once a week were recoded as 'tobacco users'.

Cannabis use: 'Have you ever taken cannabis in the last 12 months?' Response categories: 'never' to '40 times or more'. Respondents who indicated they used cannabis in the last 12 months were recoded as 'cannabis users'. 'Last year use of cannabis' was used as an indicator because in 15-year-olds regular cannabis use (i.e. weekly) is rare and occasional cannabis use has been shown to be a risk behaviour.¹²

Respondents with missing data on one or both questions were recoded as missing ($n=9814$; 6.4% of the dataset). Four 'user groups' were identified: those neither using tobacco nor cannabis ('no-users'), those consuming both tobacco and cannabis ('tobacco and cannabis users'), those using tobacco but not cannabis ('tobacco-only users') and those consuming cannabis but not tobacco ('cannabis-only users').

Statistics

Prevalence rates are reported by study-wave and region. Trends in the prevalence of the four user groups were examined for each region separately, by using logistic regression by user group with study-wave as independent variable, and controlling for gender. Sequential binary logistic regressions were employed to test each user group against the others. Interaction effects between time and gender were considered.

Results

In total, 143 796 fifteen-year-olds were included in the analyses (2002: 43 734, 2006: 48 953, 2010: 51 109). Table 1 reports the prevalence rates by region and by user group in the three study-waves, along with odds ratios (ORs) comparing the user groups between the study-waves.

Prevalence and change by region

'Anglo-Saxon countries'—a region with high proportions of cannabis only (7.5%), and tobacco and cannabis users (8.4%), as compared with tobacco-only users (4.3%)—experienced a large

increase in the no-use group between 2002 and 2010. The 'Bismarckian' countries—equal distribution between the three user groups in 2010—showed significant decreases over time in the tobacco and cannabis and the tobacco-only user groups. 'Northern European countries'—higher proportion of tobacco-only users (14.0%) compared with tobacco and cannabis users (6.5%) and cannabis-only (3.2%) in 2010—showed a substantial decrease only in the tobacco and cannabis user group. In 'Southern European countries', the largest decrease was among tobacco and cannabis users. In 'Eastern European countries', the observed decrease was limited to tobacco-only and tobacco and cannabis user groups. Finally, in 'North America'—high proportion of cannabis-only users in 2010 (19.1%), compared with tobacco and cannabis (7.7%) and tobacco-only users (1.8%)—decreases were found among cannabis-only and tobacco and cannabis user groups.

Prevalence and change by user group

The proportion of (weekly) 'tobacco-only users' ranged from 1.8% (North America) to 14.1% (Eastern Europe) in 2010. With the exception of North America, where there was no change, a decrease is observed in the proportion of tobacco-only users between 2002 and 2010, most notably in the 'Bismarckian', Anglo-Saxon countries and in Eastern Europe. No interaction between gender and time was found.

'Cannabis-only users (last year)' ranged from 3.2% (Northern Europe) to 19.1% (North America) in 2010. Across all regions, no significant decrease was observed between 2002 and 2010. Within regions, the proportion of cannabis-only users decreased significantly in the Anglo-Saxon countries and North America. In the other regions, no or marginal ($0.01 < P < 0.05$) changes were observed. No interaction between gender and time was found.

The proportion of 'tobacco and cannabis users', ranged between 6.5% (Northern Europe) and 9.3% (Bismarckian countries) in 2010. Significant decreases between 2002 and 2010 (all $P < 0.001$) were observed in all regions ranging from 1% in Eastern European countries (from 9.2 to 8.0%) to 6% in Anglo-Saxon countries (from 14.6 to 8.4%). In North America, an interaction effect was found between gender and time. In boys, a sharp decrease between 2002 and 2006 from 14.1 to 5.4% ($P < 0.001$) was followed by an increase to 7.6% in 2010 ($P = 0.003$). In girls, a decrease was found between 2002 and 2006 from 10.3 to 7.6% ($P = 0.007$), followed by a stabilization in 2010 (7.8%, $P = 0.820$).

Table 1 Smoking and cannabis use in school year 2002, 2006 and 2010 by region

	Northern European countries ($n=9759$)			Bismarckian countries ($n=33862$)			Anglo-Saxon countries ($n=17611$)			Southern European countries ($n=22032$)			Eastern European countries ($n=47736$)			North America ($n=12796$)			All ($n=143796$)		
	2002	2006	2010	2002	2006	2010	2002	2006	2010	2002	2006	2010	2002	2006	2010	2002	2006	2010	2002	2006	2010
No use %	68.4	76.7	76.3	65.3	74.3	74.6	65	72.9	79.8	74.7	78.8	80.9	70	73.3	73.1	63	71.5	71.4	68.4	74.6	75.4
OR ^a	1	1.52	1.48	1	1.53	1.56	1	1.45	2.12	1	1.26	1.44	1	1.18	1.17	1	1.48	1.47	1	1.36	1.42
Tobacco use only (weekly use) %	16.9	14.2	14	11	8.7	8.7	6.4	6.1	4.3	9.4	8.3	7.7	16.3	13.7	14.1	2.3	1.4	1.8	12.1	9.8	9.1
OR ^a	1	0.81**	0.80**	1	0.77	0.77	1	0.98 ^{ns}	0.67	1	0.87*	0.81**	1	0.81	0.84	1	0.59**	0.81 ^{ns}	1	0.79	0.73
Cannabis use only (last year use) %	4.4	3	3.2	8.6	7.1	7.4	13.9	9.9	7.5	5.3	5.2	4.5	4.5	4.9	4.8	22.7	20.6	19.1	7.7	7.1	7.5
OR ^a	1	0.68**	0.73*	1	0.81	0.85**	1	0.66	0.49	1	0.99 ^{ns}	0.83*	1	1.09 ^{ns}	1.07 ^{ns}	1	0.87*	0.8	1	0.9	0.95 ^{ns}
Cannabis and tobacco use %	10.3	6	6.5	15.1	9.9	9.3	14.6	11	8.4	10.6	7.7	6.9	9.2	8.1	8	12	6.5	7.7	11.7	8.6	8
OR ^a	1	0.56	0.61	1	0.62	0.58	1	0.73	0.54	1	0.7	0.63	1	0.86	0.85	1	0.51	0.61	1	0.7	0.66

a: OR from logistic regression by user group and region separately, controlling for gender, with 2001/2002 as reference year. All ORs are significant at $P < 0.001$ except: ^{ns}, $P > 0.05$; *, $P < 0.05$ and **, $P < 0.01$

Discussion

Tobacco and cannabis use among 15-year-olds decreased significantly in most regions between 2002 and 2010. The extent of this change varies by user group and by region. Exceptions to these overall reductions are North America and the Eastern European countries, where no significant changes were observed in the proportions of tobacco-only and cannabis-only users. The concurrent use of tobacco and cannabis in 15-year-olds decreased dramatically within the study period.

Different factors may have accounted for the observed decrease in tobacco and cannabis use in the different regions. Economic and policy factors are likely to have played an important role, most notably the increase in tobacco price, which may have made these substances less accessible to adolescents.⁷ In addition, social factors can be important. Kuntsche et al.¹³ found that in most countries adolescents went out less frequently with their friends in 2006 compared with 2002, and demonstrated that cannabis use decreased accordingly.

The lack of decline in cannabis use in Eastern Europe can be partially explained by three important factors occurring in post-communist transition countries: (i) their previous relative isolation led to a delay in the development of cannabis distribution networks; the subsequent growth of these networks may have counteracted any otherwise downward trend (ii) dramatic social and economic changes, including increases in wealth and leisure opportunities, which have driven to substance use and (iii) unpreparedness of public health authorities and decision makers in terms of legislation, policy and education.¹⁴

One study limitation is that self-reports of smoking and cannabis use may raise validity and reliability issues. Adolescents typically view tobacco use as unnatural, harmful to health, addictive and unethical, and cannabis use as natural and harmless to their health.¹⁵ It could therefore be that adolescents who are using tobacco only, or tobacco together with cannabis under-report their tobacco smoking but not their cannabis use. In addition, because cannabis is often smoked with a small amount of tobacco, we cannot rule out a degree of error in group classifications. A second limitation is that the study only focuses on 15-year-olds and current substance use. Use of cannabis and other illicit drugs is more typical in late adolescence. Our results cannot be generalized to that group. Finally, the data were not weighted by country population. Therefore, a small country in a region has the same influence on the prevalence as a larger country. This has to be taken into account when interpreting the results.

Overall the findings are encouraging, demonstrating declining tobacco and cannabis use in most regions. However, there are considerable regional variations, which should be studied more thoroughly in future research. Our study provides support for the notion that changes in the use of the two substances are related. Though the legal status of tobacco and cannabis is vastly different in most countries, it is valid to study not only tobacco and cannabis use separately, but also as a co-occurring activity.

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Key points

- Tobacco-only use decreased in all European regions between 2002 and 2010; while cannabis-only use decreased in all regions except in Eastern European countries.
- Moreover, the concurrent use of tobacco and cannabis decreased in all regions between 2002 and 2010.
- Regional variations in prevalence rates are considerable and should be studied further.

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