

Binge Drinking, Cannabis and Tobacco Use among Ethnic Norwegian and Ethnic Minority Adolescents in Oslo, Norway

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Abstract

Aim

The aim of the study was to assess prevalence and factors associated with binge drinking, cannabis use and tobacco use among ethnic Norwegians and ethnic minority adolescents in Oslo.

Methods

We used data from a school-based cross-sectional survey of adolescents in junior- and senior high schools in Oslo, Norway. The participants were 10,934 adolescents aged 14 to 17 years, and just over half were females. The sample was comprised of 73.2% ethnic Norwegian adolescents, 9.8% 1st generation immigrants, and 17% 2nd generation adolescents from Europe, the US, the Middle East, Asia and Africa. Logistic regression models were applied for the data analyses. Age, gender, religion, parental education, parent-adolescent relationships, depressive symptoms and loneliness were as covariates in the regression models.

Results

Ethnic Norwegian adolescents reported the highest prevalence of binge drinking (16.1%), whereas the lowest prevalence was found among 2nd generation adolescents from Asia (2.9%). Likewise, the past-year prevalence for cannabis use ranged from 10.6% among 2nd generation Europeans and those from the US to 3.7% among 2nd generation Asians. For daily tobacco use, the prevalence ranged from 12.9% among 2nd generation Europeans and the US to 5.1% among 2nd generation Asians. Ethnicity, age, gender, religion, parental education, and parent-adolescent relationships and mental health status were significantly associated with binge drinking, cannabis and tobacco use. These factors partly explained the observed differences between ethnic Norwegians and ethnic minority adolescents in the current study.

Conclusion

There are significant differences in substance use behaviors between ethnic Norwegian and immigrant youth. Factors like age, gender, religion, parental education and relationships and mental

health status might influence the relationship between ethnicity and substance abuse. The findings have implications for planning selective- as well as universal prevention interventions.

Keywords: binge drinking, alcohol use, cannabis use, tobacco use, ethnic minority, adolescents, immigrants

Introduction

Research from Western countries has shown clear differences in the use of alcohol, cannabis [1] and tobacco [2] between adolescents with an immigrant background and adolescents with a background from the host culture. Few studies in Norway have also revealed such ethnic differences in substance use behaviors [3, 4]. However, given the increased immigration to Norway over the past 20 years, along with the increasing ethnic diversity among youth in Norwegian schools, we need more knowledge about ethnic differences and risk factors for lifestyle behaviors. Such knowledge is potentially important to reduce social inequality in health in general [5].

The use of alcohol, drugs and tobacco may vary with different ethnic backgrounds, primarily due to different social and cultural traditions and religious norms [6]. Studies from Western countries have examined the extent to which non-Western immigrants differ from the majority population with respect to drinking, cannabis use and tobacco use. These studies have generally found that immigrants tend to drink less than the majority population, and that drinking becomes more prevalent across immigrant generations [3, 7-10]. In contrast, cannabis seems to be more prevalent among immigrant youth than among youth in the majority population [10]. This might be due to cultural differences as cannabis is more culturally accepted and even legalized in some countries and there is a tendency for one type of drug to often being replaced with another.

Despite the increasing ethnic diversity among youth in several Western countries, and Norway in particular, very few studies on tobacco use, drinking and drugs use patterns from the Nordic countries have thus far distinguished between immigrant and majority backgrounds. Exceptions include a study by Amundsen, Rossow and Skurtveit (2005), who found that among 16-year olds in Norway, a smaller proportion of immigrant students were current drinkers, frequent drinkers and drank to intoxication compared with adolescents with a Norwegian background. They also found indications that immigrant youth who were more integrated (acculturated) into Norwegian culture had adopted Norwegian drinking habits to a greater extent than those who were

less acculturated. [3]. Similarly, a study of Swedish adolescents aged 13 to 16 found that 2nd generation adolescents drank more and engaged in more binge drinking than did 1st generation immigrants. However, the ethnic Swedish adolescents were less likely to use illicit drugs than all the minority groups [5]. This finding corresponds with a study from the UK, in which ethnic minority students were found to be over-represented in cannabis use, as well as the use of other illicit drugs [10].

The use of alcohol and cannabis is usually reported to be more prevalent among boys [10], although some studies have suggested that the gender gap has decreased in recent years [11]. In contrast, tobacco use has been reported to be more prevalent among adolescent girls [10]. In a Swedish study on adolescent alcohol and drug use, girls were more likely to engage in frequent alcohol drinking than boys [5], as the use of both alcohol and cannabis tends to increase with age throughout adolescence across genders [10-12], with similar trajectories observed for tobacco use [10].

Religion has been considered a stable protective factor against alcohol and drug use. For example, Muslims are not allowed to drink alcohol, and low consumption or abstaining has more often been reported among Muslim adolescents than among other adolescent groups [13]. In a study of 15- and 16-year-olds in the UK, Muslim, Hindu and Sikh youth reported lower levels of alcohol drinking than did the English majority youth [14]. In the same vein, two Norwegian studies have previously shown that ethnic Norwegian adolescents reported higher frequency of drinking compared to adolescents from countries where Islam was the main religion [3, 4].

In adolescence, peers become increasingly important, but the family situation still influences adolescents' lifestyle. Most studies show that a cohesive and supportive relationship within the family is associated with less substance use in adolescence. For instance, positive family relationships are considered to discourage drug use and initiation [15], whereas insecure relationships with the parents were related to higher levels of alcohol use [16]. Parental monitoring

has been associated with a lower frequency of alcohol use in Swedish adolescents [17] and less drug use among ethnic minority adolescents in the US [11]. Moreover, parental relationship styles may vary across cultures and ethnic groups, particularly among adolescents, which may help to explain some of the ethnic variations in binge drinking, cannabis use and tobacco use in adolescents.

In addition to the above mentioned familial and social factors, psychological characteristics, mainly involving affective and behavioural dysregulation, have been identified as potential contributors. These include depressed mood, anxiety and impulsivity, as well as antisocial tendencies [18]. Both cross-sectional and longitudinal studies have shown positive correlations between mental health, alcohol and illicit drugs use, and tobacco use [18].

In general, previous research has shown some evidence that majority and immigrant youth differ by means of binge drinking, cannabis use and tobacco use in the Nordic countries. However, little is known about heterogeneity among different ethnic groups. Additionally, the factors that may account for the differences in drinking, cannabis use and tobacco use are not well-established. The specific research questions for the current study were: 1) Do ethnic minority adolescents from Europe, the US, the Middle East, Asia and African differ from ethnic Norwegians in terms of binge drinking, cannabis use and tobacco use? 2) Do both 1st- and 2nd generation ethnic minority adolescents differ from ethnic Norwegians in binge drinking, cannabis and tobacco use? 3) Can age, gender, religion, parental education, trust and control and/or mental health account for the differences in binge drinking, cannabis use and tobacco use?

Methods

Study Design and Participants

The study employed a cross-sectional design and data were collected from the Young in Oslo study ("*Ung I Oslo 2006*"), which was conducted in 2006. From the list of all junior- and senior high schools in Oslo, 68 schools were selected at random and weighted by size (proportional allocation).

The response rate was 97.0%. The respondents comprised 11,440 adolescents aged 14 to 17 years (51.2% females, 48.8% males). The students completed the self-administered questionnaires in class, and those not present at the time of data collection were asked to complete the survey at a later occasion. The questionnaire addressed a number of issues related to psychosocial and academic status. In this paper, the net sample was 10,934 after excluding participants with invalid or missing data for various reasons; 95.6% of the sample are included in this study.

Ethical Considerations

Students gave informed consent according to the standards prescribed by the Norwegian Data Inspectorate, and the regional committee for research ethics endorsed the survey.

Outcome Variables

Binge drinking was measured by asking participants to indicate how much they had been drinking alcohol per week during the preceding 12 months. The response scale ranged from 1 (“never”) to 8 (“about every day”). Drinking 5 or more alcohol drinks at least once per week over the past year was used as a cut-off point for measuring the prevalence of binge drinking in the past year [19]. This cut-off point has showed a sensitivity of 0.90 for last year alcohol abuse or dependence in men and 0.77 in women [20].

Cannabis use (marijuana or hash) was also assessed by asking the frequency of cannabis use over the past 12 months. The response scale ranged from 1 (“never”) to 7 (“more than 50 times”). Using cannabis at least once in the past year was a cut-off point for measuring the prevalence over the past year [21].

Tobacco use was assessed by measuring the frequency of smoking over the past 12 months, ranging from 1 (“never smoking”) to 4 (“smoking daily”), and smoking daily was applied as a cut-off point for measuring the prevalence of tobacco use.

Despite the risk of losing information we have dichotomized the outcome variables to get a visible measure to easily compare between the groups and to be able to calculate Odds Ratios (OR) in the logistic regression where most of the independent variables are nominal.

Independent Variables

Ethnicity was determined by the birth place of the participants for the 1st generation adolescents (i.e. “immigrant youth” according to the term used by Statistics Norway) and by the birth place of the parents for the 2nd generation adolescents (i.e. “youth with both migrant parents born outside of Norway” according to the term used by Statistics Norway). Since the size of the sample population for ethnic minority adolescents in each country was small, we categorized ethnic minority adolescents into four groups based on their parents’ birth place – Europe and the US, the Middle East (predominantly from Iraq, Iran and Turkey), Asia (predominantly from Pakistan, Vietnam, Sri Lanka and India) and Africa (predominantly from Somalia and Morocco).

Parental level of education was determined on the basis of the participant’s mother and father’s combined scores that ranged from 1 (“less than junior high school education”) to 5 (“college or university education”).

Family relationship styles including trust and social control were measured by 12 items. Items with a high factor loading, 8 items for trust and 4 items for social control, were selected by applying a factor analysis, with the response for each response ranging from 1 (“corresponds very poorly”) to 4 (“corresponds very well”) [22]. A higher score indicates a greater trust and social control styles of family relationship. Internal consistency (Cronbach’s alpha) for the scale in the current study was 0.81.

Symptoms of depression were measured by use of the six items on the Hopkins Symptom Checklist [23]. Using a four-point response scale ranging from 1 (“corresponds very poorly”) to 4 (“corresponds very well”), the participants were asked to restrict their ratings to the preceding

week. High scores showed high levels of depressive symptoms. Internal consistency for the scale in the current study was 0.86.

Loneliness was measured by a five-item version of the UCLA Loneliness Scale. For each item, response options ranged from 1 (“never”) to 4 (“often”) [24]. A higher score reflects greater loneliness. Internal consistency for the scale in the current study was 0.71.

Age was recorded as a continuous variable. Gender was also recorded and coded 0 for males and 1 for females. Religious affiliation was categorized as Christian, Muslim and “other.” The “other” category comprised Hindus, Buddhist, Jews and individuals with no religious affiliation.

Statistical Analysis

To examine differences in the prevalence of binge drinking, cannabis use and daily tobacco use between ethnic Norwegian- and ethnic minority adolescents, and investigate the association between these behaviors and explanatory factors, we applied a step-wise logistic regression model, in which explanatory factors were added step-by-step for each model. Odds ratio with 95% confidence intervals (CI) were estimated. A p-value ($P \leq 0.05$) was regarded as statistically significant. The changes in OR and p-values were considered as explanatory indicators for the association between substance use behaviors and ethnicity across each model. Maximum likelihood estimates were applied, and a statistical analysis was carried out using survey commands in Stata SE/11. The use of survey command analyses for logistic regression helps to reduce bias induced by the sampling design and clustering [25]. Moreover, preliminary analyses showed only a small between schools variation (<5%) in substance use behaviors, and as such it was not considered necessary to run multi-level analysis that would take into account possible systematic variation among schools.

Results

The sample populations and past-year prevalence of binge drinking, cannabis use and tobacco use are presented in Table 1. The study population was comprised of 73.2% ethnic Norwegian adolescents, 9.8% of 1st and 17% of 2nd generation ethnic minority adolescents from Europe, the US, the Middle East, Asia and Africa. For binge drinking, the ethnic Norwegians reported the highest prevalence, while the lowest was reported by 2nd generation adolescents from Asia. The prevalence of cannabis use was greatest among 2nd generation adolescents with migrant parents from Europe and the US and lowest among 2nd generation from Asia. For daily tobacco use, the highest prevalence was found among 2nd generation adolescents from Europe and the US and the lowest among 2nd generation adolescents from Asia.

Table 1 about here

A bivariate correlation matrix of all explanatory variables and outcomes is depicted in Table 2. The table shows significant correlations between most explanatory and outcome variables. As for factors associated with binge drinking, cannabis use and daily tobacco use, the logistic regression results are presented in Tables 3, 4 and 5, respectively. As described in the method section, the explanatory factors were added to the logistic regression models step-by-step: The differences in OR between ethnic groups were summarized in Model 1, age and gender were added in Model 2, religion was added in Model 3, parental education and relationships were added in Model 4 and mental health status was added in Model 5.

Adjusting only for age and gender, Model 2 shows that 2nd generation adolescents from the Middle East, Asia and Africa, as well as all 1st generation ethnic minority adolescents, had significantly lower odds of binge drinking compared to ethnic Norwegian adolescents. In the final model (Model 5), there was no longer a significant difference between ethnic Norwegian adolescents and 1st generation immigrant adolescents from Europe and the USA, and 1st and 2nd generation adolescents from the Middle East. These changes appear to be due to the inclusion of

religion in Model 3. In Model 5, older age; higher levels of parental education; and greater depressive symptoms and loneliness were significantly associated with higher odds of binge drinking. While those who were Muslims and those with a higher score on parental social control had significantly lower odds of binge drinking.

Table 2 and 3 about here

As shown in Model 2 in Table 4, after adjusting for age and gender the risk of cannabis use was significantly lower among 2nd generation adolescents from the Middle East, Asia and Africa, and 1st generation Middle Eastern and Asian as compared to ethnic Norwegian adolescents. At the final step of the analysis (Model 5), there was no longer a significant difference between ethnic Norwegian adolescents and the 2nd generation immigrant adolescents from the Middle East and Africa, and the 1st generation immigrant adolescents from the Middle East. These changes appear to be due to the inclusion of religion in Model 3. In the final model (Model 5), older age; being male; belonging to non-Christian/non-Muslim group; and greater symptoms of depression were significantly associated with higher odds of cannabis use. While higher scores for parental trust and social control were significantly associated with lower odds of cannabis use. Even though the difference between ethnic Norwegians and 1st generation Africans was not significant in Models 1 to 4, this difference became statistically significant in the final model, after depressive symptoms and loneliness were included.

Table 4 about here

In Table 5, after only adjusting for age and gender (Model 2), the 2nd generation adolescents from Europe and the US had higher odds of daily tobacco use compared to ethnic Norwegians, whereas 2nd generation Asians had lower odds of tobacco use. In the final model (Model 5), the 2nd generation adolescents from Europe and the US were no longer significantly different from the ethnic Norwegian adolescents. In the final model (Model 5), the 2nd generation Africans had significantly lower odds of daily tobacco use. This difference became evident after the inclusion of

religion in Model 3. Similarly, after including religion, 1st generation Asian adolescents had significantly lower odds of daily tobacco use compared to the ethnic Norwegians. In the final model, the 1st generation Africans also had significantly lower odds of daily tobacco use compared to the ethnic Norwegian adolescents. This became evident after parental education, and family relationship were included in the analysis. Furthermore, older age; belonging to the Islamic religious group and non-Christians/non-Muslims; and greater symptoms of depression were significantly associated with higher odds of tobacco use in the final model. Whereas, being male; higher levels of parental education; and higher scores for parental trust and social control were significantly associated with lower odds of cannabis use.

Table 5 about here

Discussion

In this study, we found that ethnic minority adolescents from the Middle East, Asia and Africa differed from ethnic Norwegian adolescents in terms of the risk of binge drinking and cannabis use. Some of these differences were also evident after adjustments for age, gender, religion, parents' education, parental relationship with trust and social control, as well as depressive symptoms and loneliness. In particular, adolescents from the Middle East, Asia and Africa had a lower risk of binge drinking and cannabis use compared to ethnic Norwegians. Such ethnic differences have also been found in studies conducted in Sweden, the UK and the US, where adolescents with non-host culture backgrounds had a lower risk of drinking alcohol compared to those with host culture background [1, 5, 10, 26]. With regard to tobacco use, there were no differences between most ethnic minority groups compared to ethnic Norwegians, with the exception of a higher daily tobacco use prevalence among 2nd generation adolescents with migrant parents from Europe and the US, in addition to a lower risk of tobacco use among 2nd generation Asians compared to ethnic Norwegians. The lower risk of cannabis use is contradictory to studies from the US that found

higher use of cannabis among immigrant youth [1, 5, 10, 26]. We think that might be due to lower level of cannabis use among youth in Norway compared to the US.

More specifically, adolescents from Asia, both the 1st and 2nd generations, had a lower risk of binge drinking and cannabis use compared to ethnic Norwegians. The overall reduced risk for adolescents from Asia may be associated with a strong family attachment and social support established through their longer residence time in Norway. For example, a study among migrants from Vietnam to Norway found that there is a strong adherence to traditional culture and a high level of educational ambitions transferred from parents to the new generation, which may account for the lower risk of such risky lifestyle behaviors [27].

The acculturation hypothesis states that there are lesser distinctions in terms of lifestyle behaviors between the majority population and those born in host countries, as well as those immigrants with a longer residence time. Along the same lines, other studies reported that 2nd generation adolescents tended to be more similar to the majority population with regard to drinking habits [3, 28]. In contrast to this hypothesis and prior findings, our study revealed that 2nd generation adolescents tended to have lower rates of binge drinking and cannabis use than ethnic Norwegians. Such contradictory findings should be addressed in future studies.

Older adolescents had a greater risk of binge drinking, cannabis use and tobacco use, which is in accordance with previous studies [10, 29]. Boys had a higher risk of binge drinking and cannabis use, but girls had a higher risk of tobacco use, with prior studies reporting similar gender differences [10, 11]. In contrast, a Swedish study reported that girls were more likely to engage in frequent alcohol drinking than boys [5]. However, the current study showed that the ethnic differences in binge drinking, cannabis use and tobacco use could not be accounted for by differences in age and gender.

Our study found religion to be associated with binge drinking, cannabis use and tobacco use, as well as being an explanatory factor for ethnic differences, particularly for 2nd generation adolescents from the Middle East. More specifically, Muslims had a lower risk of binge drinking, but a higher risk of tobacco use, which was a finding also reported in other studies [13, 14]. Alcohol is forbidden in many Islamic countries and there is a tendency for one type of drug to often being replaced with another. A good example of this is that when alcohol is culturally unaccepted, it may be replaced with a higher degree of anxiolytic drug consumption [30].

Higher level of parental education was associated with an increased risk of binge drinking and a decreased risk of tobacco use, but was unrelated to cannabis use. These findings might show that alcohol is accepted culturally among the well-educated. Higher levels of both trust and social control in the parent-adolescent relationship were associated with a decreased risk of binge drinking, cannabis use and tobacco use. This supports family interaction theory insofar as adolescents who have good interaction with their parents and emotional attachment to their parents may have reduced risky behaviors [31]. Even so, parental level of education and the parent-adolescent relationships could not account for any of the other differences in relation to the risk of binge drinking, cannabis use and tobacco use. Furthermore, although length of stay has been considered as a determinant for psychosocial well-being, this study did not investigate its effect on risky lifestyle behaviours. This should also be taken up in future studies.

Symptoms of depression were positively associated with greater risk of binge drinking, cannabis use and tobacco use, while loneliness was only significantly associated with binge drinking. However, depressive symptoms and loneliness could not account for the ethnic differences in binge drinking, cannabis use and tobacco use. Moreover, the effect of tobacco use and symptoms of depression were also documented in the Norwegian longitudinal studies [32]. Although studies reported mixed findings about the direction of the association in general, the co-

occurrence between mental illness and the use of alcohol, illicit drugs and tobacco use is well established in epidemiological research [18].

The main strength of the current study is that it included data from a representative sample of adolescents in Oslo, thereby allowing for a generalization to the adolescent population in Oslo. However, the study also has limitations. First, the sample was not randomly drawn from the population, since the school was the primary sampling unit. However, this clustered sampling was adjusted for in the analyses. Second, the use of cross-sectional design may limit the interpretation of our findings, as we cannot draw inferences about the causal direction of the observed associations. Longitudinal studies are required to come closer to establishing the direction of causality. Moreover, qualitative studies with a longitudinal design could supplement our understanding of acculturation processes regarding substance use behaviors. Third, the data used in the current study was self-reported. This may be a limitation, as the findings may have been influenced by self-report bias and common method variance. Fourth, the sample was too small to allow stratification by country of origin or birth. We therefore had to analyze clusters of countries. Ethnicity was measured by proxy – the country of birth rather than defining through a sense of group belonging based on culture, language, experience and self-value, which could be a source for the misclassification bias. The same applies for religious affiliation. We only measure religion as a cultural entity and not the strength of faith or religious activity which might have changed the way religion appear in this study. Fifth, a large difference in sample sizes between ethnic Norwegian- and ethnic minority adolescents may limit comparability across groups. This should be carefully considered when interpreting the study findings. Sixth, even though we found that substance use behaviors show a small between-schools variation (<5%), future study should consider examining these behaviors through a multi-level analysis that identifies variations between and within schools. Lastly, we did not explore moderation or mediation analyses; however, future research may benefit

from such an analysis to help further explore the relationships between substance use behaviors and ethnicity.

Conclusion

In summary, the current study found marked ethnic differences in binge drinking, cannabis use and tobacco use. Particularly ethnic Norwegian adolescents were found to be at a greater risk for binge drinking. These risky lifestyle behaviors were significantly associated with most psychosocial and familial factors, though ethnic differences could not be accounted for by most of these factors.

Significant psychosocial and familial factors can be used in identifying or characterizing high-risk adolescents, in addition to being an important precursor in the design of the content of prevention programs. The ethnic differences and similarities are important knowledge for planning selective as well as universal prevention interventions, which may further reduce social inequality in health.

We also highly recommend future longitudinal and qualitative studies to address this public health challenge in greater detail.

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Table 1. Past-year prevalence of binge drinking, cannabis use and smoking among adolescents in Oslo.

Ethnic groups	Total sample population		Binge drinking		Cannabis use		Tobacco use	
	N	%	N	% (95% CI)	N	% (95% CI)	N	% (95% CI)
Norwegian	8002	73.2	1266	16.1(15.3, 16.9)	783	10.1(9.4, 10.8)	654	8.3(7.7, 8.9)
2 nd generation:								
European & USA	181	1.7	25	14.2(9.8, 20.2)	18	10.6(6.8, 16.2)	23	12.9(8.7, 18.7)
Middle East	284	2.6	13	5.1(2.9, 8.6)	16	5.6(3.4, 9.0)	22	7.7(5.1, 11.6)
Asian	1069	9.8	29	2.9(2.0, 4.2)	39	3.7(2.6, 5.0)	54	5.1(3.9, 6.6)
African	319	2.9	12	4.1(2.4, 7.1)	19	6.3(4.0, 9.6)	16	5.2(3.2, 8.3)
1 st generation:								
European & USA	228	2.1	21	9.3(6.0, 14.1)	25	9.8(6.4, 14.7)	17	7.2(4.4, 11.6)
Middle East	261	2.4	12	4.3(2.3, 7.8)	18	7.1(4.5, 11.1)	29	11.5(8.1, 16.1)
Asian	366	3.3	19	5.7(3.6, 8.7)	21	5.9(3.9, 8.9)	26	7.3(5.1, 10.5)
African	224	2.0	14	6.6(3.8, 11.1)	17	7.9(4.9, 12.6)	15	6.8(6.1, 11.1)

N=number; CI=confidence interval; %=percentage

Note: The prevalence (N) was calculated using complete cases or those who responded for binge drinking, tobacco and alcohol use

Table 2. Bivariate correlations among outcome and predictor variables in the study.

Ethnicity	-										
Alcohol use	-0.13*	-									
Cannabis use	-0.50*	0.37*	-								
Tobacco use	-0.02	0.31*	0.42*	-							
Age	0.01	0.18*	0.13*	0.13*	-						
Gender	-0.01	0.02	0.05*	-0.02	-0.01	-					
Religion	0.05*	0.03*	0.06*	0.09*	0.01	0.08*	-				
Parental education	-0.26*	0.06*	-0.01	-0.08	-0.02*	0.02	-0.06*	-			
Family: Trust	-0.01	-0.12*	-0.18*	-0.18*	<-0.01	-0.05*	-0.10*	0.10*	-		
Family: Social control	-0.05*	-0.15*	-0.20*	-0.17*	-0.05*	-0.15*	-0.11*	0.06*	0.54*	-	
Depressive symptoms	0.02*	0.11*	0.16*	0.19*	0.10*	-0.16*	0.04*	-0.10*	-0.29*	-0.13*	-
Loneliness	-0.09*	0.08*	0.07*	0.07*	0.07*	-0.07*	0.01	0.08*	-0.09*	-0.05*	0.31*

*p<0.05

Table 3. Factors associated with binge drinking among adolescents in Oslo.

Factors	Binge drinking				
	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Ethnicity:					
Norwegian	1.00	1.00	1.00	1.00	1.00
2 nd generation:					
European & USA	0.86(0.56-1.33)	0.90(0.57-1.41)	1.09(0.67-1.78)	0.97(0.55-1.71)	0.75(0.39-1.39)
Middle East	0.28(0.16-0.46)***	0.27(0.17-0.49)***	0.54(0.28-1.06)	0.46(0.19-1.05)	0.46(0.19-1.08)
Asian	0.16(0.11-0.23)***	0.15(0.10-0.23)***	0.26(0.16-0.39)***	0.21(0.12-0.37)***	0.22(0.12-0.38)***
African	0.22(0.13-0.40)***	0.22(0.12-0.41)***	0.35(0.17-0.70)**	0.29(0.13-0.67)**	0.28(0.12-0.68)**
1 st generation:					
European & USA	0.54(0.33-0.86)*	0.53(0.32-0.87)*	0.63(0.36-1.10)	0.52(0.28-0.99)*	0.58(0.31-1.11)
Middle East	0.24(0.12-0.44)***	0.18(0.09-0.38)***	0.39(0.17-0.91)*	0.39(0.15-1.01)	0.38(0.14-1.02)
Asian	0.31(0.19-0.50)***	0.24(0.14-0.43)***	0.38(0.21-0.68)**	0.44(0.24-0.80)**	0.46(0.25-0.85)*
African	0.37(0.21-0.65)**	0.33(0.13-0.64)**	0.71(0.35-1.44)	0.31(0.11-0.86)*	0.34(0.12-0.97)*
Age	-	1.93(1.81-2.07)***	1.95(1.81-2.08)***	1.99(1.83-2.16)***	1.93(1.78-2.10)***
Gender:					
Female	-	1.0	1.0	1.0	1.00
Male	-	1.25(1.03-1.44)**	1.21(1.03-1.44)*	1.09(0.89-1.32)	1.01(0.81-1.53)
Religion:					
Christian	-	-	1.0	1.0	1.00
Islam	-	-	0.34(0.23-0.52)***	0.46(0.29-0.73)**	0.47(0.29-0.76)**
Other	-	-	1.19(1.05-1.36)**	1.09(0.95-1.25)	1.10(0.95-1.27)
Parental education	-	-	-	1.14(1.06-1.22)***	1.14(1.06-1.22)***
Family relationship with:					
Trust	-	-	-	0.86(0.77-0.95)***	0.96(0.85-1.07)
Social control	-	-	-	0.61(0.55-0.68)**	0.61(0.54-0.68)***
Depressive symptoms	-	-	-	-	1.31(1.18-1.47)***
Loneliness	-	-	-	-	1.22(1.01-1.47)*

OR= odds ratio; CI= confidence interval; *p < 0.05, **p < 0.01, ***p < 0.001.

Table 4. Factors associated with cannabis use among adolescents in Oslo.

Factors	Cannabis use				
	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Ethnicity:					
Norwegian	1.00	1.00	1.00	1.00	1.00
2 nd generation:					
European & USA	1.05(0.64-1.73)	1.09(0.65-1.81)	1.17(0.68-2.03)	0.91(0.47-1.77)	0.70(0.34-1.44)
Middle East	0.53(0.31-0.89)*	0.57(0.34-0.98)*	0.67(0.37-1.22)	0.63(0.32-1.24)	0.55(0.27-1.12)
Asian	0.34(0.24-0.47)***	0.34(0.24-0.48)***	0.37(0.25-0.56)***	0.28(0.16-0.47)***	0.29(0.17-0.49)***
African	0.59(0.37-0.96)*	0.60(0.36-0.99)*	0.59(0.32-1.11)	0.49(0.24-0.97)*	0.46(0.21-1.01)
1 st generation:					
European & USA	0.97(0.61-1.54)	1.04(0.63-1.70)	0.97(0.56-1.68)	1.28(0.71-2.31)	1.29(0.69-2.40)
Middle East	0.68(0.41-1.12)	0.54(0.30-0.97)*	0.58(0.28-1.19)	0.54(0.22-1.31)	0.54(0.22-1.33)
Asian	0.56(0.36-0.88)*	0.58(0.36-0.96)*	0.56(0.33-0.97)*	0.35(0.18-0.66)**	0.35(0.18-0.68)**
African	0.77(0.45-1.29)	0.58(0.31-1.11)	0.65(0.31-1.38)	0.45(0.18-1.17)	0.30(0.09-0.91)*
Age	-	1.74(1.61-1.89)***	1.74(1.61-1.89)***	1.77(1.61-1.95)***	1.77(1.61-1.96)***
Gender:					
Female		1.00	1.00	1.00	1.00
Male	-	1.39(1.21-1.61)***	1.34(1.16-1.55)***	1.11(0.93-1.31)	1.39(1.16-1.67)***
Religion:					
Christian	-	-	1.00	1.00	1.00
Islam	-	-	1.05(0.71-1.54)	1.14(0.73-1.76)	1.11(0.69-1.76)
Other	-	-	1.55(1.32-1.81)***	1.23(1.03-1.47)*	1.23(1.02-1.47)*
Parental education	-	-	-	0.96(0.89-1.03)	0.98(0.91-1.07)
Family relationship with:					
Trust	-	-	-	0.66(0.59-0.75)***	0.77(0.68-0.88)***
Social control	-	-	-	0.55(0.49-0.62)***	0.55(0.49-0.63)***
Depressive symptoms	-	-	-	-	1.81(1.60-2.05)***
Loneliness	-	-	-	-	0.93(0.74-1.17)

OR= odds ratio; CI= confidence interval; *p < 0.05, **p < 0.01, ***p < 0.001.

Table 5. Factors associated with daily tobacco use among adolescents in Oslo.

Factors	Daily Smoking				
	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)	Model 4 OR (95% CI)	Model 5 OR (95% CI)
Ethnicity:					
Norwegian	1.00	1.00	1.00	1.00	1.00
2 nd generation:					
European & USA	1.62(1.04-2.54)*	1.74(1.10-2.74)*	1.53(0.93-2.51)	1.49(0.83-2.68)	1.44(0.75-2.76)
Middle East	0.92(0.58-1.44)	0.96(0.60-1.54)	0.68(0.40-1.14)	0.62(0.33-1.14)	0.53(0.27-1.01)
Asian	0.59(0.44-0.79)***	0.57(0.42-0.78)***	0.42(0.28-0.62)***	0.32(0.20-0.51)***	0.32(0.19-0.52)***
African	0.60(0.36-1.00)	0.63(0.37-1.07)	0.39(0.21-0.76)**	0.19(0.08-0.46)***	0.20(0.08-0.52)***
1 st generation:					
European & USA	0.85(0.50-1.45)	0.86(0.49-1.49)	0.59(0.30-1.17)	0.66(0.29-1.45)	0.73(0.32-1.67)
Middle East	1.42(0.95-2.13)	1.23(0.95-2.13)	0.91(0.53-1.55)	0.73(0.37-1.41)	0.71(0.35-1.39)
Asian	0.86(0.57-1.29)	0.75(0.46-1.20)	0.50(0.28-0.88)*	0.30(0.15-0.58)***	0.31(0.16-0.61)**
African	0.80(0.46-1.38)	0.71(0.37-1.36)	0.51(0.24-1.08)	0.29(0.10-0.85)*	0.27(0.10-0.85)*
Age	-	1.77(1.62-1.94)***	1.78(1.63-1.96)***	1.81(1.62-2.01)***	1.75(1.56-1.97)***
Gender:					
Female		1.00	1.00	1.00	1.00
Male	-	0.83(0.75-0.96)*	0.79(0.68-0.93)**	0.69(0.58-0.83)***	0.80(0.66-0.98)*
Religion:					
Christian	-	-	1.00	1.00	1.00
Islam	-	-	1.98(1.40-2.81)***	2.04(1.37-3.05)***	2.05(1.33-3.14)**
Other	-	-	1.62(1.37-1.93)***	1.25(1.03-1.52)*	1.27(1.03-1.57)*
Parental education	-	-	-	0.79(0.74-0.86)***	0.81(0.74-0.88)***
Family relationship with:					
Trust	-	-	-	0.56(0.49-0.63)***	0.66(0.58-0.76)***
Social control	-	-	-	0.68(0.59-0.77)***	0.67(0.58-0.77)***
Depressive symptoms	-	-	-	-	1.74(1.51-1.99)***
Loneliness	-	-	-	-	1.13(0.87-1.46)

OR= odds ratio; CI= confidence interval; *p < 0.05, **p < 0.01, ***p < 0.001.