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COMPREHENSIVE REVIEW

Substance use prevalence rates among migrant and native adolescents in Europe: A systematic review

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Abstract

Issues. *Migrant adolescents show specific risk and protective factors associated with substance use, but the extent to which prevalence rates differ between migrant and native-born youth in Europe remains unclear. The present study aims to provide a comprehensive review of all available substance use prevalence studies on differences in substance use between migrant and native-born adolescents in Europe.* ***Approach.*** *In this systematic review, PubMed, Medline and Pre-Medline, EMBASE and PsycINFO were searched for articles comparing substance use prevalence rates (tobacco, alcohol, illicit drugs) between migrant and native-born adolescents or young adults aged 11 to 29 years in European countries. The Joanna Briggs Institute prevalence critical appraisal tool was used for quality assessment.* ***Key Findings.*** *Fifteen studies met the inclusion criteria. The findings unanimously showed lower alcohol use in migrant compared to native-born adolescents, in particular among migrant adolescents from non-European countries and/or with a Muslim background. For tobacco and illicit drug use, findings were mixed.* ***Implications.*** *The results suggest a healthier behaviour profile among migrants than among native-born adolescents regarding alcohol use. Therefore, it would be beneficial to develop interventions to support migrant communities in maintaining their healthier alcohol use practices upon arrival in the host country.* ***Conclusion.*** *Compared to native-born adolescents, migrant adolescents are less likely to use alcohol. The findings on tobacco and illicit drug use were mixed. A European standard for surveys regarding substance use among adolescents is needed to investigate fluctuations, causes, and consequences of substance use differences between migrants and natives at the European level.* [van Dorp M, Boon A, Spijkerman R, Los L. Substance use prevalence rates among migrant and native adolescents in Europe: A systematic review. *Drug Alcohol Rev* 2021;40:325–339]

Key words: substance use, prevalence, migrant, adolescent, Europe.

Introduction

In many cultures, substances such as tobacco, alcohol and cannabis have been used for centuries for their psychoactive effects, but their regular use is associated with increased health risks, resulting in large societal and economic burdens [1,2]. Adolescence and young adulthood are the typical life stages in which people start experimenting with psychoactive substances. Frequent or excessive substance use can pose serious health risks to adolescents and young adults, along with other detrimental consequences such as injuries, violence, delinquency and psychological, school and family problems [2,3]. Furthermore, adolescents who are susceptible to the addictive properties of these

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substances may develop a substance use disorder [4], which further increases the risk of harmful consequences and long-term problems [5].

Adolescents with a migrant background can have an increased risk for developing substance use disorders. In general, migration is a stressful process which can create multiple challenges for adolescents to overcome [6]. Upon arrival in the host country, they must adjust to norms, values and cultural beliefs that may differ from those in their country of origin. This process of acculturation [7] is associated with specific stressors, such as discrimination by members of the host culture [8,9]. This form of acculturative stress [10] is associated with a higher likelihood of using substances [8,11] and a higher level of substance use [12]. Furthermore, acculturative stress can affect parent–child discrepancies in acculturation patterns. During the process of migration, children adapt to the new culture more rapidly than their parents [11,12], which can lead to an acculturation gap. Often, children of immigrant parents (i.e. second-generation immigrants) are more prone to embrace the substance use culture of the host country (acculturation hypothesis), whereas their parents might not be familiar with this culture and might therefore be less able to identify activities that place their children at risk of (problematic) substance use [8].

In addition to the increased risk of engaging in problematic substance use, there are also migration-related protective factors that guard migrant adolescents from developing problematic substance use behaviours, which are reflected in the immigrant paradox [13–15]. The immigrant paradox refers to the phenomenon whereby recent immigrants—despite typically poorer socioeconomic conditions, such as lower income or educational level—show less risk-taking behaviour and better health outcomes than their native-born counterparts and more established immigrants [15]. This paradox is supported by the finding that adolescent and young adult immigrants are less likely than their native-born counterparts to initiate substance use and develop substance use disorders [16]. Research has also shown that, compared to first-generation immigrants (foreign-born with at least one foreign-born parent, according to definitions by Statistics Netherlands), second-generation immigrants (native-born with at least one foreign-born parent, according to definitions by Statistics Netherlands) are more at risk of adjusting to the substance use norms of the host country [17]. Moreover, greater ethnic pride and adherence to traditional family values are related to lower tobacco and alcohol use [18,19], and religiosity and perceived religious support are protective against marijuana and tobacco use among urban adolescents [20]. These findings suggest that cultural values might be protective against substance use. For second-generation immigrants, however, social-cognitive factors seem more important than cultural and religious factors in predicting alcohol use [21].

In summary, compared to their native-born counterparts, migrant adolescents may show increased specific risk and protective factors [22,23] associated with substance use. This may result in different substance use prevalence rates between migrant and native youths. On the one hand, migrant adolescents may be more likely to engage in substance use as a way of coping with stress or trauma. On the other hand, migrant adolescents may be less susceptible to substance use because particular substances might not be allowed by their religion or culture, or might be uncommon in their country of origin. Finally, differences in substance use prevalence rates between migrant and native-born adolescents might decrease over time as migrant adolescents reside in the host country.

In the USA, ample research is available about substance use among different groups of migrants [13,14,24–26]. Studies on this topic in Europe are scarce, and whether results from American studies can be directly applied to the European context is unclear. For instance, migrant heritage profiles differ between the USA and Europe. After a population decline of several decades, the European population has been increasing again since the mid-1980s. This growth can be fully attributed to migration from outside of Europe [15], especially from 2009 onwards due to refugee inflows to countries in northwest Europe [27]. As the world population became increasingly mobile and diverse, in 2016 almost 25% of all European school-aged adolescents (11–15 years) had a migration background [28].

Although adolescents with a migration background comprise a significant proportion of the population in Europe, actual differences in substance use patterns between migrant and native-born adolescents in Europe have not been studied extensively [17,18]. To our knowledge, only one systematic review has documented empirical evidence on differences in substance use prevalence rates between migrant and native-born adolescents in Europe [18]. This review focused on mental health in general and presented substance use prevalence rates from three studies conducted in Norway, Spain and Sweden, respectively [19,22,23]. Its findings showed decreased alcohol and cannabis use prevalence rates in migrants compared to native-born youth, but mixed findings for illicit drug use and smoking. Curtis *et al.* [18] did not cover all available studies comparing substance use prevalence rates between native-born and migrant adolescents in European countries. Moreover, no information was provided on study quality and possible confounders such as demographic variables, Islamic background and first- and second-generation status. Lower alcohol use prevalence rates may be partly explained by the

number of Islamic adolescents included in the migrant group. Furthermore, mixed findings for smoking might be partly explained by deviating smoking rates and a less strict tobacco policy in the home countries of the migrants in question, which in turn might lead to a higher prevalence rate in first-generation migrants as compared to second-generation migrants. In addition, mixed findings for illicit drug use could be due to different categorisations of migrant groups (migrants from European versus non-European countries).

The present study aims to provide a comprehensive review and evaluation of all available substance use prevalence studies on differences in migrant adolescents' and native-born adolescents' substance use in Europe. It charts the overall differences between migrant and native-born adolescents regarding tobacco, alcohol and illicit drug (including cannabis) prevalence rates in Europe, taking into account the different categorisations of migrant groups across the included studies. Lower substance use prevalence rates in migrant youth compared to non-migrant youth could indicate support for the immigration paradox, particularly if the differences remain when adolescents' age, sex and socioeconomic status are taken into account. Similar substance use prevalence rates may indicate support for the acculturation theory, which can be further explored by considering migrant generation or duration of stay in the host country. Furthermore, we expect that migrants with an Islamic background or from Islamic countries will show lower alcohol and cannabis use than non-Islamic migrant and non-migrant youth.

Methods

A systematic review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines [29]. The Joanna Briggs Institute prevalence critical appraisal tool [30] was used to determine the quality of the included studies.

Inclusion criteria

Publications were included if they: (i) reported data on substance use in Europe (defined as the European Union, Norway and Switzerland); (ii) included data collected among adolescents or young adults aged 11 to 29 years; (iii) stated prevalence statistics or data comparing migrants' and native-born individuals' substance use prevalence; and (iv) were published in the English or Dutch language.

Exclusion criteria

Publications were excluded if they were: (i) studies in which adolescent data were not presented separately from adult data; (ii) studies reporting on cultural groups (e.g. Roma people); (iii) treatment studies (including case studies); or (iv) opinion pieces, commentaries or conference papers.

Search strategy

We performed a PubMed, Medline and Pre-Medline, EMBASE and PsycINFO search covering the period from January 1997 to November 2019. A defined search strategy was devised covering all main terms associated with definitions of migrant adolescents (immigra*, migra*, emigra*, refugee, transient, asylum seek*), substances (including tobacco, alcohol, and illicit drugs) and substance use (including tobacco, alcohol and illicit drug use). The electronic database search was supplemented by reference checking and a complementary search via Google Scholar using the main terms mentioned above.

Study selection

All authors were involved in screening studies, scanning for relevance and assessing full texts against the eligibility criteria. When there was disagreement, articles were discussed until consensus was reached. After assessing full-text articles for eligibility, a reference check was performed to ensure that all relevant studies had been identified and included. If a dataset was used in multiple included studies, the authors discussed these studies to decide if the included studies could be retained.

Results

Search results

After removing duplicates, the search identified a total of 1754 articles. After scanning the titles and abstracts of these articles for relevance, 696 articles remained. Of these, 677 articles were excluded because they did not meet the eligibility criteria. Consequently, 19 articles were retrieved and reviewed in detail. Six articles were excluded since it was unclear whether the samples had a migration background. In three cases, two studies used data from the same dataset [22,31–35]. The studies by Amundsen *et al.* [31,32] were based on the same dataset (the Oslo Health Study) and showed overlap in reported substance use prevalence rates. Unlike their more recent study of 2012 [32], the earlier study by Amundsen *et al.* (2005) [31] presented prevalence rates for both alcohol and illicit substance use

and was therefore retained. For the same reason, only the study by Svensson and Hagquist [22], and not Svensson's [35] additional study on the same dataset, was included. The final two studies that were partly based on the same dataset (the i4culture project) were both retained because both had a somewhat different participant pool and investigated different substances. After discussing these cases, the authors decided to exclude two studies [32,35]. The remaining 11 studies were subjected to a reference check, which led to the inclusion of four additional studies. In total, 15 studies were retained (see Figure 1, Table 1) and subjected to critical appraisal by MD, RS and AB (see Table 2).

Characteristics of the included studies

The included studies were published between 2005 and 2017. Six studies reported on tobacco use (range 2005–2016), 14 studies on alcohol use (range 2005–2017) and nine studies on illicit drug use (range 2005–2016). Thirteen studies investigated substance use prevalence rates within a specific European country, one study reported prevalence rates in six European countries [39], and one study presented alcohol prevalence data on the European level [36]. The included studies did not provide enough information to obtain insight into geographical trends. All studies had a cross-sectional design and were predominantly carried out in school settings with the use of self-report surveys.

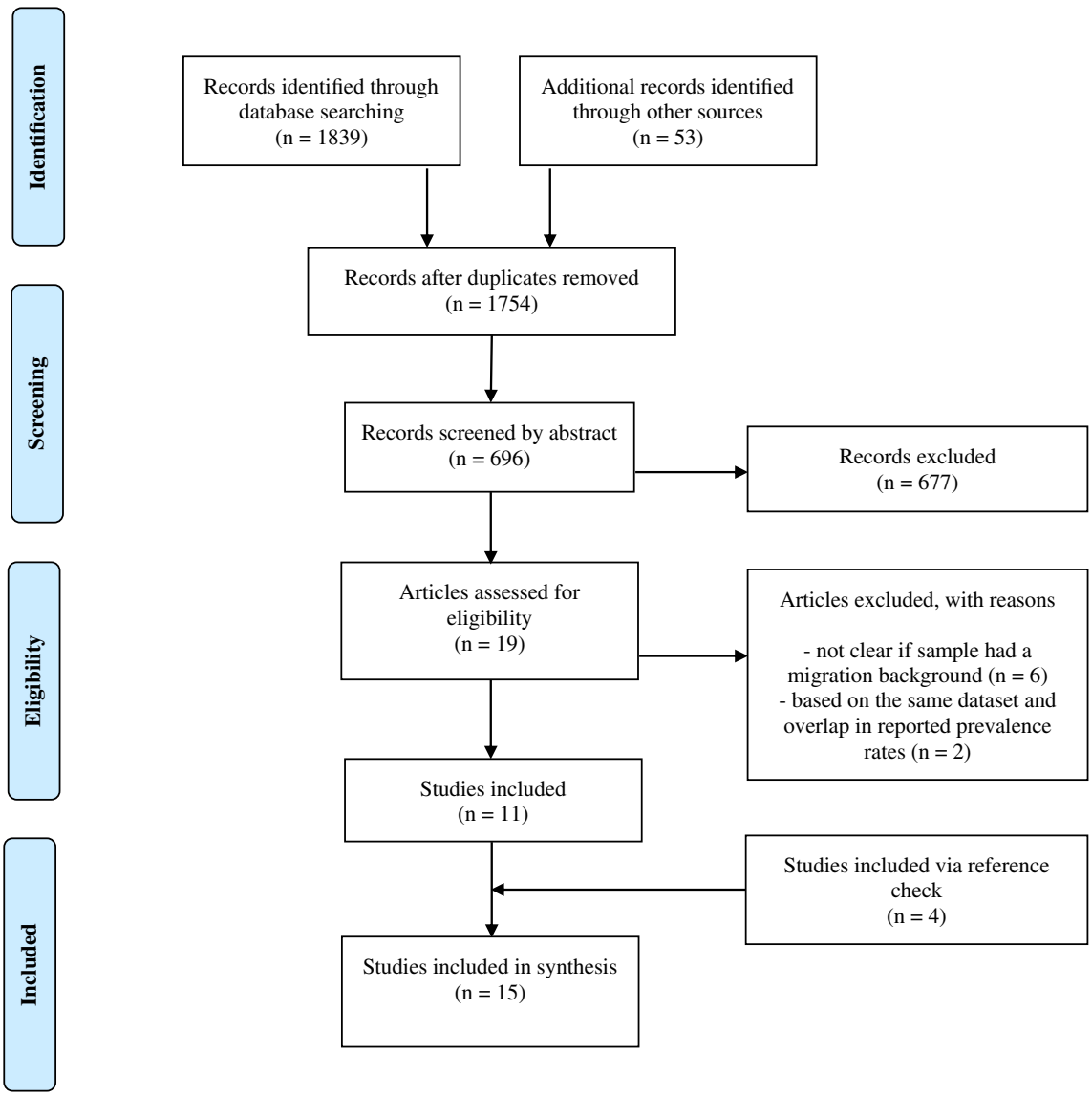

Figure 1. *PRISMA flow diagram.*

Table 1. *Characteristics of the included studies*

	Author, publication year	Region	Year data collection	Age, years	Total, *n*	Migrant, *n*, %	Generation	Religion	Cultural heritage	Prevalence rates compared to native adolescents		
										Tobacco	Alcohol	Cannabis and other illicit drugs
1	Abebe *et al.*, 2014 [19]	Norway	2006	14–17	10 934	2930, 26.8	1st, 2nd	Included	Europe, USA, Middle East, Asia, Africa	Higher in 2nd generation EU/US. Lower in 2nd generation Asians, also when controlled for age, gender.	Lower binge drinking in 2nd generation Middle East, Asia, Africa, and all 1st generation migrants, controlled for age, gender.	Lower in 2nd generation Middle East, Asia, Africa, and 1st generation Middle East, Asia, controlled for age, gender.
2	Amundsen *et al.*, 2005 [31]	Norway	2000–2001	15–16	4627	1213, 26.2	1st, 2nd	Included	Selected for analysis if $n > 50$: Pakistan, Turkey, Somalia, Iran, Morocco, Iraq, Vietnam, India, Sri Lanka.		Lower current, frequent and intoxication drinking. Controlled for gender, SES. Lower in migrants with short stay and large proportion Muslims in school.	
3	Barsties *et al.*, 2017 [36]	Europe and Israel	2013–2014	13–15	69 842	12 571, 18.0	1st, 2nd	NR	130 countries, but not specified.		Lower lifetime, frequency, drunkenness, controlled for age, gender, SES.	
4	Creemers *et al.*, 2017 [33]	Netherlands	2010–2013	15–24	659	578, 87.7	NR	Religious affiliation included	Surinam, Morocco, Turkey, Asia, Antilles.		Lower frequency-intensity except for Asians, controlled for age.	
5	Cristini *et al.*, 2015 [36]	Italy	NR	Mean: 17.3, SD: 1.6	2034	186, 9.1	Only 1st generation migrants included	NR	Europe, Africa, South-America, Asia.			Lower illicit drug use, controlled for age, gender, SES.
6	Delforterie *et al.*, 2016 [34]	Netherlands	2010–2013. RADAR: 2005–2010.	15–17	705	178, 25.3	NR	Islamic adolescents excluded	Surinam, Antilles, Asia, other non-Western, substance use not specified.		Lower weekly use in both males and females, controlled for age.	Similar, controlled for age.
7	Donath *et al.*, 2011 [38]	Germany	2007–2008	Mean: 15.3 SD: 0.7	44 610	12 223, 27.4	NR	NR	Specified for 20 countries of origin.		Lower in Turkish, similar in former Soviet Union migrants. Lower in migrants Islamic countries, except for Iran. Higher binge drinking in migrant ever drinkers.	

(Continues)

Table 1. (Continued)

	Author, publication year	Region	Year data collection	Age, years	Total, *n*	Migrant, *n*, %	Generation	Religion	Cultural heritage	Prevalence rates compared to native adolescents		
										Tobacco	Alcohol	Cannabis and other illicit drugs
8	Lorant *et al.*, 2016 [39]	Belgium, Finland, Germany, Italy, Netherlands, Portugal	2013	14–16	11 015	2850, 25.9	1st, 2nd, speaking other language at home	NR	NR	Similar in all migrants, slightly higher 1st generations, controlled for age, gender, SES.	Lower last month use, controlled for age, gender, SES.	Higher illicit drug use, controlled for age, gender, SES.
9	Marsiglia, 2008 [40]	Spain	2005	13–16	817	229, 28.0	NR	NR	Latin-America, Europe, Africa, 'other'.	Lower, controlled for age, gender, SES, etc.	Lower, controlled for age, gender, SES, etc.	Lower, controlled for age, gender, SES, etc.
10	Monshouwer *et al.*, 2007 [41]	Netherlands	2003	12–16	5801	1523, 26.3	NR	NR	NR		Lower heavy episodic drinking, controlled for age and gender.	
11	Rodham *et al.*, 2005 [42]	England	2000–2001	15–16	6020	1065, 17.7	NR	NR	Black, Asian, other, unknown.	Lower in Asian and Black females.	Lower drinking and drunken-ness in non-white males and females.	Higher illicit drug use.
12	Sarasa-Renedo *et al.*, 2015 [23]	Spain	Pooled data: 2006, 2008, 2010	14–18	87 943	12 400, 14.1	1st, 2nd	Muslim region	Specified 25 of 137 countries for $n > 100$	Lower in all migrants, regardless of 1st, 2nd generation, controlled for age, gender, SES.	Lower binge drinking, controlled for age, gender, SES.	Lower illicit drug use, controlled for age, gender, SES.
13	Skogen *et al.*, 2016 [43]	Norway	2012	16–19	10 122	386, 3.8	NR	NR	EU/EEA or non-EU/EEA	Higher in EU/EEA. Lower in non-EU/EEA, controlled for age, gender, SES.	Non-EU/EEA less likely tried alcohol, similar for migrants from EU/EEA countries, controlled for age, gender, SES.	Higher illicit drug use in EU/EEA, similar in non-EU/EEA, controlled for age, gender, SES.
14	Svensson, 2010 [22]	Sweden	2005	13–16	13 070	2875, 22.0	1st, 2nd	NR	Nordic, non-Nordic European, and non-European countries, controlled for age, gender, different proxy SES.		Lower use and binge drinking in 1st, 2nd generation migrants from non-European countries, especially girls, controlled for age, gender, different proxy SES. Higher binge drinking migrants Nordic countries.	Higher illicit drug use, controlled for age, gender, different proxy SES.
15	Van Tubergen and Poortman, 2010 [44]	Netherlands	Pooled data: 1994, 1996, 1999, 2001	11–20	36 573	6217, 17.0	NR	Parental religiosity, % Muslim at school level included.	Turkey, Morocco, Surinam, Antilles, 'other'.		Lower use, drunkenness, number of glasses previous month, controlled for age gender, different proxy SES.	

EU/EEA, minority adolescents from countries within the European Union/European Economic Area; NR, not reported; SES, socioeconomic status.

Table 2. *Quality evaluation of the included studies*

	Author	Region	Evaluation criteria based on Joanna Briggs Institute Prevalence Critical Appraisal Tool[a]										Total rating[b]	Comments
			1	2	3	4	5	6	7	8	9	10		
1	Abebe *et al.* [19]	Norway	U	U	Y	Y	Y	Y	U	Y	Y	Y	7	C1, C2: Sample representative for Oslo, but unclear if it is representative for Norway, C7: No research assistant present at data-collection.
2	Amundsen *et al.* [31]	Norway	N	N	Y	Y	Y	Y	Y	Y	Y	Y	8	C1, C2: Oslo-sample, select sample: Only migrant youth from relatively dry drinking cultures; adolescents from mixed marriages were excluded.
3	Barsties *et al.* [36]	Europe	Y	Y	Y	Y	U	Y	U	U	Y	Y	7	C5: Information about response rates was missing. C7: In some countries research assistants were present, but not clear in which and how many countries. C8: Not controlled for school level due to non-convergence of the model.
4	Creemers *et al.* [33]	Netherlands	N	N	N	U	U	Y	U	U	Y	Y	3	C1, C2: Convenience sample. C3: Insufficient power for some of the advanced analyses. C4: Unclear reporting of covariates. C5: No information on non-response. C7: Not reported; C8: No info on clustering.
5	Cristini *et al.* [37]	Italy	N	N	N	Y	N	Y	U	U	Y	Y	4	C1: Selective sample. C2: No information. C3: Too low in subgroup migrant youth. C5: Response rate not reported and large group excluded. C7: Not reported. C8: No info on clustering.

(Continues)

Table 2. (Continued)

	Author	Region	Evaluation criteria based on Joanna Briggs Institute Prevalence Critical Appraisal Tool[a]										Total rating[b]	Comments
			1	2	3	4	5	6	7	8	9	10		
6	Delforterie *et al.* [34]	Netherlands	N	N	N	Y	U	Y	U	U	Y	Y	4	C1, C2: Selective sample and exclusion of Islamic respondents. C3: Too low in subgroup migrant youth. C5: Response rates not reported. C7: Not reported for part of sample. C8: No info on clustering.
7	Donath *et al.* [38]	Germany	Y	Y	Y	Y	Y	Y	Y	N	N	Y	8	C8: Not controlled for clustering. C9: Not controlled for important confounders.
8	Lorant *et al.* [39]	Six European countries	N	N	Y	Y	Y	Y	U	Y	Y	N	6	C1, C2: No representative sampling frame, low response. C3: Number of migrants may not by sufficient per country. C7: Not reported. C9: Not speaking local language at home was classified as migrant status.
9	Marsiglia [40]	Spain	N	N	N	Y	U	Y	U	U	Y	U	3	C1, C2: Convenience sample, limited sampling frame. C3: Too low in subgroup migrant youth. C5: No info on response rates. C7: Not reported. C8: No info on clustering. C10: Unclear how migrant status was defined.
10	Monshouwer [41]	Netherlands	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	9	C9: Prevalence rates were not controlled for confounders.
11	Rodham *et al.* [42]	England	N	N	Y	Y	N	Y	Y	U	N	N	4	C1, C2: Convenient sample, limited sampling frame. C5: Response rate of schools was <70%, no info on students' response rates. C8: No info on clustering, not controlled for confounders. C9: No confounders explored. C10: Migrant status not clearly described not based on country of birth of respondent and parents.

(Continues)

Table 2. (Continued)

	Author	Region	Evaluation criteria based on Joanna Briggs Institute Prevalence Critical Appraisal Tool[a]										Total rating[b]	Comments
			1	2	3	4	5	6	7	8	9	10		
12	Sarasa-Renedo *et al.* [22]	Spain	Y	Y	Y	Y	Y	Y	U	U	Y	Y	8	C7: Not reported. C8: No info on clustering.
13	Skogen *et al.* [43]	Norway	N	N	N	Y	N	Y	U	Y	Y	Y	5	C1, C2: Study only conducted in one county of Norway and low response rate. C3: N in group of immigrants too low. C5: Response rate was only 53%. C7: Not reported.
14	Svensson [22]	Sweden	U	Y	Y	Y	U	Y	U	Y	Y	Y	7	C1: Unclear if the chosen regions are representative of whole Sweden. C5: Non-response 'due to other reasons' not included in non-response rate. C7: Not reported.
15	Van Tubergen and Poortman [44]	Netherlands	Y	Y	Y	Y	U	Y	U	Y	Y	Y	8	C5: Students' response rate is not reported. C7: Not reported.

[a]The criteria addressed: (i) sample representativeness; (ii) appropriate recruitment; (iii) adequate sample size; (iv) appropriate reporting of study setting and subjects; (v) adequate data coverage of the targeted sample; (vi) objective standard criteria for measurement condition; (vii) reliable measurement of the condition; (viii) appropriate statistical analysis; (ix) important confounders are controlled/accounted for; and (x) subpopulations identified using objective criteria.

[b]Study quality was rated according to 10 criteria based on the Joanna Briggs Institute Prevalence Critical Appraisal Tool (see Appendix S1, Supporting information). Studies received a Y stands for Yes if they met the criterion, N stands for No if they did not meet the criterion and U stands for Unclear if relevant information was missing or unclear. Criteria that were rated with 'Yes' received 1point, criteria that were rated with 'No' or 'Unclear' received no points. The total quality score varied between 0 and 10 points.

The majority of the studies included relatively large sample sizes (>1000 participants, M = 25 216, SD = 28 474.9, range 2034–87 934 participants). Three studies included smaller samples (range 659–817 participants) [33,34,40]. In 10 studies, prevalence data were collected among adolescents under the age of 18; five studies also included young adults aged 18 years and older (18–24 years). The mean proportion of immigrant respondents was 25.0% (SD = 18.8, range 3.8–87.7). Due to selective targeted sampling of migrant youth, one study included an exceptionally high percentage of migrants (87.7%) [33]. In contrast, another study among Norwegian youth [36] featured an exceptionally low percentage of migrants (3.8%).

Information about migrant adolescents' countries of origin differed across studies. Some studies used broad categorisations based on continents [19,37,40], regions [22] and/or economic development [43]. Other studies only presented countries of origin that met a cut-off score for the minimum number of participants per country [23,31] or reported on countries and/or regions of origin represented by the largest number of migrant participants [33,34,44]. Three studies did not report or specify the country of origin for migrant adolescents [36,39,41], and one study reported adolescents' ethnic background instead of country or region of origin [42]. Six studies also distinguished between first- and second-generation migrants [19,22,23,31,36,39]. Four studies examined or controlled for associations with migrant adolescents' religious backgrounds or environments [19,31,33,44]. One study excluded migrants with an Islamic background from its analyses because of low levels of substance use [34].

Quality of the evidence base

To evaluate study quality, a slightly adapted version of the Joanna Briggs Institute prevalence critical appraisal tool [30] was used. The criteria addressed: (i) sample representativeness; (ii) appropriate recruitment; (iii) an adequate sample size; (iv) appropriate reporting of the study setting and subjects; (v) adequate data coverage of the targeted sample; (vi) objective standard criteria for the measurement condition; (vii) reliable measurement of the condition; (viii) appropriate statistical analysis; (ix) important confounders controlled/accounted for; and (x) subpopulations identified using objective criteria. All criteria were answered with either 'yes', 'no' or 'unclear'. For each study, the total number of criteria answered with 'yes' was used as the final evaluation score (see Table 2). Total quality ratings ranged from 3 to 9 (M = 6.1, SD = 2.0); nine studies received a total quality rating of 6 or higher [19,22,23,31,36,38,41,44]. The criteria sample representativeness and participant recruitment were often not met by the included studies: eight studies received negative ratings [31,33,34,37,39,40,42,43] on these criteria. Except for one study [33], all studies met the criterion for appropriate reporting of the study setting and subjects. For criterion 7 (reliable measurement of the condition), nine studies [19,23,33,34,36,37,39,40,42] received the rating 'unclear' because of unclear reporting or because assessments were not conducted or supervised by research personnel. Finally, all studies used self-report measures and received positive ratings on criterion 6 (objective standard criteria for measurement condition).

Substance use prevalence rates

Differences in substance use prevalence rates between adolescents with and without a migration background were examined for tobacco, alcohol and illicit drugs.

Tobacco. Of the six studies presenting tobacco prevalence rates, three reported outcomes for migrant youth as one category [23,39,40]. When controlling for adolescents' age, gender and socioeconomic status, two studies showed lower [23,40] and one study showed similar tobacco prevalence rates in migrants compared to natives [39]. Marsiglia *et al.* [40] reported higher tobacco prevalence rates in migrant youths compared to natives. However, when controlling for confounders, substance prevalence rates were lower in migrants compared to natives. These analyses were, however, based on a composite measure for substance use, and outcomes of the analyses controlling for confounders were not presented separately for tobacco, alcohol and cannabis.

Four studies presented differences in tobacco prevalence rates between natives and migrants categorised according to home country or region [19,23,42,43]. Comparisons between different groups of migrants from non-European countries were presented in four studies, with one study showing lower tobacco prevalence rates in all migrants from countries outside the European Union [43] and two studies showing lower tobacco prevalence rates in specific groups of migrants from non-European countries [19,23]. Abebe *et al.* [19] found lower tobacco use in Asian and African migrants compared to natives. Furthermore, Sarasa-Renedo *et al.* [23] found lower tobacco use in first-generation migrants from Muslim regions and the rest of Africa, Asia and countries outside the Southern Cone of Latin America (Venezuela, Brazil, Mexico, Central America and the Caribbean), but higher tobacco use in first-generation migrants from

the Southern Cone (Argentina, Chile, Paraguay and Uruguay) compared to natives. Finally, a British study [42] on tobacco prevalence rates using self-reported ethnic status (i.e. Asian, Black, white and other) showed similar tobacco prevalence rates in boys regardless of ethnic status and lower tobacco prevalence rates in Asian and Black females compared to white females.

Data on tobacco prevalence rates in migrant adolescents from European countries were presented in three studies [19,23,43]. In two studies, tobacco use was higher among both all migrants from European countries [43] and among second-generation migrants from European countries [19] compared to among natives. In contrast, the third study found similar tobacco prevalence rates for both natives and first-generation migrants from European countries. The third study also found similar tobacco prevalence rates for both natives and migrants from non-European countries.

Three studies examined tobacco use prevalence rates in first- and second-generation migrants [19,23,39]. In line with the acculturation hypothesis, we expected stronger similarities in tobacco use prevalence rates between natives and second-generation migrants than between natives and first-generation migrants. One study confirmed this assumption, showing similar tobacco use prevalence rates for second-generation migrants and somewhat higher tobacco use prevalence rates for first-generation migrants when compared to natives [39]. In the second study, tobacco prevalence rates did not significantly differ between first- and second-generation migrants, although tobacco use was somewhat higher and more similar to the rate for natives in second-generation migrants than in first-generation migrants [23]. The third study showed mixed findings: it suggested similar tobacco prevalence rates among first- and second-generation migrants from Asia and Africa, while in migrants from the Middle East, tobacco prevalence rates were higher in second- compared to first-generation migrants [19].

Finally, two studies examined the relation between tobacco use and a Muslim religious background [19,23]. Abebe *et al.* [19] found that both Muslims and non-religious adolescents had a higher probability of using tobacco than did Christian adolescents. In contrast, Sarasa-Renedo *et al.* [23] found that migrant adolescents from Muslim regions had a lower likelihood of tobacco use compared to both migrants from non-Muslim regions and native-born adolescents.

In sum, studies on tobacco use only provided partial support for the migration paradox since two out of three studies showed lower tobacco use in migrant adolescents compared to native-born adolescents. First, three of the four studies that differentiated migration status according to home country or ethnic group provided indications that the migration paradox may be applicable to specific groups of migrants. Second, the three studies that included information about generation status provided some support for an acculturation effect concerning tobacco use in migrant adolescents. Last, the two studies on tobacco use prevalence in migrant adolescents with a Muslim background produced mixed results.

Alcohol. Fourteen studies examined differences in alcohol use prevalence rates between migrant and non-migrant adolescents. Eight studies reported comparisons for migrant adolescents as one category and unanimously showed lower alcohol prevalence rates for migrant adolescents as compared to native-born adolescents [23,31,34,36,39–41,44]. Eight studies also presented differences in alcohol prevalence rates between natives and migrants categorised according to their home country or region [19,22,23,31,33,40,43,44]. Six studies reported lower alcohol prevalence rates in migrants from non-European countries than in natives [19,22,23,31,43,44]. One study reported lower alcohol use in migrants from non-European countries, except for migrants from Asian countries [33]. In contrast, another study showed higher alcohol prevalence rates in migrants from Latin American compared to native-born adolescents in Spain [40].

Four studies provided data on alcohol prevalence rates in migrant adolescents from European countries [19,22,23,43]. In two studies, lower binge drinking rates were found in either all migrants from European countries [19] or only second-generation migrants from European countries [23]. Three studies showed similar alcohol use prevalence rates when native adolescents were compared to all [22] or second-generation [23] migrants from European countries or to migrants from non-Nordic European countries. In contrast, higher alcohol use was found in migrant adolescents from Nordic European countries compared to natives [43].

Six studies examined possible acculturation effects by including information about generation status [19,22,23,31,36,39]. The findings were not straightforward, with two studies showing no evidence for an acculturation effect: binge drinking or past month alcohol use rates were not more similar to natives' drinking practices in second-generation migrants compared to first-generation migrants [19,39]. Two studies reported an acculturation effect for alcohol use but not for binge drinking [21,36], and two studies showed an acculturation effect in specific migrant groups [24,31]. One of these studies reported acculturation effects of frequency of drinking and drunkenness in migrants with a Vietnamese background but not in migrants with a Pakistani

background. In particular, Pakistani girls did not show acculturation in drinking habits [31]. The other study indicated no overall acculturation effect when taking into account first- versus second-generation migration status. Instead, acculturation effects for binge drinking appeared to be related to having parents with a mixed versus same cultural background [23].

Finally, five studies examined whether lower alcohol prevalence rates in migrant adolescents were related to having a Muslim background [19,23,31,33,44]. All studies indicated lower alcohol use prevalence rates in migrant adolescents with a Muslim background compared to natives and other migrant groups.

To summarise, studies on alcohol use provided support for the immigrant paradox. All eight studies showed lower alcohol use in migrant adolescents compared to native-born adolescents. Support for the migration paradox was also found in seven out of eight studies that differentiated migration status according to home country or region. Furthermore, four out of six studies that included information about generation status provided nuanced support for an acculturation effect. Finally, the five studies on alcohol use in migrant adolescents with a Muslim background provided support for the assumption that Muslim migrant youth are less likely to use alcohol than non-Muslim youth.

Illicit drugs. Nine studies examined illicit drug use prevalence rates in adolescents with and without migration backgrounds [19,22,23,34,37,39,40,42,43]. Seven studies compared prevalence rates in migrant adolescents as one category and showed contrasting findings. Four studies reported lower prevalence rates of illicit drug use in migrants compared to natives [23,37,39,40], two reported higher prevalence rates in migrants compared to natives [23,42], and one reported similar prevalence rates for both migrants and natives [34].

Five studies described differences in drug use prevalence rates among migrants depending on their home country or region [19,22,23,40,43]. Three studies noted generally lower illicit drug use in migrants from non-European countries than in natives [19,23,40]. One study showed similar drug use prevalence rates between natives and migrants from non-European countries [43], and another study reported higher drug use in this group of migrants compared to natives [22]. A study on substance use among different ethnic groups showed higher substance use in adolescents categorised as Black or 'other' compared to adolescents categorised as white or Asian [42].

Four studies presented comparisons between migrants from European countries and native adolescents and also produced mixed findings [19,22,23,43]. On the one hand, two studies reported higher illicit drug use in migrants from European countries compared to natives. On the other hand, one study showed similar cannabis prevalence rates [19], and another reported lower cannabis use and similar use of stimulants and sedative-hypnotics in migrants from European countries [23].

Three studies differentiated between first- and second-generation migrants and provided data on the presence of acculturation effects. In one study, prevalence rates of illicit drug use in second-generation migrants were more similar to the rates for native-born adolescents than for first-generation migrants, which confirmed the acculturation hypothesis [22]. The other two studies, however, did not present supportive evidence for this hypothesis [19,23].

Finally, two studies examined whether substance use prevalence rates differed between migrant adolescents with and without a Muslim background [19,23]. One study showed similar cannabis prevalence rates between native adolescents and migrants with a Muslim background [19], while the other study found lower prevalence rates for cannabis and stimulant use, and higher prevalence rates for sedatives-hypnotic use in migrants from Muslim regions compared to migrants from other regions and natives [23].

In summary, studies on illicit drug use provided mixed support for the migration paradox since the seven included works offered contrasting findings. Five studies that differentiated migration status according to home country, region or ethnic group reported contrasting findings regarding the migration paradox. The acculturation hypothesis also received limited support. Of the three studies that included information about generation status, only one provided support for an acculturation effect. Lastly, the two studies on illicit drug use prevalence in migrant adolescents with a Muslim background led to mixed results: compared to migrants with a non-Muslim background and natives, migrant youths with a Muslim background showed either similar or lower cannabis use.

Discussion

In this systematic review, we evaluated studies comparing substance use prevalence rates among migrant and native adolescents in Europe. The findings differed according to the type of substance. With regard to alcohol, the findings unanimously showed lower prevalence rates for migrant adolescents compared to native-born adolescents, providing support for the immigrant paradox. Differences in alcohol use

prevalence rates between migrant and native-born adolescents were still present after controlling for certain substance-related demographic characteristics. Studies that examined additional explanations for differential prevalence rates between migrant and native-born adolescents provided nuanced support for the acculturation hypothesis, which is consistent with earlier research inside and outside Europe [45–47]. Substance use levels were lower for migrants with a relatively short stay in the receiving country and for migrants whose parents were both born abroad. Migrant adolescents were also generally more influenced by the substance use levels of their country of origin than of their receiving country. The hypothesised generational differences in substance use, however, varied across ethnic groups. Moreover, Muslim religious affiliation appeared to be a protective factor against alcohol use. For tobacco and illicit drug use, however, the evidence was mixed and provided limited support for the immigrant paradox and acculturation hypothesis. Furthermore, the results regarding cannabis use among migrants with an Islamic background or from Islamic countries were inconclusive.

The study's findings are limited in that the quality of the included studies was variable. The total quality ratings ranged from 3 to 9, and only nine studies received a total quality rating of 6 or higher. While some studies lacked information on response rates and did not control for confounders, other studies used convenience samples and included a low percentage of migrant adolescents. Moreover, most included studies generally compared prevalence rates within one specific country and were predominantly based on data from a selection of Western European countries. These inconsistencies are an important limitation as they complicate comparison of the results and reduce the generalisability to European youth. Furthermore, the self-report data in the included studies may have been biased due to recall errors or social desirability tendencies among respondents. Among immigrant groups in particular, self-reporting measures about substance use may be affected by social desirability concerns, leading to under-reported prevalence rates [48–50]. It is unclear to what extent the usual self-report measures are culturally sensitive or tend, for example, to generate a stronger social desirability bias in migrant adolescents. It is also important to note that information regarding publication bias was not taken into account in this review.

By including studies covering all types of substance use, a large age span and multiple European countries, this review has offered a comprehensive understanding of substance use prevalence rates among migrant and native-born adolescents. Furthermore, this review has considered important confounders and moderating factors, such as differences between first- and second-generation migrant adolescents. The results of this review are similar to the findings of a less comprehensive earlier review [19]. Both reviews report lower alcohol use prevalence rates in migrant compared to native-born adolescents, while findings for tobacco use have been inconclusive. In contrast, the present review indicates mixed results for illicit drug use.

Although questions remain about how substance use prevalence rates differ between migrant and native-born adolescents, differences between the two groups exist. The nuanced support for the immigrant paradox for alcohol use suggests a healthier behavioural profile regarding substance use for migrant adolescents versus native-born adolescents. Therefore, developing interventions to support migrant communities in maintaining their healthier substance use practices when arriving in the host country would be beneficial.

In this review, the immigrant paradox and acculturation hypothesis appear to hold true for alcohol use. The findings on tobacco and illicit drug use, however, were mixed. This outcome illustrates that much remains to be understood about how and to what extent confounders such as demographic variables, Islamic background, and first- and second-generation status play a role in substance use differences between migrant and native-born adolescents, and across ethnic groups. Therefore, it is recommended to develop a European standard for surveys regarding substance use among adolescents, in which information about, for example, the country of birth of both parents, the substance use culture in the host country and the country of origin, age of migration and length of stay in the host country is included. This approach would make it possible to investigate fluctuations, causes, consequences and geographical trends regarding substance use prevalence rates for migrant and native-born adolescents on the European level.

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Conflict of Interest

The authors have no conflicts of interest.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Appendix S1. Quality Evaluation Criteria based on the Joanna Briggs Institute Prevalence Critical Appraisal Tool.