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Immigrant Status, Family Support, and Psychoactive Substance Use Among Adolescents: A Multilevel Analysis of the Cross-National HBSC Study Data

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Abstract

Background: Immigrant adolescents experience distinct risk and protective factors related to substance use; however, cross-national differences between immigrant and native-born youth remain insufficiently understood. This study examines differences in the prevalence of psychoactive substance use between immigrant and non-immigrant 15-year-old adolescents and assesses the protective role of family support across Europe, Central Asia, and North America. Materials and Methods: Data were drawn from nationally representative samples of the 2021/2022 WHO Health Behaviour in School-aged Children (HBSC) survey, including 15-year-olds from 32 countries, representing Belgium by two separate regions (n = 66,400). Outcomes included cigarette smoking, electronic cigarette use, alcohol consumption, drunkenness, and cannabis use in the past 30 days. Key predictors were immigrant status and family support. Multilevel analyses incorporated country-level indicators, including the proportion of immigrant youth and the Inclusiveness Index, and were adjusted for sex and family affluence. Results: Substantial cross-national variation in substance use prevalence was observed. Immigrant adolescents were more likely to smoke cigarettes, use electronic cigarettes, and use cannabis, whereas alcohol consumption was more common among non-immigrant adolescents. However, in countries with a low proportion of immigrant youth (<5%), immigrant adolescents showed an elevated likelihood of engaging in all forms of psychoactive substance use, including alcohol consumption. Low family support emerged as the strongest and most consistent predictor of substance use across all outcomes. Conclusions: Immigrant adolescents living in countries with low immigration rates constitute a particularly vulnerable group facing increased risk of substance use. Family support is protective against adolescent substance use for both immigrant and non-immigrant youth, with the strongest effect for alcohol use in low-immigration contexts.

Keywords: adolescent; immigrant; substance use; family support; HBSC; multilevel analysis

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1. Introduction

In recent times, migration has been one of the main processes shaping the sociocultural landscape of contemporary societies. Moving to another country is usually driven by expectations of finding better opportunities, but it can also be a source of anxiety, particularly for adolescents. Coping with pre- and post-migration experiences, access to and availability

of substances, and socialization with peers are key factors influencing young people's health-risk behaviors [1]. Immigrant youth may experience elevated stress and greater difficulties during the process of acculturation, that is, adaptation to and integration into the host country [2–4]. Anxiety related to migration status, driven by perceived discrimination and low levels of social support, may have negative implications for young people's mental health [5,6] and may trigger maladaptive behavioral responses, such as the use of psychoactive substances [7–9].

Another behavioral pattern discussed in the literature is the healthy immigrant paradox, whereby recent immigrants, including immigrant youth, may exhibit better health outcomes and engage in healthier lifestyles than the native population [9,10]. A systematic review comparing prevalence rates among immigrant and native adolescents found that the risk of alcohol use was lower among immigrants—particularly those with a Muslim background—whereas for tobacco and illicit drug use, no consistent patterns or clearly delineated differences were observed between immigrant and native peers [10].

Behavioral patterns related to substance use among young people depend on different factors, such as cultural norms, peer influence, family and school connectedness, and participation in positive social activities. For immigrant youth, family support plays an especially important role. In particular, supportive relationships in the family, family connectedness maintained through frequent joint activities between family members, positive parenting practices, effective parental control and monitoring are associated with lower levels of risky behaviors among young people with non-native background [11–13]. Accordingly, consideration of family dynamics and parent–child relationships is recommended as an integral element in any intervention program, targeting immigrant youth's behavioral health [14,15].

Drawing on family systems theory [16] as a theoretical framework of the present study, immigration experience is conceptualized as a specific family-level characteristic that shapes young people's health behavior. Immigrant families are viewed as entities of emotional interdependence between the family members in which the experiences and changes in one family member affects the others. Challenges related to acculturation and integration in the host country, socioeconomic deprivation and perceived discrimination may strain family and parent–child relationships, thereby influencing immigrant adolescents' health behaviors in multiple ways. On the one hand, strengthened family cohesion, effective parental monitoring and positive parenting may have a preventive effect on the external difficulties of acculturation and social integration, promoting healthier behavioral outcomes in immigrant youth. On the other hand, difficulties in social adaptation, experiences of social exclusion, socioeconomic vulnerability, and material deprivation may undermine family relationships and elicit maladaptive behavioral responses, increasing the risk of substance use.

In view of the above, and given the scarcity of empirical evidence of the association between the concepts addressed, the aim of this study was to examine the differences in the prevalence of psychoactive substance use between immigrant and non-immigrant 15-year-old adolescents in Europe, Central Asia, and North America. We hypothesized that (H1) immigrant adolescents are more likely to engage in risky behaviors than their native-born peers; (H2) insufficient family support is associated with an increased risk of substance use among adolescents; and (H3) the effects of immigrant status on adolescent risk behaviors vary across countries.

2. Materials and Methods

2.1. Study Population

The current analysis was based on data from the 2021–2022 Health Behaviour in School-aged Children (HBSC) survey conducted in 41 countries across Europe, Central Asia, and Canada [17–19]. As in the HBSC study, Belgium is represented by separate French- and Flemish-speaking regions, and the UK is represented by separate England, Scotland and Wales regions; therefore, 44 regions were treated as distinct units in the present analysis. All countries/regions employed an observational, cross-sectional study design. Study participants were adolescents—students attending general education schools—aged 11, 13, and 15. They anonymously completed a standardized questionnaire assessing a broad range of health indicators and related behaviors. Research teams followed the standardized methodology outlined in the HBSC protocol [17]. Further details on the study's aims, theoretical framework, and survey methodology are available online in international reports [18,19].

In each country, the survey received approval from the appropriate regulatory or ethics body, and informed consent was obtained from both the adolescents and a parent or guardian. As the present study involved secondary analysis of existing data with no direct participant contact, no additional ethical approval was required.

Data were obtained from the HBSC Data Management Centre at Bergen University, Norway [20]. The full dataset contained nationally representative samples of adolescents aged 11, 13, and 15 from 41 countries (44 regions) (n = 279,117). To minimize response bias and focus on more prevalent behaviors, thereby supporting more robust statistical inference, the current study restricted its analysis to 15-year-old adolescents. Middle adolescence is characterized by increased risk-taking behaviors, including substance use, driven by growing independence from parents and family, the formation of personal identity, and the expansion of social relationships beyond the family. At the same time, this developmental stage is marked by heightened vulnerability due to limited life experience, which, in the context of substance use, may lead to negative consequences for young people's mental and behavioral health. This vulnerability is even more pronounced among immigrant youth, who additionally face challenges related to adaptation and integration in the host country. The final analyses included fifteen-year-olds from 32 countries (33 regions), all of whom provided information on both their country of residence and country of birth (n = 66,400).

2.2. Variables

The outcome (dependent) variables measured the use of psychotropic substances (nicotine, alcohol, and cannabis) in the last 30 days. Adolescents were asked on how many days they had smoked cigarettes, used electronic (e-) cigarettes, and consumed alcoholic beverages in the last 30 days. Response options were: 1 = never, 2 = 1–2 days, 3 = 3–5 days, 4 = 6–9 days, 5 = 10–19 days, 6 = 20–29 days, and 7 = all days. Additionally, respondents were asked if they had ever had so much alcohol that they were really drunk in the last 30 days. Response options were: 1 = no never, 2 = yes once, 3 = yes 2–3 times, 4 = yes 4–10 times, and 5 = yes more than 10 times. Findings presented in this study show the proportions reporting 'never' use (coded as 0) and use 'at least 1–2 days'/'yes once' (coded as 1) in the last 30 days.

The set of independent variables included two individual- and two country-level factors. The first individual-level factor estimated how much support an adolescent receives from family, especially parents, when they have problems. It was measured using the Multidimensional Scale of Perceived Social Support [21,22], adapted and validated for the HBSC study as the 'Family Support Scale'. Adolescents responded to four statements: (1) 'My family really tries to help me', (2) 'I get the emotional help and support I need

from my family', (3) 'I can talk about my problems with my family', and (4) 'My family is willing to help me make decisions'. Response options ranged from 0 ('very strongly disagree') to 6 ('very strongly agree'). Cronbach's alpha for this scale was 0.933, based on data from all 15-year-old participants. Family support was assessed by summing the scores of responses to the statements, with a higher total score indicating greater levels of family support. Based on the ROC curve and sensitivity analyses in regard to substance use among 15-year-olds, a total score of 24 or higher was categorized as high perceived family support (=0), while a score below 24 was categorized as low perceived family support (=1).

The second individual-level factor examined whether the adolescent could be granted immigrant status. To this end, the subjects were asked to write in which country they were born [17]. In cases where the student indicated that they were born in a country other than the country of residence, the person was considered an immigrant (born abroad) (=1). Otherwise, the person was considered a non-immigrant (born in the same country) (=0).

To more accurately estimate the extent of immigration at the country level, we used data from a survey of students across all age groups (11–15 years). This analysis showed that the proportion of immigrant students varied substantially across countries, ranging from 1.1% in Tajikistan to 23.2% in Luxembourg. To facilitate interpretation, this variable was dichotomized. Using the median value as a cut-off, supported by sensitivity analysis, countries were classified into two groups: (1) those where the proportion of immigrant students exceeded 5% (Group 1), and (2) those where the proportion was 5% or lower (Group 2). For control purposes, data from those countries (Group 3) that did not collect information on the country of birth of the surveyed students were also analyzed. The proportion of immigrants and country group were considered country-level factors. The distribution of countries (regions) into these three groups with the percentage of immigrant adolescents is presented in Table 1.

Table 1. Participating countries ranked by the proportion of 11–15-year-old adolescents born abroad (n = 279,117).

Country/Region	Total Sample Size	Number and Proportion of Adolescents Born Abroad	
		n	**% (Immigration Rate)**
Group 1. Countries with Proportion of Adolescents Born Abroad Greater than 5% (n = 114,184)			
LU Luxembourg	4232	981	23.2
BE-WAL Belgium (French)	5946	832	14.0
CY Cyprus	4667	610	13.1
CA Canada	12,586	1514	12.0
MT Malta	3407	353	10.4
IE Ireland	3624	370	10.2
DE Germany	6475	610	9.4
PT Portugal	5182	479	9.2
AT Austria	5178	473	9.1
AL Albania	5454	467	8.6
SI Slovenia	6327	513	8.1
BE-VLG Belgium (Flemish)	9567	767	8.0
IS Iceland	9898	782	7.9
RO Romania	8382	586	7.0
NL Netherlands	4316	240	5.6
DK Denmark	5255	286	5.4
KG Kyrgyzstan	9649	488	5.1

Table 1. *Cont.*

Country/Region	Total Sample Size	Number and Proportion of Adolescents Born Abroad	
		n	**% (Immigration Rate)**
Group 2. Countries with Proportion of Adolescents Born Abroad Less than 5% (*n* = 101,497)			
PL Poland	5395	267	4.9
ES Spain	4104	196	4.8
IT Italy	4572	199	4.4
KZ Kazakhstan	7369	301	4.1
LT Lithuania	4949	193	3.9
BG Bulgaria	3006	104	3.5
FI Finland	3522	122	3.5
CZ Czech Republic	12,906	428	3.3
EE Estonia	4862	151	3.1
RS Serbia	3713	107	2.9
MD Republic of Moldova	5491	150	2.7
HU Hungary	4068	101	2.5
HR Croatia	5338	118	2.2
GR Greece	6250	122	2.0
MK Macedonia	4061	82	2.0
TJ Tajikistan	6221	69	1.1
Group 3. No Available Data on the Country of Birth (*n* = 63,436)			
AM Armenia	4346		
CH Switzerland	7141		
FR France	5280		
UK-ENG England	4241		
UK-SCT Scotland	4354		
UK-WLS Wales	36,973		
GL Greenland	1667		
LV Latvia	5920		
NO Norway	3260		
SE Sweden	4379		
SK Slovakia	5584		

Another country-level factor was the Inclusiveness Index (II) [23]. This indicator was chosen to determine the relationship between the extent of immigration of young people and the socio-economic situation of the country. The Inclusiveness Index is an annual ranking of nations and states. The index holistically examines the experiences of groups across a range of social dimensions, including race/ethnicity, gender, sexual orientation, religion, disability, and general population indicators of inclusivity, including political inclusion, income inequality, incarceration rate, refugee settlement, and greenhouse gas emission rates [23]. The Inclusiveness Index captures broader dimensions of integration. It is not a direct measure of specific policy instruments; rather, it serves as a proxy for the overall integration environment in a certain country. II values for 2022 were retrieved from the Othering & Belonging Institute (Berkley, CA, USA) database [23].

Adolescent sex (1 = boys, 2 = girls) and family affluence were included as adjustment variables. Because the age of 15-year-olds varies by only about 12 months, these small differences were not expected to substantially influence the distribution of the outcome variables; therefore, age was not used as an adjustment variable.

Family affluence status (FAS) was assessed using the Family Affluence Scale, which was specifically developed for the HBSC study [24]. Consistent with HBSC reports [18,19], this measure categorizes adolescents into three FAS groups: the lowest 20%, the middle 60% (reference group), and the highest 20% of family affluence.

2.3. Data Analysis

We conducted quantitative data analysis utilizing the whole sample of 11-, 13-, and 15-year-old adolescents (data combined from 41 countries (44 regions), n = 279,117) as well as its subsamples of all 15-year-olds (n = 92,178) and 15-year-olds from 32 countries (33 regions), which collected information on the country of the adolescent's residence and birth. The total number of subjects in 32 countries (33 regions) was n = 66,400. Sample size by countries/regions is shown in Table A1 (in the Appendix A). During the analysis, sample size varied depending on the variables included in the analysis, which had a small percentage of missing values (e.g., for smoked cigarettes 3.8%, smoked e-cigarettes 6.5%, drank alcoholic beverages 4.3%, was drunk 8.3%, and used cannabis 5.5%). The frequency of missing data did not differ noticeably between immigrants and non-immigrants, except for reporting used cannabis, which was higher among immigrants than among non-immigrants (10.9% vs. 5.1%, $p < 0.001$).

First, we calculated descriptive statistics to estimate the frequency (n), percentage (%), mean, standard deviation (SD), standard error (SE), and range of the variables. Due to unequal country/region sample sizes, the analyses incorporated sampling weights to restore national representativeness of the student populations. A weight *Wi* for country/region *i* was calculated as (Average *N*)/*Ni*, where *Ni* is the number of observations in country/region *i* and Average N is the mean sample size across all regions.

Bivariate analysis was performed to identify differences between respondent groups. The Chi-square test and z-tests were applied to compare percentages of categorical variables, while Odds Ratio (OR) was calculated to evaluate an association between the binary outcome variable and its predictor. A p-value ≤ 0.05 was considered statistically significant, and the confidence interval (CI) was set at 95%. ORs with 95% CIs not including 1 indicated statistical significance at the 0.05 level. To assess the extent to which the variance of regression coefficients was inflated due to multicollinearity, variance inflation factors (VIFs) were calculated, with values below 5 considered acceptable. These analyses were conducted using SPSS statistical software (version 23; IBM SPSS Inc., Chicago, IL, USA).

Multilevel modeling (MLM) was then applied to examine the relationships between adolescent substance use and individual- and country-level factors [25–27]. This approach also allowed adjustment for individual characteristics, such as sex and family affluence. We employed a two-level logistic MLM for binary outcomes, using a logit link function and a random-intercept specification.

The model estimated the probability π_{ij} (for individual i in country j) of substance consumption in the last 30 days. Based on the findings of the cross-tabulation analysis, the following multilevel model was constructed:

$$\begin{aligned}\mathrm{LOGIT}(\pi_{ij}) = {} & \beta_{0j} + \beta_1 \times \mathrm{IMM}_{ij} + \beta_2 \times \mathrm{FS}_{ij} + \beta_3 \times \mathrm{SEX}_{ij} + \beta_4 \times \mathrm{FASlow}_{ij} + \beta_5 \times \mathrm{FAShigh}_{ij} + \beta_6 \times \mathrm{CG}_j + \beta_7 \times \mathrm{II}_j + \beta_8 \times \\ & \mathrm{IMM}_{ij} \times \mathrm{FS}_{ij} + \beta_9 \times \mathrm{IMM}_{ij} \times \mathrm{CG}_j + \beta_{10} \times \mathrm{FS}_{ij} \times \mathrm{CG}_j,\end{aligned}$$

where $\mathrm{LOGIT}(\pi_{ij}) = \ln [\pi_{ij}/(1 - \pi_{ij})]$; IMM indicates adolescent immigrant status (0 = non-immigrant, 1 = immigrant); FS denotes family support level (0 = high, 1 = low); SEX represents adolescent sex (0 = boy, 1 = girl); FASlow indicates low family affluence (0 = medium, 1 = low); FAShigh indicates high family affluence (0 = medium, 1 = high); CG denotes country group according to the proportion of immigrant adolescents (0 = Group 1, 1 = Group 2); and II is Inclusiveness Index (continuous variable).

The model intercept was specified as

$$\beta_{0j} = \beta_0 + u_{0j},$$

where β_0 is a fixed component and u_{0j} is a country-specific random effect, assumed to follow a normal distribution with mean zero and variance Ω_u. The regression coefficients β_k (k = 1, . . ., 7) represent fixed effects, from which Odds Ratios (ORs) were calculated as

$$OR_k = \exp(\beta_k).$$

For a random intercept model fitted to discrete outcome, the Variance Partition Coefficient (VPC) was calculated as follows [25]:

$$VPC = 100 \times \Omega_u/(\Omega_u + 3.29)\ \%.$$

Although regression coefficients can, in principle, vary across countries, random slopes for β_k were not included in the final models because their estimated variances were negligible. Sampling weights were incorporated in MLM at the student level. MLM analyses were conducted using MLwiN statistical software (version 2.28; Centre for Multilevel Modeling, University of Bristol, UK), choosing MCMC estimation which is preferred for binary outcomes and missing data models [25].

3. Results

3.1. Sample Characteristics

According to the selected criteria for assessing psychoactive substance use during the past 30 days, among 15-year-olds in 32 countries (33 regions), 14.3% reported cigarette smoking (ranging from 1.5% in Tajikistan to 31.6% in Bulgaria), 18.8% reported electronic cigarette smoking (from 1.1% in Tajikistan to 35.0% in Lithuania), 36.8% reported alcoholic beverages consumption (from 0.5% in Tajikistan to 68.6% in Denmark), 14.9% reported having been drunk (from 0.5% in Tajikistan to 34.3% in Denmark), and 6.0% reported cannabis use (from 0.2% in Tajikistan to 13.9% in Canada) (Table A1 in the Appendix A). These ranges indicate substantial cross-national variation in the prevalence of substance use. Overall, substance use was lowest among adolescents in Tajikistan and highest among adolescents in Bulgaria, Lithuania, Denmark, and Canada, depending on the specific substance examined.

Family support scores ranged from 4 to 28, with a mean of 21.6 (SD = 7.1) and a median of 24 among 15-year-olds across 32 countries (33 regions). Using the predefined cut-off score of 24, 45.9% of the study population was classified as having low family support. The prevalence of low family support varied markedly between countries (regions), ranging from 19.9% in Tajikistan to 68.5% in Canada. Weighted estimates, which accounted for differences in country sample sizes, were very similar to the crude estimates presented above.

Additional information on the characteristics of the study sample across the 32 countries (33 regions) is provided in Table A1 in the Appendix A.

3.2. Prevalence of Substance Use: A Cross-Tabulation Analysis

Table 2 presents the prevalence of psychoactive substance use in the past 30 days among 15-year-old adolescents, stratified by country of birth. The data indicate that adolescents born outside their country of residence (immigrants) are more likely to use cigarettes (OR = 1.12, 95% CI: 1.03–1.22, $p = 0.008$), e-cigarettes (OR = 1.13, 95% CI: 1.04–1.22, $p = 0.003$), and cannabis (OR = 1.85, 95% CI: 1.66–2.06, $p < 0.001$). Notably, the difference

between immigrants and non-immigrants was particularly pronounced in countries where the proportion of immigrants was relatively low (below 5%).

An exception emerged in the case of alcohol use, whereas alcoholic beverages drinking were significantly more common among native-born adolescents than among immigrants (OR = 0.73, 95% CI: 0.69–0.78, $p < 0.001$). In the country Group 1, where immigrants make up a large share of the study population, alcohol consumption was significantly higher among local residents than among immigrants. However, in the country Group 2, alcohol use—similarly to the use of other psychoactive substances—was again more common among immigrants than among non-immigrants.

It is also worth noting that the prevalence of psychoactive substance use in countries of Group 3 (where no data on country of birth were available) was comparable to that observed in countries of Groups 1 and 2.

The data presented in Table 3 show the level of family support adolescents receive and allow for a comparison between immigrants and non-immigrants. Overall, adolescents reported high levels of family support. However, immigrant adolescents reported even lower levels of support than their native-born peers. This pattern was consistent across both country groups and thus did not depend on the proportion of immigrants in the population.

Table 4 presents estimates of the effect of family support on the prevalence of psychoactive substance use in the past 30 days. These estimates show that, across all study groups, low family support significantly increases the risk of using any psychoactive substance among fifteen-year-olds. However, for all types of psychoactive substances, this risk was consistently higher among students in countries where the proportion of immigrants was below 5%. For alcohol consumption and drunkenness, these differences were statistically significant because their OR confidence intervals did not overlap.

Table 5 shows how the prevalence of psychoactive substance use in the past 30 days among 15-year-olds varied according to both country of birth and level of family support. The results once again demonstrate that, in both country groups, low family support is a significant risk factor for psychoactive substance use among both immigrants and non-immigrants. A closer examination of the data indicates that the impact of this factor on adolescent risky behavior is most pronounced among immigrants in countries where their proportion is relatively small. Therefore, this group of adolescents can be considered particularly vulnerable and in greater need of family support.

3.3. Multilevel Modeling of Substance Use

To support the above findings, a two-level MLwiN logistic regression model was used to explore in detail the association of smoking, alcohol and cannabis use simultaneously with both individual- and country-level factors. This approach also allowed adjusting data for several socio-demographic factors (sex and family affluence), which are related to the prevalence of psychoactive substance use among adolescents. The complex dependence of psychoactive substance prevalence on country group, immigrant/non-immigrant status and family support level, which was presented in Table 5, allows us to assume the interaction of these three factors; therefore, this was also taken into account in the MLwiN model. The results of this model are presented in Table 6.

Table 2. Prevalence of psychoactive substance use in the past 30 days among 15-year-old adolescents, by country's groups and adolescent immigrant status [1].

Country Group by Proportion of Adolescents Born in Other Country	Adolescent Immigrant Status	Smoked Cigarettes			Smoked Electronic Cigarettes			Drank Alcoholic Beverages			Was Drunk			Used Cannabis		
		n	%	OR (95% CI)	*n*	*n*	*n*	*n*	%	OR (95% CI)	*n*	%	OR (95% CI)	*n*	%	OR (95% CI)
Both Group 1 and Group 2	Non-immigrants	59,657	14.8	**1.12 ****	56,919	56,919	56,919	593,79	38.1	**0.73 *****	56,919	15.3	1.04	58,815	5.8	**1.85 *****
	Immigrants	4220	16.3	**(1.03–1.22)**	3977	3977	3977	4198	31.1	**(0.69–0.78)**	3977	15.8	(0.95–1.13)	3960	10.3	**(1.66–2.06)**
	Total	63,877	14.9		60,896	60,896	60,896	63,577	37.7		60,896	15.3		62,775	6.1	
Group 1 (5% or more)	Non-immigrants	31,957	11.9	**1.16 ****	30,669	30,669	30,669	31,303	39.1	**0.61 *****	30,669	15.4	**0.81 *****	30,961	5.9	**1.46 *****
	Immigrants	3294	13.5	**(1.04–1.28)**	3145	3145	3145	3276	28.2	**(0.57–0.66)**	3145	12.8	**(0.74–0.90)**	3091	8.4	**(1.27–1.67)**
	Total	34,751	12.0		33,814	33,814	33,814	34,579	38.0		33,814	15.2		34,052	6.2	
Group 2 (up to 5%)	Non–immigrants	28,200	17.7	**1.62 *****	26,250	26,250	26,250	28,076	37.1	**1.17 ***	26,250	15.2	**2.03 *****	27,854	5.7	**3.28 *****
	Immigrants	926	25.8	**(1.40–1.87)**	832	832	832	922	40.9	**(1.03–1.34)**	832	26.6	**(1.74–2.37)**	869	16.6	**(2.74–3.94)**
	Total	29,126	18.0 ###		27,082	27,082	27,082	28,998	37.3		27,082	15.5		28,723	6.0	
Group 3	No available data	23,222	15.2		22,685	22,685	22,685	22,921	36.7		22,685	18.3		20,607	7.2	

Notes: [1] Data weighted by country sample size; * $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$ comparing proportions between immigrants and non-immigrants; ### $p < 0.001$ comparing total proportions between country's Group 1 and Group 2; OR: Odds Ratio for immigrants vs. non-immigrants (significant values are highlighted).

Table 3. Characteristics of Family Support Scale among 15-year-old adolescents, by country's group and adolescent immigrant status [1].

Country Group by Proportion of Adolescents Born in Other Country	Adolescent Immigrant Status	*n*	Sum Score of Family Support Scale				
			Mean	SD	*p* [2]	% of Low Family Support	OR (95% CI)
Both Group 1 and Group 2	Non-immigrants	58,532	21.83	6.96	<0.001	45.2	**1.45 *****
	Immigrants	4081	20.34	7.46		54.5	**(1.28–1.54)**
	Total	62,613	21.73	7.00		45.9	
Group 1 (5% or more)	Non-immigrants	30,771	21.44	7.16	<0.001	46.5	**1.39 *****
	Immigrants	3185	20.33	7.49		54.8	**(1.29–1.50)**
	Total	33,956	21.34	7.20		47.3	
Group 2 (up to 5%)	Non-immigrants	27,761	21.99	6.92	<0.001	44.0	**1.46 *****
	Immigrants	896	20.48	7.50		53.4	**(1.28–1.66)**
	Total	28,657	21.94 ##	6.95		44.3	
Group 3	No available data on the country of birth	20,295	20.53	6.93		52.9	

Notes: [1] Data weighted by country sample size; [2] Mann–Whitney U test. *** $p < 0.001$ comparing proportions between immigrants and non-immigrants; ## $p < 0.01$ comparing total means between country's Group 1 and Group 2; OR: Odds Ratio for immigrants vs. non-immigrants (significant values are highlighted).

Table 4. Prevalence of psychoactive substance use in the past 30 days among 15-year-old adolescents, by country's group and level of family support [1].

Country Group by Proportion of Adolescents Born in Other Country	Level of Family Support	Smoked Cigarettes			Smoked Electronic Cigarettes			Drank Alcoholic Beverages			Was Drunk			Used Cannabis		
		n	%	OR (95% CI)	*n*	%	OR (95% CI)	*n*	%	OR (95% CI)	*n*	%	OR (95% CI)	*n*	%	OR (95% CI)
Both Group 1 and Group 2	Low	28,601	19.9	**2.13** ***	27,975	24.2	**1.92** ***	28,471	42.7	**1.50** ***	27,399	19.0	**1.74** ***	28,124	9.1	**3.05** ***
	High	33,171	10.4	**(2.04–2.23)**	32,093	14.3	**(1.84–2.00)**	33,024	33.2	**(1.45–1.55)**	31,608	11.9	**(1.66–1.82)**	32,723	3.2	**(2.84–3.29)**
	Total	61,772	14.7		60,068	18.9		61,495	37.5		59,007	15.2		60,847	5.9	
Group 1 (5% or more)	Low	16,095	15.9	**2.08** ***	16,029	21.2	**1.87** ***	16,012	41.2	**1.29** ***	15,635	17.7	**1.47** ***	15,775	9.0	**2.88** ***
	High	17,434	8.4	**(1.94–2.23)**	17,338	12.6	**(1.76–1.99)**	17,347	35.2	**(1.24–1.35)**	17,026	12.8	**(1.38–1.57)**	17,179	3.3	**(2.60–3.19)**
	Total	33,529	11.9		33,417	16.7		33,359	38.0		32,661	15.1		32,954	5.9	
Group 2 (up to 5%)	Low	12,506	24.3	**2.25** ***	11,946	27.9	**2.00** ***	12,459	44.3	**1.75** ***	11,764	20.5	**2.10** ***	12,349	9.2	**3.25** ***
	High	15,737	12.5	**(2.12–2.39)**	14,705	16.2	**(1.89–2.12)**	15,677	31.3	**(1.67–1.84)**	14,582	10.9	**(1.97–2.25)**	15,544	3.0	**(2.92–3.62)**
	Total	28,243	17.7 ###		26,651	21.4 ###		28,136	37.0		26,346	15.2		27,893	5.8	
Group 3	Low	11,247	19.5	**2.17** ***	10,946	25.9	**1.91** ***	11,164	41.7	**1.55** ***	10,952	18.6	**1.82** ***	9945	9.3	**2.04** ***
	High	9862	10.0	**(1.98–2.39)**	9738	15.2	**(1.85–1.98)**	9741	31.5	**(1.46–1.66)**	9708	11.1	**(1.66–2.00)**	8847	4.8	**(1.77–2.36)**
	Total	21,109	15.0		20,684	20.7		20,905	36.9		20,660	14.9		18,792	7.1	

Notes: [1] Data weighted by country sample size; *** $p < 0.001$ comparing proportions between immigrants and non-immigrants; ### $p < 0.001$ comparing total proportions between country's Group 1 and Group 2; OR: Odds Ratio for adolescents with low family support vs. adolescents with high family support (significant values are highlighted).

Table 5. Prevalence of psychoactive substance use in the past 30 days among 15-year-old adolescents, by country's group, adolescent immigrant status and level of family support [1].

Country Group by Proportion of Adolescents Born in Other Country	Adolescent Immigrant Status	Level of Family Support	Smoked Cigarettes			Smoked Electronic Cigarettes			Drank Alcoholic Beverages			Was Drunk			Used Cannabis		
			n	%	OR (95% CI)	*n*	%	OR (95% CI)	*n*	%	OR (95% CI)	Level of Family Support	Was Drunk	Level of Family Support	*n*	%	OR (95% CI)
Group 1 (5% or more)	Non-immigrants	Low	14,393	15.7	**2.04** ***	14,354	21.0	**1.85** ***	14,327	42.4	**1.29** ***		***n***		14,177	8.7	**2.83** ***
		High	16,014	8.4	**(1.90–2.20)**	15,971	12.6	**(1.74–1.97)**	15,929	36.3	**(1.23–1.36)**	Low	14,007	Low	15,828	3.3	**(2.54–3.15)**
	Immigrants	Low	1702	17.5	**2.43** ***	1675	22.5	**2.03** ***	1685	32.0	**1.58** ***	High	15,668	High	1598	11.7	**3.09** ***
		High	1420	8.1	**(1.93–3.05)**	1417	12.5	**(1.67–2.46)**	1418	22.9	**(1.35–1.86)**	Low	1628	Low	1351	4.1	**(2.27–4.21)**
Group 2 (up to 5%)	Non-immigrants	Low	12,052	23.9	**2.20** ***	11,509	27.5	**1.96** ***	12,006	44.2	**1.74** ***	High	1358	High	11,919	8.7	**3.16** ***
		High	15,317	12.5	**(2.07–2.34)**	14,303	16.2	**(1.85–2.08)**	15,260	31.3	**(1.66–1.82)**	Low	11,347	Low	15,148	2.9	**(2.82–3.83)**
	Immigrants	Low	454	35.8	**3.64** ***	437	39.0	**3.19** ***	453	48.5	**2.19** ***	High	14,210	High	430	22.9	**4.17** ***
		High	420	13.2	**(2.61–5.07)**	402	16.7	**(2.32–4.39)**	417	30.0	**(1.67–2.88)**	Low	417	Low	396	6.7	**(2.67–6.53)**

Notes: [1] Data weighted by country sample size; *** $p < 0.001$ comparing proportions between levels of family support; OR: Odds Ratio for adolescents with low family support vs. adolescents with high family support (significant values are highlighted).

Across all outcomes, low family support emerged as the strongest and most consistent predictor of substance use, more than doubling the odds of cigarette smoking (OR = 2.28, 95% CI: 2.11–2.45) and cannabis use (OR = 2.88, 95% CI: 2.58–3.21), and substantially increasing the likelihood of electronic cigarette use (OR = 1.97, 95% CI: 1.85–2.10), alcohol consumption (OR = 1.56, 95% CI: 1.48–1.65), and drunkenness (OR = 1.73, 95% CI: 1.62–1.85). These associations were robust across countries and remained significant after adjustment for individual- and country-level covariates. Moreover, low family support interacted with country group variable, and was associated with higher risk of alcoholic beverage consumption (OR = 1.07, 95% CI: 1.00–1.15) and drunkenness (OR = 1.12, 95% CI: 1.02–1.24) (for comparison, see data in Tables 4 and 5). This finding indicates that family support is a common protective factor against adolescent substance use among both immigrant and native-born adolescents across all countries, having a higher protective effect for alcohol use for immigrants in a low-immigration context.

Immigrant status showed substance-specific patterns. When adolescent immigrant status was considered as the sole factor, immigrant adolescents did not differ from non-immigrants in cigarette or electronic cigarette smoking and cannabis use, but they had significantly lower odds of alcohol use and drunkenness, suggesting protective effects for alcohol-related behaviors. However, these protective associations were attenuated or reversed in country Group 2, as indicated by significant immigrant × country group interactions across all outcomes. In country Group 2, immigrant adolescents had significantly higher odds of substance use than their native peers, particularly for alcohol use (OR = 1.65, 95% CI: 1.39–1.96), drunkenness (OR = 1.91, 95% CI: 1.55–2.37), and cannabis use (OR = 2.11, 95% CI: 1.63–2.74). This finding once again points out that adolescent immigrants in countries with low rates of immigration constitute a specific group that most needs help to protect against risk behaviors, such as family support.

Sex differences were outcome-dependent. Girls, compared with boys, had lower odds of cannabis use and drunkenness, but higher odds of electronic cigarette use. Family affluence showed a graded association, with adolescents from high-affluence families consistently exhibiting higher odds of all substance use behaviors, whereas low affluence was protective for alcohol-related outcomes but associated with higher smoking behavior and cannabis use. Therefore, sex and family affluence differences are factors that were worth including in the model in order to adjust data.

The random-intercept variances (Ω_u: 0.222 (0.059)–0.710 (0.175)) and Variance Partition Coefficients (VPC: 6.3–17.8%) indicate meaningful between-country variation, particularly for alcohol consumption, justifying the use of multilevel modeling and underscoring the importance of national context in adolescent substance use. In the presented analyses, this random effect was related to country-level factors: proportion of young immigrants in the country and Inclusiveness Index. At the country level, country Group 2 was associated with higher odds of cigarette smoking and cannabis use, though main effects were less consistent for alcohol-related outcomes. The Inclusiveness Index demonstrated a small but statistically significant positive association, with each one-unit increase corresponding to a 4–12% increase in the odds of substance use outcomes. In addition, it should be noted that in the 32 countries (33 regions) where information on the country of respondent birth was collected (see Table A1 in the Appendix A), the correlation between the immigration rate and the Inclusiveness Index was significant ($r = 0.425$, $p = 0.014$), but the linearity between variables was more pronounced among countries with a low immigration rate. Thus, country Group 2 can be characterized as a group of countries with a low Inclusiveness Index.

Table 6. Multilevel logistic regression coefficients and odds ratios in analysis of psychoactive substance use in the past 30 days among 15-year-old adolescents from 32 countries (33 regions).

Predictors (Compared Categories)	Model Component	Smoked Cigarettes (n = 61,334)	Smoked Electronic Cigarettes (n = 59,630)	Drank Alcoholic Beverages (n = 61,054)	Was Drunk (n = 58,566)	Used Cannabis (n = 60,407)
Immigrant status (Yes vs. No)	β_1 (SE) OR (95% CI)	–0.014 (0.091) 0.99 (0.83–1.18)	–0.045 (0.078) 0.96 (0.82–1.12)	–0.608 (0.063) **0.54 (0.48–0.62)**	–0.238 (0.088) **0.79 (0.66–0.94)**	0.061 (0.131) 1.06 (0.82–1.37)
Family support (Low vs. High)	β_2 (SE) OR (95% CI)	0.822 (0.038) **2.28 (2.11–2.45)**	0.677 (0.033) **1.97 (1.85–2.10)**	0.446 (0.026) **1.56 (1.48–1.65)**	0.548 (0.034) **1.73 (1.62–1.85)**	1.057 (0.055) **2.88 (2.58–3.21)**
Sex (Girls vs. Boys)	β_3 (SE) OR (95% CI)	–0.029 (0.024) 0.97 (0.93–1.02)	0.063 (0.022) **1.07 (1.02–1.11)**	0.036 (0.018) **1.04 (1.00–1.07)**	–0.145 (0.024) **0.87 (0.83–0.91)**	–0.440 (0.036) **0.64 (0.60–0.69)**
FAS (Low vs. Medium)	β_4 (SE) OR (95% CI)	0.118 (0.031) **1.13 (1.06–1.20)**	0.050 (0.028) **1.05 (1.00–1.11)**	–0.247 (0.024) **0.78 (0.75–0.82)**	–0.047 (0.033) 0.95 (0.89–1.02)	0.165 (0.045) **1.18 (1.08–1.28)**
FAS (High vs. Medium)	β_5 (SE) OR (95% CI)	0.171 (0.033) **1.19 (1.11–1.27)**	0.246 (0.028) **1.28 (1.21–1.35)**	0.293 (0.024) **1.34 (1.28–1.41)**	0.339 (0.030) **1.40 (1.33–1.49)**	0.257 (0.046) **1.29 (1.18–1.42)**
Country group (Group 2 vs. Group 1)	β_6 (SE) OR (95% CI)	0.737 (0.227) **2.09 (1.34–3.26)**	0.516 (0.240) **1.68 (1.05–2.68)**	0.387 (0.326) 1.47 (0.78–2.79)	0.345 (0.247) 1.41 (0.87–2.29)	0.409 (0.195) **1.51 (1.03–2.22)**
Inclusiveness Index (Continuous variable, one-unit increase)	β_7 (SE) OR (95% CI)	0.043 (0.017) **1.04 (1.01–1.08)**	0.046 (0.018) **1.05 (1.01–1.09)**	0.111 (0.024) **1.12 (1.07–1.17)**	0.084 (0.018) **1.09 (1.05–1.13)**	0.084 (0.014) **1.09 (1.06–1.12)**
Immigrant (Yes vs. No) × Family support (Low vs. High)	β_8 (SE) OR (95% CI)	0.163 (0.103) 1.18 (0.96–1.44)	0.081 (0.090) 1.08 (0.91–1.29)	0.098 (0.078) 1.10 (0.95–1.29)	0.028 (0.103) 1.03 (0.84–1.26)	0.063 (0.142) 1.07 (0.81–1.41)
Immigrant (Yes vs. No) × Country group (Group 2 vs. Group 1)	β_9 (SE) OR (95% CI)	0.192 (0.102) **1.21 (1.00–1.50)**	0.239 (0.098) **1.27 (1.05–1.54)**	0.501 (0.088) **1.65 (1.39–1.96)**	0.648 (0.109) **1.91 (1.55–2.37)**	0.745 (0.133) **2.11 (1.63–2.74)**
Family support (Low vs. High) × Country group (Group 2 vs. Group 1)	β_{10} (SE) OR (95% CI)	–0.062 (0.050) 0.94 (0.85–1.04)	–0.059 (0.045) 0.94 (0.86–1.03)	0.068 (0.037) **1.07 (1.00–1.15)**	0.113 (0.050) **1.12 (1.02–1.24)**	–0.038 (0.078) 0.96 (0.83–1.12)
Intercept	$\beta_{0j} + u_{0j}$ (SE) Ω_u (SE)	–5.649 (1.211) [0.335 (0.084)]	–5.491 (1.272) [0.371 (0.094)]	–8.807 (1.755) [0.710 (0.175)]	–8.008 (1.312) [0.346 (0.098)]	–9.008 (1.048) [0.222 (0.059)]
Variance Partition Coefficient	VPC (%)	9.3	10.2	17.8	9.5	6.3

Notes: Significant OR values are highlighted.

4. Discussion

The present study examined differences in the prevalence of cigarette smoking, electronic cigarette smoking, alcohol consumption, and cannabis use between immigrant and non-immigrant 15-year-old adolescents in Europe, Central Asia, and North America. Across most participating countries, a high prevalence of psychoactive substance use during the past 30 days was observed among adolescents. The findings indicate that adolescents born outside their country of residence (immigrants) were more likely to smoke cigarettes, use electronic cigarettes, and use cannabis, whereas alcohol consumption was significantly more common among non-immigrant adolescents. Consequently, the first hypothesis (H1) was only partially supported. Furthermore, low family support emerged as the strongest and most consistent predictor of substance use across all outcomes, thereby confirming the second hypothesis (H2). Finally, substantial between-country variation in both substance use prevalence and associated predictors was identified. Despite this heterogeneity, the results suggest that in countries with a relatively low proportion of young immigrants, immigrant adolescents were even more likely to engage in all forms of psychoactive substance use, including alcohol consumption. These findings support the third hypothesis (H3), indicating that the effects of immigrant status on adolescent risk behaviors vary across countries.

When discussing these research results, it is first necessary to clarify the definition of an immigrant. Clarifying this status is important because there is no single universal definition; instead, authoritative international organizations and scientific studies use closely related but not identical formulations depending on purpose and data availability [28]. For instance, the United Nations defines an international migrant as "Any person who changes his or her country of usual residence." [29]. This definition is country-of-birth-based and does not depend on citizenship, legal status, or duration of stay. In immigration studies in the United States, individuals are often considered as immigrants only when they are not born in the country of residence (first-generation immigrants) [30]. In contrast, in Western European studies, children whose parents or even grandparents were born abroad are conceived of as (second- and third-generation) immigrants [31]. In epidemiological and adolescent health studies (including HBSC, and similar surveys), the most common operational definition is "Immigrant = individual born outside the country of residence; Non-immigrant = individual born in the country of residence" [28,32]. These studies explicitly note that this definition does not distinguish between first- and second-generation immigrants and it has several limitations (see below for limitations) [33,34].

Differences in substance use prevalence between immigrant and non-immigrant adolescents varied in magnitude and gradient by substance examined and across countries, particularly when countries were stratified by low (<5%) and high (≥5%) youth immigration rates. Previous HBSC studies show that immigrant adolescents' families usually have lower socioeconomic status and experience more disadvantages compared to the non-immigrant families [32]. Due to the disadvantaged background, immigrant adolescents face higher social exclusion which may provoke complex behavioral responses in terms of substance use by increasing it (due to challenges in acculturation and perceived discrimination-related stress and anxiety) or decreasing it (showing the healthy immigrant paradox of reduced risky activities, including also lower psychoactive substance use). The complexity of the behavioral outcomes among young immigrants calls for "more focused studies on immigrants, looking at different groups, and at country of origin and country of residence, potentially through comparing specific immigrant groups across countries" [32]. HBSC-based and similar studies underscore this complexity in various findings. For example, studies have shown that family and school support, and, to a lesser extent, peer support act as protective factors for immigrant young people's mental health and reduce health complaints [35,36]. Lorant et al. (2016) [37] revealed that higher

popularity, frequent socialization and connectedness with native peers were associated with higher risk of smoking, alcohol and cannabis use among immigrant youth in six European cities. Demonstrating the healthy immigrant paradox, Foresta et al. (2025) [38] found that the second-generation immigrants were less likely to drink alcohol and smoke cigarettes compared to non-immigrant peers in Italy. Walsh et al. (2018) [39] showed that high parental monitoring and friend and teacher support as elements of social capital were associated with lower risk of alcohol and cannabis use among immigrant adolescents in Israel who experienced discrimination, while friend support had the opposite effect on alcohol use. Young people's identification with the host country affects the degree of acceptance and replication of native peer's behaviors with regard to substance use [10,40]. For example, studies identified the adoption of social norms and behavioral patterns of native peer groups with regard to psychoactive substances [10,41]. Sense of belonging, acceptance and connectedness with the local community were also identified as factors influencing young immigrants' health risk behaviors [42].

The association between the Inclusiveness Index, treated as a contextual indicator of social integration, and substance use outcomes among both immigrant and non-immigrant adolescents was small but statistically positive. This modest positive association may reflect several relationships. For example, more inclusive societies may foster greater openness and more accurate self-reporting of substance use, cultural norms may render experimentation more socially acceptable, or adolescents may have greater autonomy and opportunities for social interaction [43]. Importantly, the magnitude of this association is small and should be interpreted cautiously, particularly in relation to its interactions with immigrant status, family support, and broader country-level contexts.

It should also be noted that the correlation between the immigration rate and the Inclusiveness Index was positive (r = 0.425, p = 0.014); therefore, countries with a low adolescent immigration rate (<5%) can be characterized as a group of countries with a low Inclusiveness Index. In countries with a low immigration rate, young immigrant adolescents have an elevated likelihood of engaging in all forms of psychoactive substance use, including alcohol consumption. In our opinion, alcohol-related risk behaviors in the low-immigration-rate countries require more complex interpretation. Typically (and also relevant for our sample), countries with low immigration rates are less economically developed, have stronger ethnocentric culture and are less inclusive to different minorities, including immigrants. In these countries, immigrants may have specific characteristics (coming from very poor countries; with very low resources and integration capacities) and may face stronger socioeconomic deprivation and vulnerability. Lower socioeconomic status and challenges related to perceived discrimination may hinder young people's integration in the host country, deprive them of social contact with natives and keep them in prevailingly (ethnically) homogeneous peer groups [44]. Considering that Group 2 countries in our analysis also have low Inclusiveness Index scores, these results highlight the importance of societal inclusiveness for the behavioral health of immigrant adolescents. To our knowledge, the behavioral patterns identified and their association with societal inclusiveness are an under-researched area, making these findings both theoretically and practically important.

Furthermore, the results from the present study uncover significant gender differences in (immigrant) adolescents' psychoactive substance use, with girls having lower risk of cannabis use and drunkenness, but heightened risk of vaping. A similar gender pattern in substance use is also discussed in previous studies and explained with traditional gender norms related to higher permissiveness of risk-taking behaviors among boys [45–47].

The results from the multivariate analysis reveal a significant association between family affluence and adolescent substance use. Adolescents from affluent families consistently showed more risky behavior with respect to all substances. Low material status of

the family was associated with lower risk of alcohol use and drunkenness and heightened risk of smoking, vaping and cannabis use. These results highlight the importance of socioeconomic inequalities in the society and their influence on young people's behavioral health [48]. Previous studies show that immigrant adolescents may experience unique social, cultural, and structural stressors related to acculturation challenges, discrimination, and intergenerational conflicts [49–52]. These challenges may amplify and shape the role of socioeconomic factors, influencing how material resources and family affluence affect adolescent health behaviors. In some cases, family affluence may function differently among immigrant families compared to non-immigrant families, as material resources and socioeconomic inequalities intersect with migration-related experiences, such as segmented assimilation processes and varying levels of social capital and cultural integration in the host country [53–55]. These dynamics can increase certain risk behaviors while mitigating others, depending on the social status of the immigrant family.

The research results show that family support is one of the main protective factors with regard to substance use among immigrant and non-immigrant youth. The effect of family support remains consistent across all countries included in the analysis. These findings align with previous studies, showing that family connectedness, effective parental control, and parent–child attachment have a protective effect against psychoactive substance use in native and immigrant youth, albeit the effect differs across genders [56–58]. Emotional connectedness and open communication with parents, trust and support in the family help young immigrants to cope with different problems, positively affect self-esteem and support the adaptation in the host country. High family support and family connectedness may serve also as a means to preserve values and norms that differ from the cultural and socio-normative setting of the host country. This is particularly relevant for families with different religious and ethnic/racial background, aligning to Mason's (2024) [59] conclusion that cultural variations in risk and protective factors in diverse families affects socializing practices, adoption of prosocial norms and (health) behaviors of young people.

Strengths and Limitations

The present study was strengthened by employing a large and culturally diverse sample of adolescents from the HBSC study, which provided a unique opportunity to gain further understanding of adolescent immigrants' behavior, using similar methods and a standardized questionnaire across a range of regions in different countries of Europe, Central Asia, and North America. The approach of multilevel modeling helped to reveal the relationship between adolescent immigrant substance use and individual and country-level factors.

We also hereby acknowledge several limitations of the present study. First, the HBSC study has a cross-sectional design, and this allows us to only explore associations between the studied variables, but not causation. It is conceivable, for example, that adolescents who do not engage in risky behaviors are viewed more positively by their parents, who in turn find it easier to talk with and support their teens. The HBSC study also relies only on adolescents' self-reported data and is thus subject to potential response bias. For example, using sensitive questions, such as questions about substance use, can be affected by the possibility of a social fear bias in adolescent responses. Due to this problem, every effort was made to minimize that possibility by ensuring strict anonymity of respondents.

Second, overall, the HBSC study is aimed at the general population and not at immigrants. The question on adolescent immigration was optional, so not all participating countries used it and did not provide data on the adolescents' country of birth. Other countries reported relatively low absolute numbers of immigrant adolescents, so it was not possible to conduct an analysis by country, or to stratify the data by gender and other socio-demographic factors.

Third, immigrant status in this study was defined solely on the basis of adolescents' country of birth, which allows for cross-national comparability but does not capture important dimensions of migration. Specifically, this definition does not account for the country from which the young person came, length of residence in the host country, age at migration, reason for migration, or legal status. We also could not differ between immigrants and returning citizens whose children were born while away from their native country. These factors may influence acculturation processes, access to social resources, and health-related behaviors, and their absence may partly explain the heterogeneity observed across countries. There is a clear need for specific studies to be conducted to facilitate these more nuanced views that should be explored among immigrant adolescents. The Inclusiveness Index captures broad social integration environment, and it should not be interpreted as evidence of policy mechanisms.

Finally, several limitations relate to the origin and analysis of the data. Comparable school- or class-level identifiers were not consistently available across all participating regions; therefore, a two-level structure (students nested within country/region) was applied. This should be considered a limitation, as omission of intermediate clustering may lead to biased variance estimates depending on the degree of within-school correlation. In addition, the analysis could not account for the impact of missing data or for potential differences in the proportion of missing values between immigrant and native adolescents. Therefore, in the analysis performed, it must be acknowledged that missing values were uniformly and randomly distributed across respondent subgroups.

5. Conclusions

Immigrant adolescents living in countries with low immigration rates (e.g., less than 5%) represent a particularly vulnerable group with an increased risk of cigarette smoking, electronic cigarette use, consumption of alcoholic beverages, drunkenness, and cannabis use. Family support is a crucial protective factor against adolescent substance use among both immigrant and non-immigrant youth across European, Central Asian, and North American countries. It demonstrates the most pronounced effect for alcohol consumption in countries with lower proportions of immigrants. Future research is warranted to investigate whether these findings can be replicated for other adolescent risk behaviors (e.g., bullying and suicidal actions) and in younger HBSC groups while differentiating between immigrants from a variety of origin countries.

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Institutional Review Board Statement: This study used publicly available data via the HBSC Data Management Centre (dmc@hbsc.org). The HBSC protocol includes gaining ethics approval in each study country. All data are fully de-identified. As our study is based on secondary analysis of the datasets in which respondents did not participate directly, it was deemed unnecessary to obtain further ethical approval.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data used in this study are available on request from the HBSC Data Management Centre (dmc@hbsc.org).

Conflicts of Interest: The authors declare that there are no conflicts of interest.

Appendix A

Table A1. Sample characteristics in 33 countries/regions [1].

Country/Region	Sample Size	Immigration		Prevalence of Psychoactive Substance Use (%)					Family Support		Boys (%)	FAS (%)			Inclusiveness Index
		%	Country Group	Smoked	E-Cigarette Smoked	Drank Alcohol	Drunkenness	Cannabis	Mean Score	Low (%)		Low	Medium	High	
AL Albania	1851	8.6	1	12.7	21.7	24.5	10.4	4.8	24.2	27.1	44.8	19.8	58.4	21.8	69.78
AT Austria	2522	9.1	1	19.1	21.0	53.0	24.7	7.2	22.8	38.4	42.4	15.9	70.3	13.9	73.51
BE-VLG Belgium (Fl)	3550	8.0	1	14.3	17.7	49.4	21.1	7.6	21.8	47.9	50.2	15.5	69.0	15.4	72.97
BE-WAL Belgium (Fr)	1817	14.0	1	9.7	14.0	42.6	21.4	5.1	20.7	55.6	46.0	19.9	57.7	22.4	72.97
BG Bulgaria	1270	3.5	2	31.6	32.0	53.7	29.7	13.6	19.8	52.1	54.6	20.7	58.6	20.7	63.97
CA Canada	3433	12.0	1	7.4	19.2	27.6	14.3	13.9	18.7	68.5	49.1	27.7	51.7	20.5	74.40
CY Cyprus	1461	13.1	1	10.9	26.9	46.5	10.8	4.4	22.5	42.7	49.3	20.4	60.9	18.6	64.33
CZ Czech Republic	4263	3.3	2	14.1	21.2	47.8	17.8	7.3	21.1	51.2	50.7	18.7	63.2	18.1	72.60
DE Germany	2113	9.4	1	17.1	22.6	55.0	23.3	9.0	21.1	53.4	46.4	16.3	61.9	21.8	72.28
DK Denmark	1528	5.4	1	12.6	11.3	68.6	34.3	3.8	23.6	31.5	48.4	18.8	66.2	15.0	72.08
EE Estonia	1564	3.1	2	11.9	25.2	28.1	12.0	4.2	22.0	47.6	52.3	18.9	61.2	19.9	69.71
ES Spain	1496	4.8	2	15.3	13.4	39.4	16.2	6.7	21.8	47.1	47.2	19.7	63.4	17.0	68.79
FI Finland	978	3.5	2	18.8	13.7	26.6	15.3	6.5	21.4	50.4	47.0	12.5	65.1	22.4	72.49
GR Greece	2391	2.0	2	16.8	20.6	49.7	13.2	4.3	22.3	42.0	45.1	24.7	55.6	19.6	68.29
HR Croatia	1666	2.2	2	26.1	25.1	50.8	20.8	7.9	22.2	42.9	46.2	20.6	60.2	19.2	70.38
HU Hungary	1678	2.5	2	29.8	33.1	52.9	27.4	5.5	23.2	36.1	43.5	17.7	63.3	19.0	65.76
IE Ireland	1095	10.2	1	7.5	18.7	23.1	10.3	4.2	19.0	63.2	44.2	22.9	54.5	22.6	73.51
IS Iceland	2887	7.9	1	4.1	13.8	13.5	6.1	3.9	22.2	41.8	51.2	19.5	66.1	14.4	76.29
IT Italy	1548	4.4	2	26.1	22.9	55.8	23.8	12.0	20.9	54.5	54.6	20.0	57.6	22.4	69.26
KG Kyrgyzstan	3253	5.1	1	6.2	6.9	5.6	2.8	1.0	18.8	55.1	47.2	23.1	57.9	19.0	51.38
KZ Kazakhstan	2432	4.1	2	6.7	9.7	6.0	3.7	2.0	22.9	34.2	48.0	15.2	63.3	21.5	51.60
LT Lithuania	1834	3.9	2	19.7	35.0	30.0	16.8	6.9	20.6	54.2	51.4	18.1	60.7	21.2	70.36
LU Luxembourg	1467	23.2	1	13.0	16.7	34.7	9.7	10.0	20.9	52.6	50.1	22.4	57.0	20.6	74.17
MD Rep. of Moldova	1803	2.7	2	11.8	21.6	40.8	11.7	1.8	21.3	46.0	49.6	18.0	62.2	19.7	62.97

Table A1. *Cont.*

Country/Region	Sample Size	Immigration		Prevalence of Psychoactive Substance Use (%)					Family Support		Boys (%)	FAS (%)			Inclusiveness Index
		%	Country Group	Smoked	E-Cigarette Smoked	Drank Alcohol	Drunkenness	Cannabis	Mean Score	Low (%)		Low	Medium	High	
MK North Macedonia	1608	2.0	2	20.2		34.6	11.3	3.9	23.3	34.9	49.9	19.4	58.8	21.8	65.40
MT Malta	863	10.4	1	9.5	18.9	39.3	15.7	8.7	21.5	49.0	48.0	17.3	65.0	17.7	75.29
NL Netherlands	1302	5.6	1	14.6	7.7	41.2	15.7	8.3	22.7	39.8	49.9	18.7	66.4	14.9	76.98
PL Poland	2204	4.9	2	22.9	31.0	36.4	18.3	11.6	19.1	65.1	45.3	24.2	53.1	22.7	68.35
PT Portugal	1845	9.2	1	9.3	7.8	32.2	8.9	3.7	22.1	44.4	44.2	19.8	56.5	23.6	77.66
RO Romania	2946	7.0	1	23.1	25.8	45.6	14.8	3.2	21.8	45.7	46.8	18.5	63.5	18.0	67.94
RS Serbia	1460	2.9	2	18.1	19.8	47.3		4.5	23.1	35.1	41.0	21.4	58.8	19.8	66.73
SI Slovenia	2172	8.1	1	13.3	17.6	44.8	16.5	7.4	21.0	50.5	51.6	21.2	63.9	14.9	76.29
TJ Tajikistan	2100	1.1	2	1.5	1.1	0.5	0.5	0.2	25.4	19.9	45.9	18.0	66.2	15.8	51.18
Total:															
Crude values	66,400			14.3	18.8	36.8	14.9	6.0	21.6	45.9	47.5	15.6	65.7	18.7	
Weighted values				14.9	19.0	37.7	15.3	6.1	21.7	45.9	47.5	18.3	58.3	18.4	

Notes: [1] Countries/regions that collected information on the country of adolescent's birth.

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