

# The prevalence of tobacco, alcohol, stimulant, khat, and cannabis use among school-going students in African and Arab countries: a systematic review and meta-analysis

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## ABSTRACT

**Objectives:** The objectives of this review and meta-analysis were twofold: first, to determine the prevalence of substance use among school-going children in Arab and African countries; and second, to highlight the considerable influence of variables such as the nation's region and the timeframe of the study on the prevalence of substance use.

**Methods:** Research was sourced from Science Direct, Scopus, Web of Science, Google Scholar, and PubMed. Thirty-seven articles were incorporated in accordance with the PRISMA guidelines. This review included studies published from 2013 to 2023. The statistical meta-analysis was performed using Comprehensive Meta-Analysis ver. 3 software. Across 37 studies, the total number of study participants was 73,508.

**Results:** The meta-analysis revealed that tobacco was the most commonly used substance, with a prevalence of 16% (95% confidence interval [CI], 12.7%–20.02%). This was closely followed by alcohol, which had a prevalence of 15% (95% CI, 10.5%–22.8%), stimulants at 11.4% (95% CI, 7.4%–17%), khat at 10% (95% CI, 5.7%–15%), and cannabis at 8% (95% CI, 3.3%–18.4%). Notably, alcohol was the only substance that showed an increasing trend in prevalence from before to after 2019, rising from 13.3% (95% CI, 6.2%–26.1%) to 17% (95% CI, 10.2%–27%) ( $p < 0.001$ ). Additionally, the prevalence of substance use varied significantly between Arab and African countries ( $p < 0.001$ ).

**Conclusion:** Although the prevalence of substance use among school-going populations has significantly decreased over time, with the exception of alcohol, it is imperative that both African and Arab countries implement comprehensive measures and stringent laws to address the production and marketing of substances.

**Keywords:** Africa; Arabs; Meta-analysis; Prevalence; Students; Substance-related disorders

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## Introduction

Today, the world is home to 1.9 billion adolescents, the highest number in history, accounting

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for 24% of the global population [1]. In the Middle East and North Africa region, predominantly composed of low- and middle-income countries, adolescents aged 10 to 19 constitute 17% of the population, with nearly half of the region's inhabitants under 30. Despite significant potential benefits, efforts to improve adolescent health in this region are advancing slowly [2]. While the incidence of communicable diseases has significantly decreased in recent decades, this progress has been overshadowed by the emergence of non-communicable diseases, mental health issues, unintentional injuries, self-harm, and the health consequences of ongoing regional conflicts. Moreover, preventable risk factors such as high body mass index and tobacco use continue to be widespread [3].

Substance use has emerged as a significant public health issue among adolescents, defined by the regular consumption of substances such as alcohol or psychoactive drugs in harmful quantities or through dangerous methods [4]. Early initiation and polysubstance use are strong predictors of future problems related to substance use. Despite this, adolescents frequently do not seek help for these issues, underscoring the importance of early interventions to prevent long-term consequences [4].

Globally, substance use results in significant health impacts, accounting for 494,000 deaths and 30.9 million disability-adjusted life years as reported in the World Drug Report 2021 [5]. In addition to health consequences, substance use presents moral, social, and economic challenges. No country is immune to these issues. However, certain regions, such as North Africa and the Eastern Mediterranean—key transit areas for illicit drugs—are especially vulnerable. This vulnerability is exacerbated by rapid social changes and ongoing conflicts. The rising trends of substance use among youth (ages 15–24) and women, with increasing dependence on substances like cannabis, sedatives, opiates, and stimulants, reflect this vulnerability [6].

Understanding the terminology related to substance use is essential: harmful use involves consumption that directly damages health, hazardous use refers to consumption that increases the risk of harm, and intoxication is a disruption of mental and physical functions due to acute effects. Substance abuse is characterized as a pattern of use that leads to significant impairment or distress [7]. Several factors contribute to substance use, such as genetic predisposition, family dynamics, environmental influences, and psychological well-being [8].

In Africa, cannabis is the most commonly used illicit substance, with prevalence rates ranging from 5.2% to 13.5% in West and Central Africa. Amphetamine-type stimulants rank as the second most prevalent, while benzodiazepines

## HIGHLIGHTS

- This research provides insights into the prevalence of commonly used substances in African and Arabic nations, including alcohol, tobacco, cannabis, khat, and stimulants.
- This study focused on the primary psychoactive substances within a specific age group in both Arabic and African countries. It is hoped that the data will guide policymakers and healthcare professionals in tailoring preventive actions for this particular population.
- This research examined how the location of a country and the time frame of the study influence the prevalence of substance use among the school-going population in 2 highly populated regions (African countries and Arab countries) by showing the decrease and increase rates over the years, with comparisons between countries.

and inhalants are also used in some countries. For instance, in Sierra Leone, 3.7% of youth engage in injecting drug use [9]. In the Middle East and North Africa region, where 50% of the population is under 24 and 1 in 5 individuals is aged between 10 and 24, these young people have the potential to drive change if provided with opportunities for education and skill development [10]. However, substance use among students poses significant risks, including academic decline and increased vulnerability to sexually transmitted infections, such as human immunodeficiency virus, during intoxication [11].

Despite numerous studies, comprehensive assessments of substance use prevalence among school-going students in Africa and Arab countries remain limited. This systematic review and meta-analysis aimed to address this gap by offering a broad perspective on substance use among school-going populations in both Africa and Arab countries. Additionally, it examined how regional conditions influence substance use trends over time, providing insights to inform effective prevention and intervention strategies.

## Materials and Methods

### Protocol and Registration

This systematic review and meta-analysis was prepared and reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Supplementary Material 1) [12]. The protocol was registered on PROSPERO (CRD4202345643).

### Search Strategy

In order to conduct this meta-analysis, the chosen studies were required to meet the following criteria: they were published between January 1, 2013, and June 1, 2023. A comprehensive search was conducted across several databases, including Web of Science, Scopus, Google Scholar, Science Direct, and PubMed. These databases are commonly utilized for indexing publications related to health and substance use. The study was conducted from August to October 2023. Given the rapid evolution of knowledge in health and behavioral sciences, our systematic review aims to synthesize the most recent evidence from the past decade concerning substance use, thereby providing valuable insights for practitioners, policymakers, and researchers. The research algorithm used involved various permutations of keywords, which were categorized as follows: (1) topic (e.g., substance use, substance consumption, prevalence of substance use); (2) population (e.g., students, school-going children, adolescents); (3) outcome (e.g., prevalence of psychoactive substance use, prevalence of substance consumption).

Table S1 provides a detailed explanation of the algorithmic strategy used in this research. This document specifies the dates, platforms/interfaces, and databases utilized, lists the terms incorporated, describes the conjunctions employed to form the search string, and presents the resulting number of findings.

### Inclusion and Exclusion Criteria

This review included publications in English that provided accessible abstracts and focused on research conducted in African countries or the Arab countries. The studies specifically targeted school-going children, aiming to measure the prevalence of psychoactive substance use. Inclusion criteria were limited to research published between January 1, 2013, and June 1, 2023, that specifically examined school-going populations. Studies were excluded if they failed to provide data on the prevalence of substance use among students, were qualitative without quantifying substance use, or were literature reviews or book chapters.

### Study Selection

The selection process involved multiple steps to ensure a thorough and unbiased review. Initially, 2 postgraduate students independently examined studies by reviewing their titles, abstracts, and keywords. They removed duplicates and those that did not meet the inclusion criteria. Subsequently, they carefully assessed the full texts of the remaining articles to determine their eligibility based on the established criteria. In cases of disagreement, the 2 primary assessors (E.C.M. and M.G.) resolved issues through structured discussion.

If consensus could not be reached, a senior professor was consulted to provide a final judgment. This process ensured that any potential bias or inconsistencies in evaluation were resolved through an impartial third party.

### Review Question

This evaluation followed the guidelines set forth in the PRISMA framework [12]. The primary objective of this study was to explore 2 main questions: “Which studies have investigated the prevalence of substance use among students in the Arab region and Africa?” and “What was the reported prevalence of substance use according to the category of substances used in each study?” Additionally, the study aimed to compare and emphasize the potential impact of variables such as the geographical location of the country and the time period of the study on the prevalence of psychoactive substance use among students.

### Data Screening and Selection

Data collection was conducted using a structured form to gather the following details: citation information, authorship years, geographical location, prevalence of substances, categories of substances used, and methods for analyzing the prevalence of substance use in studies. To ensure the accuracy and reliability of the data, 2 independent postgraduate students cross-checked the extracted data to verify consistency with the original studies. Any discrepancies in data extraction were resolved through consensus between the 2 assessors, and the final data were verified by a senior professor. This multi-step verification process was implemented to maintain the quality and accuracy of the data used in the analysis.

### Appraisal of Study Quality and Risk of Bias

The methodological quality and risk of bias assessment were primarily conducted by C.E.M. and M.G., with additional input provided through discussions among all authors. This comprehensive evaluation adhered to the Joanna Briggs Institute (JBI) Meta-analysis of Statistics Assessment and Review Instrument (MAStARI) protocol [13]. The findings from these studies were categorized by their quality as high, moderate, or low. The Grading of Recommendations, Assessment, Development, and Evaluations (GRADE approach) was used to evaluate the overall quality of evidence for each reported outcome (Table S2) [11,14–48], and the Cochrane Collaboration assessment tool was employed to assess the risk of bias [49].

The risk of bias was categorized into 3 levels based on responses of “yes” or “no.” A study was considered to have a low risk of bias if over 70% of the responses were “yes.” A moderate risk was indicated if affirmative responses ranged

from 50% to 70%, and a high risk was noted if less than 50% of the responses were affirmative (Table S3) [11,14–48]. To ensure reliability, 2 postgraduate students independently assessed each study for quality and bias. Any discrepancies in their evaluations were resolved through discussion to reach a consensus. If necessary, a senior professor reviewed the study to make the final decision. This rigorous, multi-step process ensured a comprehensive and balanced evaluation of the overall quality and potential biases in the included studies.

### Data Analysis and Synthesis

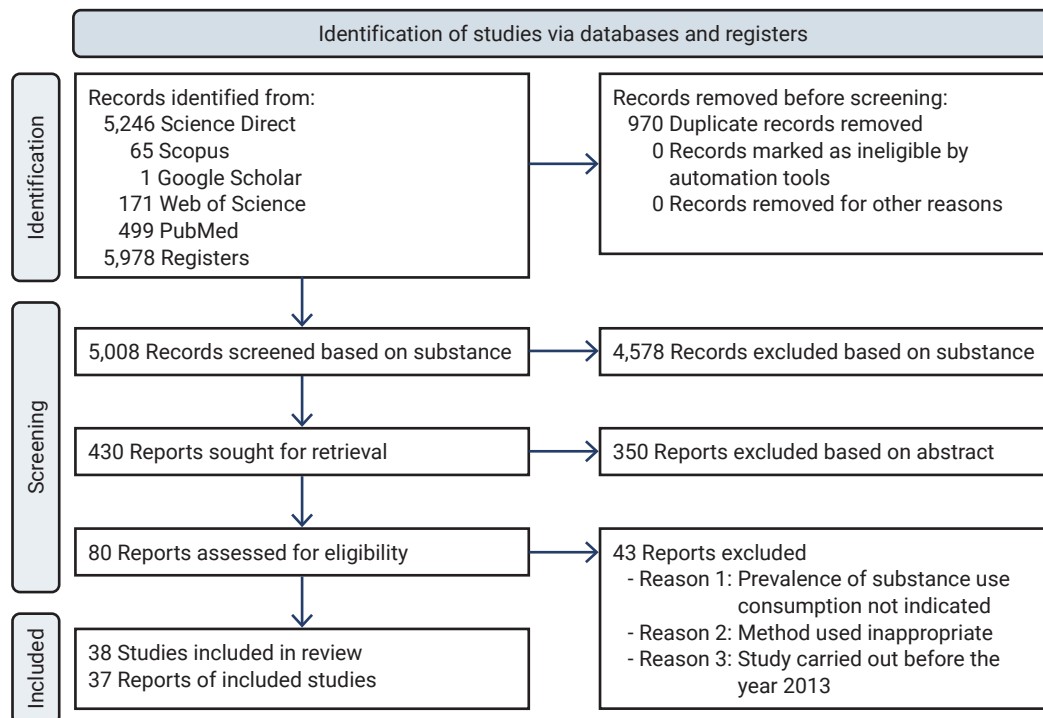
The decision regarding the type of meta-analysis model (random effects, fixed effects, or mixed effects) depended significantly on the presence or absence of heterogeneity. Once this was determined, forest plots were generated to illustrate the prevalence of substance use, with a 99% confidence interval (CI) presented on a logarithmic scale. Heterogeneity was evaluated using the  $I^2$  method [50,51], which quantifies the proportion of variability in outcomes across studies that can be attributed to heterogeneity rather than sampling error [52]. The  $I^2$  value indicates the degree of heterogeneity, with values between 50% and 75% signifying moderate heterogeneity and values exceeding 75% indicating high heterogeneity. Values below 50% suggest homogeneity among the study results, and forest plots were used to visualize this apparent

heterogeneity. The risk of bias, specifically publication bias, between studies was assessed by examining the symmetry or asymmetry of the funnel plots. The meta-analysis was conducted using Comprehensive Meta-Analysis version 3 software, (Biostat Inc.). The goal of this analysis is to provide recommendations for prevention strategies to be implemented during efforts to reduce and prevent substance use among young school-going children.

## Results

### Search Results

The search identified 5,246 studies from Science Direct, 499 from PubMed, 171 from Web of Science, 65 from Scopus, and 1 from Google Scholar. These journals and databases were specifically chosen for their relevance to health and substance use research, particularly focusing on peer-reviewed publications that target school-going populations in African and Arab countries. After eliminating 970 duplicates and applying the inclusion and exclusion criteria, 80 studies were considered eligible for review. Subsequently, 43 of these studies were excluded after full-text assessments revealed issues such as inadequate sample sizes and the absence of reliability or validity evaluations. Ultimately, 37 studies met all criteria and were included in the final review (Figure 1).



**Figure 1.** Flow diagram of the studies included in the systematic review and meta-analysis of substance use among school-going children in Africa and Arab countries.

### Study Characteristics

Every study included in this systematic review and meta-analysis utilized a cross-sectional design. The sample sizes varied across the studies, ranging from 234 to 10,684 participants. In total, this systematic review and meta-analysis included 73,508 participants. The research was conducted between 2013 and 2023 and spanned various regions in African and Arab countries, with the mean (or median) age of participants ranging from 13 to 21 years (Table 1) [11,14–48,53].

The review included studies from 19 countries, with the majority conducted in Africa, especially in North Africa ( $n=13$ ) [18–30], followed by Eastern African countries ( $n=7$ ) [11,31–36] Western African countries ( $n=5$ ) [37–40,53], Southern African countries ( $n=2$ ) [41,42], and Central African countries ( $n=1$ ) [43]. Additionally, studies from Arab countries were included ( $n=9$ ) [14–17,44–48].

### Risk of Bias in Studies and Appraisal of Study Quality

Among the 37 studies included in this review, 13 demonstrated

**Table 1.** Characteristics and outcomes of the included studies in the systematic review and meta-analysis

Study	Year	Country	Continent/subregion	Study design	Main categories of substances analyzed	Sample size	Mean age (y) <sup>a)</sup>	Predominant substances	Prevalence of predominant substances (%)
Hirpa et al. [31]	2023	Ethiopia	Eastern Africa	Cross-sectional	Alcohol, khat, tobacco, marijuana	3,347	16.5 ± 1.4	Alcohol	41.8
Melkam et al. [32]	2023	Ethiopia	Eastern Africa	Cross-sectional	Alcohol, khat, tobacco	406	17.51 ± 1.42	Alcohol	49
Bio-Sya et al. [53]	2022	Benin	Western Africa	Cross-sectional	Alcohol, stimulants, and tobacco	627	17 ± 2	Alcohol	62.67
Mavura et al. [33]	2022	Tanzania	Eastern Africa	Cross-sectional	Alcohol, tobacco, cocaine, heroin, and marijuana	3,224	10–19	Alcohol	8.2
Mehanovic et al. [37]	2022	Nigeria	Western Africa	Cross-sectional	Tobacco, alcohol, and drug use	4,078	NA	Alcohol	34
Metuge et al. [43]	2022	Cameroon	Middle Africa	Cross-sectional	Tobacco, alcohol, tramadol, and cannabis	625	22.2 ± 2.837	Tobacco	26.2
Mutiso et al. [34]	2022	Kenya	Eastern Africa	Cross-sectional	Alcohol, cannabis, tobacco, sedatives, Khat/amphetamine	9742	21.4 ± 2.4	Alcohol	17.7
Olashore et al. [41]	2022	Botswana	Southern Africa	Cross-sectional	Alcohol, tobacco products, cannabis, inhalants, amphetamine	742	15.26 ± 1.57	Alcohol	25.1
Baklouti et al. [18]	2021	Tunisia	Northern Africa	Cross-sectional	Tobacco, alcohol, and illicit drug use	1,210	14	Tobacco	13.9
Maalej et al. [19]	2021	Tunisia	Northern Africa	Cross-sectional	Cigarettes	234	16.59 ± 0.908	Tobacco	38.3
Seid et al. [35]	2021	Ethiopia	Eastern Africa	Cross-sectional	Alcohol, tobacco, khat	383	18.1 ± 1.077	Alcohol	16
Al-Gburi et al. [44]	2020	Iraq	Asia/Arab country	Cross-sectional	Alcohol	810	17.15 ± 1.20	Alcohol	9.50
Amara et al. [20]	2020	Tunisia	Northern Africa	Cross-sectional	Tobacco, alcohol, illicit drugs	1,195	13–16	Tobacco	16.70
Hamdan-Mansour et al. [45]	2020	Jordan	Asia	Cross-sectional	Tobacco, stimulants	1,497	16–17	Tobacco	18.3
Mohamed et al. [21]	2020	Sudan	Northern Africa	Cross-sectional	Tobacco	1,229	15–19	Tobacco	31
Obadeji et al. [38]	2020	Nigeria	Western Africa	Cross-sectional	Alcohol, tobacco, tramadol, cannabis, codeine, sedatives	682	16	Alcohol	8.9

(Continued to the next page)

Table 1. Continued

Study	Year	Country	Continent/ subregion	Study design	Main categories of substances analyzed	Sample size	Mean age (y) <sup>a)</sup>	Predominant substances	Prevalence of predominant substances (%)
Hamdi et al. [22]	2016	Egypt	Northern Africa	Cross-sectional	Nicotine, benzodiazepines alcohol, and organic solvents	10,648	13–18	Nicotine	8.1
Ben Ayed et al. [23]	2020	Tunisia	Northern Africa	Cross-sectional	Tobacco	1,210	15.6±4.2	Tobacco	16.7
Ben El Jilali et al. [24]	2020	Morocco	Northern Africa	Cross-sectional	Alcohol	1,236	16.9±2.2	Alcohol	9
Charfi et al. [25]	2020	Tunisia	Northern Africa	Cross-sectional	Alcohol	315	NA	Alcohol	19.7
Othman et al. [26]	2019	Sudan	Northern Africa	Cross-sectional	Shisha tobacco	3,387	14–17	Tobacco	16.8
Badr et al. [46]	2018	Kuwait	Asia/Arab country	Cross-sectional	Smoking and drug use	1,310	14.5±0.03	Tobacco and drugs	26.6
Damiri et al. [47]	2018	Palestine	Asia	Cross-sectional	Tobacco, alcohol, and illicit drugs	831	15–16	Tobacco	40.6
El Kazdoh et al. [27]	2018	Morocco	Northern Africa	Cross-sectional	Tobacco, alcohol, and drug use	764	NA	Tobacco	16.2
Idowu et al. [39]	2018	Nigeria	Western Africa	Cross-sectional	Cigarette smoking, cocaine, tramadol, heroin, cannabis, alcohol	249	16.3±2	Tramadol	39
Riva et al. [42]	2018	Botswana	Southern Africa	Cross-sectional	Alcohol, illicit drugs, marijuana	1,936	NA	Alcohol	42.1
Al-Alawi AS et al. [28]	2018	Sudan	Northern Africa	Cross-sectional	Cigarettes, herbal cigarettes, shisha, and tombak	1,229	14.5	Cigarettes	13
Zammit et al. [29]	2021	Tunisia	Northern Africa	Cross-sectional	Illicit substances, tobacco	4,272	13.3±1.2	Tobacco	12.9
Babatunde et al. [40]	2018	Nigeria	Western Africa	Cross-sectional	Cigarettes	2,000	NA	Tobacco	13.6
Chivandire et al. [36]	2016	Zimbabwe	Eastern Africa	Cross-sectional	Alcohol, smoking, cigarettes, cannabis	311	16.8	Cannabis	8
Zarrouq et al. [30]	2016	Morocco	Northern Africa	Cross-sectional	Cannabis, alcohol, inhalants, psychotropics, cocaine, heroin, amphetamine	3,020	16±2	Tobacco	16.1
McKelvey et al. [48]	2015	Jordan	Asia	Cross-sectional	Tobacco	1,454	12.6	Cigarette	29.8
Birhanu et al. [11]	2014	Ethiopia	Eastern Africa	Cross-sectional	Alcohol, cigarettes, and khat	651	17.25±1.24	Alcohol	40.9
Crookes and Wolff [14]	2014	United Arab Emirates	Asia/Arabian Peninsula	Cross-sectional	Tobacco products	394	16.9	Tobacco	23.4
Alsanosy et al. [15]	2013	Kingdom of Saudi Arabia	Asia/Arabian Peninsula	Cross-sectional	Khat	3,923	15±2.01	Khat	20.5
Gaffar et al. [16]	2013	Kingdom of Saudi Arabia	Asia/Arabian Peninsula	Cross-sectional	Tobacco	3,923	12–21	Tobacco	10.7
Raffee et al. [17]	2021	Jordan	Asia	Cross-sectional	Stimulants	414	NA	Stimulants	16.9

NA, not available; SD, standard deviation.

<sup>a)</sup>Data are presented as mean ± SD or ranges.

a 100% risk of bias, which corresponds to a low risk of bias. The reporting of the substances analyzed, the measured prevalence for each type of substance, the methods used, and a well-described study protocol in the Materials and Methods section were free from bias. The prevalence of substance use, the reporting of the most commonly used substances, and the indication of the study year were reported without bias in 36 of the included studies. Only 1 study, conducted by Raffee et al. [17], had a 71.42% risk of bias concerning the prevalence of substance use and the most commonly used substance in the sample. Fifteen studies reported on the risk of bias associated with funded studies, highlighting that financial support often led to an expansion of the sample size. Table S3 discloses the affirmative (yes) response percentages for each study included in this review and provides detailed information concerning the responses related to the evaluation of bias risk.

The quality appraisal of studies included in this systematic review was conducted using the JBI characteristics. The appraisal revealed that all 37 studies assessed demonstrated strong methodological rigor. Specifically, the following criteria were evaluated: (1) Sample frame: All studies provided an appropriate sample frame addressing the target population; (2) Participant characteristics: Each study clearly described the characteristics of the participants; (3) Sample size: All studies reported adequate sample sizes for their respective analyses; (4) Study subjects and setting: Detailed descriptions of the study subjects and settings were provided in each article; (5) Data analysis: Sufficient coverage of the identified sample was evident in the data analysis conducted; (6) Study objectives: The objectives of the studies were clearly stated and aligned with the findings; (7) Statistical analysis: Each study employed appropriate statistical analyses to support their conclusions.

Given that all appraisal criteria were met, we assessed the overall quality of evidence as high according to the GRADE framework. This high-quality assessment indicates that the findings reported in this review are reliable and can be confidently applied in practice and policy (Table S4).

## Results of Syntheses

### Prevalence of substance use according to the category of substances

The meta-analysis showed that tobacco is the most commonly used substance among those examined. There was significant variability in outcomes across studies, indicating substantial heterogeneity in the results. Notably, the prevalence of alcohol consumption and stimulant use were also high, followed by the use of khat and cannabis. All statistics were calculated using a random-effects model (Figures 2–6).

### Prevalence of substance use according to continent

The prevalence of tobacco use, the most commonly used substance, was estimated to be higher in the Arab countries at 18% compared to 14% in Africa (95% CI, 13.7%–23.2%;  $p < 0.001$ ; 95% CI, 11.3%–18.6%;  $p < 0.001$ ).

The estimated prevalence of alcohol consumption was higher in Africa at 16.7% than in the Arab countries at 7% (95% CI, 10.6%–25.2%;  $p < 0.001$ ; 95% CI, 3.6%–13.2%;  $p < 0.001$ ) respectively. However, the use of khat was significantly more prevalent in Arab countries, at 14%, than in Africa, where the prevalence rate was 9% (95% CI, 3.4%–44.1%;  $p < 0.001$  and 95% CI, 4.3%–21.3%;  $p < 0.001$ , respectively).

The prevalence of stimulant use was estimated to be approximately 10% in Africa and 9% in the Arab countries (95% CI, 6.4%–15.9%;  $p < 0.001$  and 95% CI, 5%–16.1%;  $p < 0.001$ , respectively). For cannabis use, the prevalence rates in the Arab countries and Africa were relatively similar (9%; 95% CI, 2.8%–25.2%;  $p < 0.001$  and 6%; 95% CI, 2.6%–13.2%;  $p < 0.001$ , respectively).

### Main substance categories explored and utilized

The studies included in this meta-analysis demonstrate that researchers have investigated a wide variety of psychoactive substances. A frequency analysis of substance use, performed using NVIVO ver. 12 software, shows that tobacco was the most commonly used substance, followed by alcohol, stimulants, khat, and cannabis (Table 1).

### Influence of the study duration on the prevalence of psychoactive substances

The number of studies has significantly increased over the years, focusing on the 5 substances examined in this study: tobacco, alcohol, khat, cannabis, and stimulants. The overall prevalence of these substances varied between the 2 periods (before and after 2019).

The prevalence of alcohol use significantly increased in a comparison of the 2 periods before and after 2019, from 13.3% to 17%, respectively (95% CI, 6.2%–26.1%;  $p < 0.001$  and 95% CI, 10.2%–27.0%, respectively;  $p < 0.001$ ).

The prevalence of cannabis use significantly decreased after 2019, from 10.9% to 6% (95% CI, 3.3%–30.8%;  $p < 0.001$  and 95% CI, 1.9%–17.8%, respectively;  $p < 0.001$ ).

The prevalence of tobacco use significantly decreased after 2019, from 20.8% to 13.2% (95% CI, 14.9%–28.3%;  $p < 0.001$  and 95% CI, 9.7%–17.7%;  $p < 0.001$ , respectively). Similarly, the prevalence of khat use also showed a significant decline, from 25.1% before 2019 to 8% afterwards (95% CI, 8.7%–54.0%;  $p < 0.001$  and 95% CI, 4%–15.3%;  $p < 0.001$ , respectively). Additionally, the prevalence of stimulant use decreased notably, from 17.4% to 3% during the same periods (95%

Study name	Statistics for each study					Event rate and 95% CI					Model
	Event rate	Lower limit	Upper limit	Z-Value	p-Value	-0,250	-0,125	0,000	0,125	0,250	
Hirpa et al (2023)	0,047	0,041	0,055	-36,868	0,000				+		
Melkam et al (2023)	0,242	0,203	0,285	-10,055	0,000						+
Bio sya et al. (2022)	0,434	0,395	0,473	-3,305	0,001						
Mavura et al. (2022)	0,043	0,037	0,051	-35,750	0,000				+		
Metuge et al. (2022)	0,262	0,229	0,297	-11,630	0,000						+
Mutiso et al. (2022)	0,080	0,075	0,086	-65,399	0,000				+		
Olashore et al (2022)	0,131	0,108	0,157	-17,397	0,000					+	
Baklouti et al. (2021)	0,040	0,030	0,052	-21,636	0,000				+		
Maalej (2021)	0,385	0,324	0,449	-3,498	0,000						
Seid (2021)	0,065	0,044	0,095	-12,867	0,000				+		
Al-Gburi et al. (2020)	0,095	0,077	0,117	-18,810	0,000				+		
Amara et al. (2020)	0,167	0,147	0,190	-20,704	0,000					+	
Ayman et al. (2020)	0,183	0,164	0,203	-22,382	0,000					+	
Dafaallah et al. (2020)	0,310	0,285	0,336	-12,972	0,000						
Obadeji et al (2020)	0,031	0,020	0,047	-15,561	0,000				+		
Rabie et al. (2020)	0,090	0,085	0,096	-68,322	0,000				+		
Ben Ayed et al. (2019)	0,140	0,122	0,161	-21,893	0,000					+	
Charfi et al. (2019)	0,241	0,197	0,292	-8,700	0,000						+
Othman et al (2019)	0,134	0,123	0,146	-36,993	0,000					+	
Badr et al. (2018)	0,060	0,049	0,075	-23,661	0,000				+		
Damiri et al. (2018)	0,410	0,388	0,433	-7,694	0,000						
El kazdough et al.(2018)	0,162	0,138	0,190	-16,727	0,000					+	
Idowu et al. (2018)	0,293	0,240	0,353	-6,321	0,000						+
Shaikh et al. (2018)	0,171	0,143	0,203	-14,727	0,000					+	
Zammit et al (2017)	0,129	0,119	0,140	-41,830	0,000				+		
Babatunde et al	0,136	0,122	0,152	-28,344	0,000				+		
Chivandire et al. (2016)	0,160	0,125	0,202	-11,373	0,000					+	
Zarrouq et al. (2016)	0,161	0,149	0,175	-33,325	0,000					+	
Karma et al. (2015)	0,300	0,279	0,322	-16,399	0,000						
Biranhu et al. (2014)	0,298	0,264	0,334	-9,999	0,000						
Crookes et al. (2014)	0,723	0,677	0,765	8,534	0,000						
Alsanosy et al (2013)	0,110	0,101	0,120	-40,969	0,000				+		
Ralfe et al (2010)	0,171	0,138	0,211	-12,080	0,000					+	
	0,161	0,127	0,202	-11,719	0,000					+	Random

**Figure 2.** Prevalence of tobacco use among school-children in African and Arab countries 2013–2023 (%). CI, confidence interval.

CI, 8.2%–33.1%;  $p < 0.001$  and 95% CI, 5.5%–15.4%;  $p < 0.001$ , respectively). An asymmetric funnel plot suggested the presence of reporting bias and/or heterogeneity between studies.

## Discussion

This review provides a comprehensive overview of the prevalence of substance use among school-going youth in African and Arab countries, based on 37 studies published between 2013 and 2023. Earlier reviews often focused on specific countries [54] or specific substances [55]. In contrast, our study offers a broader regional perspective, including both Africa and the Arab countries. Key findings indicate substance use prevalence rates of 16% for tobacco, 15% for alcohol, 11.4% for stimulants, 10% for cannabis, and 10% for khat. These results add to the growing body of literature on youth substance use, underscoring regional differences and

trends that warrant further investigation.

The prevalence of alcohol use was significantly higher in African countries (16.7%) than in the Arab region (7%). This discrepancy reflects cultural and regulatory differences between these regions, where alcohol consumption may be more restricted by religious and social norms in Arabic countries. Additionally, we observed a significant increase in alcohol use post-2019 (17% compared to 13.3% before 2019,  $p < 0.001$ ), a trend consistent with the Global Status Report on Alcohol and Health 2018, which documented rising alcohol consumption globally [56]. This increase may be attributed to evolving social norms, economic growth, and Western influences in parts of Africa. The social cognitive theory supports the role of social context in shaping these substance use patterns [57]. Regional variations within African countries further support the role of cultural and social factors in substance use. For instance, in Morocco, alcohol use was reported by 12.4% of boys and 7.2% of girls

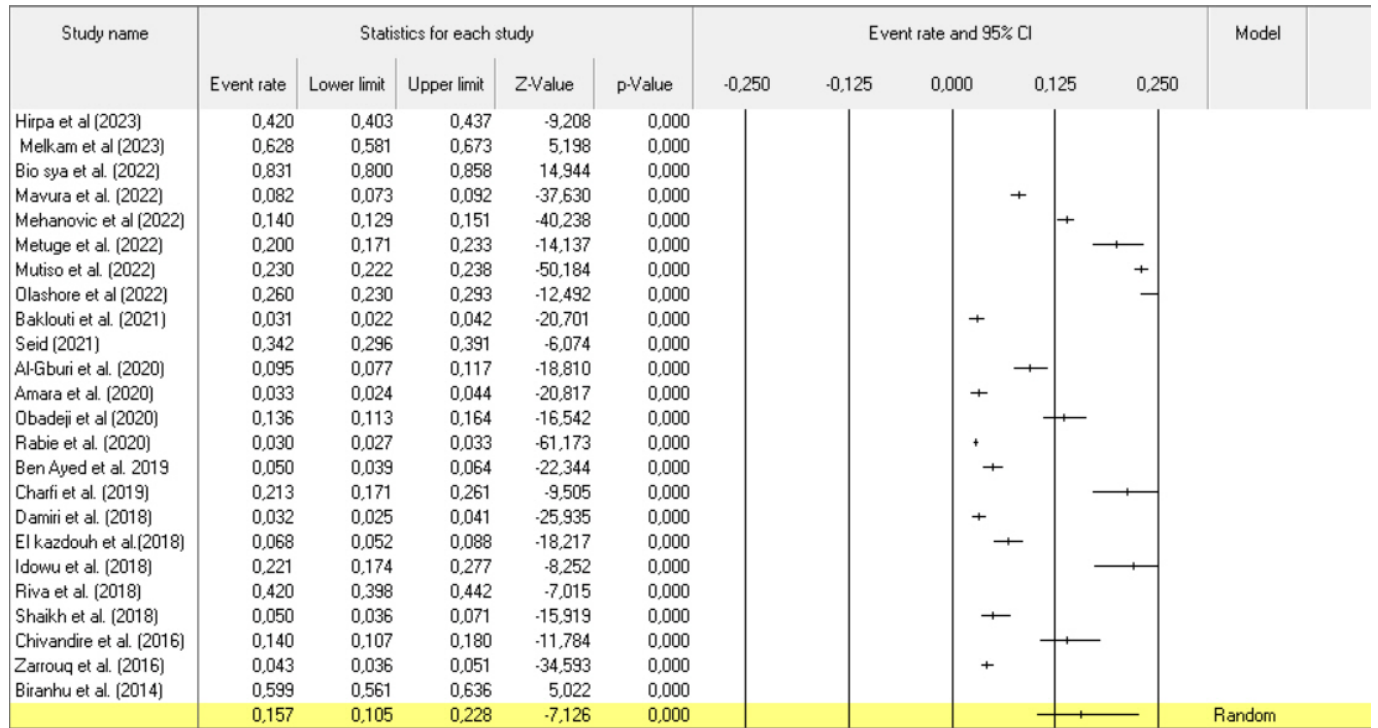


Figure 3. Prevalence of alcohol use among school-children in African and Arab countries 2013–2023 (%). CI, confidence interval.

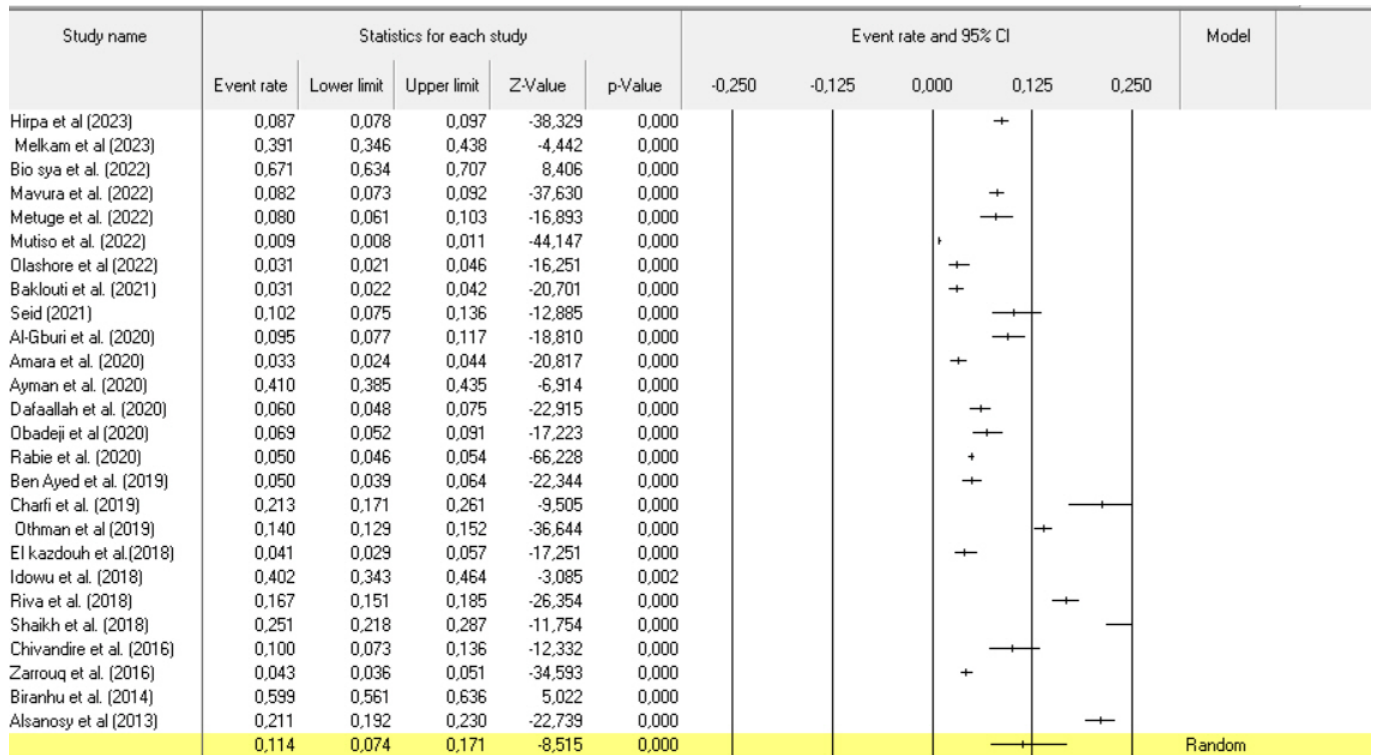


Figure 4. Prevalence of stimulant use among school-children in African and Arab countries 2013–2023 (%). CI, confidence interval.

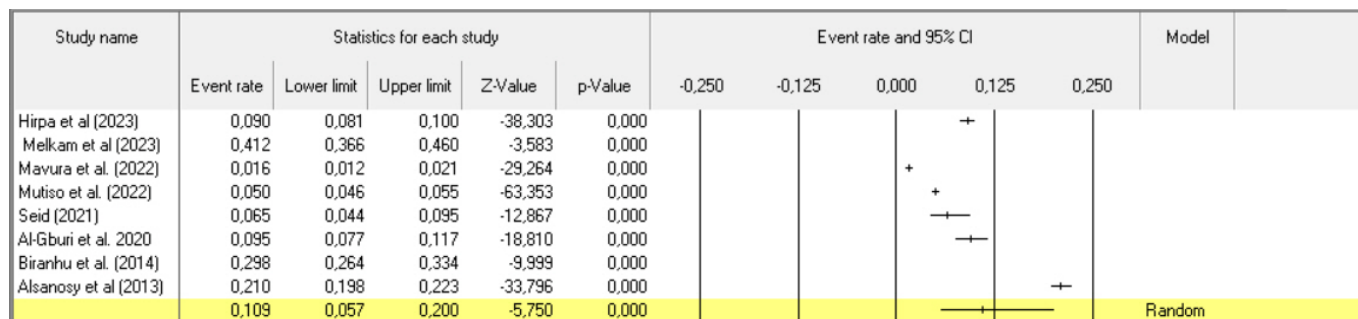


Figure 5. Prevalence of khat use among school-children in African and Arab countries 2013–2023 (%). CI, confidence interval.

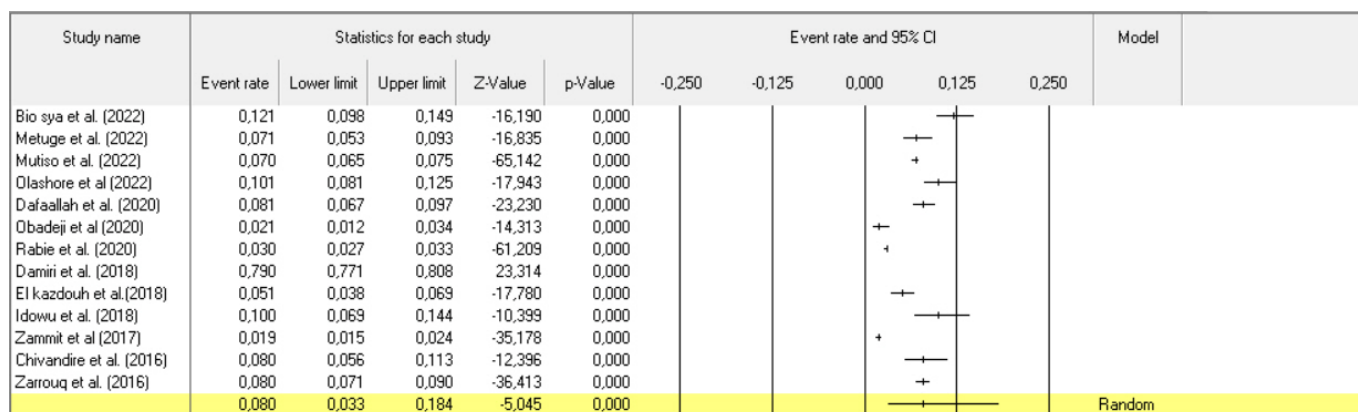


Figure 6. Prevalence of cannabis use among school-children in African and Arab countries 2013–2023 (%). CI, confidence interval.

aged 15 to 17 [58], while in Tunisia, 8.0% of students reported having consumed alcohol at least once in their lifetime [59]. In contrast, Egypt exhibited a much lower prevalence of 2.9%. The variability in alcohol use across these countries underscores the importance of localized public health strategies that consider cultural, religious, and legal contexts [60]. A broader analysis of Sub-Saharan Africa estimated the prevalence of alcohol use at 11.3% [61]. However, our study observed a higher prevalence of 16.7% (95% CI, 10.6%–25.2%) for alcohol use in African countries, highlighting a notable increase compared to previous estimates. This suggests an upward shift in alcohol consumption trends in the region, which may reflect changing social, economic, and cultural dynamics impacting substance use.

Our study observed higher smoking rates among youth in Arab countries (18%) compared to those in Africa (14%). However, there was a significant decline in smoking prevalence over time, decreasing from 20.8% before 2019 to 13.2% after 2019 ( $p < 0.001$ ). This reduction may be attributed to effective tobacco control measures, especially in countries like Tunisia, where enhanced legislation and collaboration with the World Health Organization have bolstered anti-tobacco initiatives.

This trend is consistent with global patterns, where increased awareness of the health risks associated with smoking and stricter regulations have led to lower smoking rates [62]. This observation is consistent with the health belief model, which suggests that increased perception of risk can motivate behavioral change [63].

Our study also highlighted a notable decline in stimulant use, from 17.4% before 2019 to 3% after 2019 ( $p < 0.001$ ). This significant reduction contrasts with global trends, where stimulant use has generally increased. The sharp decline observed in our sample may indicate the effectiveness of recent drug policies or targeted youth prevention programs, which could be explored further in future research. In Africa, the prevalence of cocaine use is estimated at 0.2% to 0.5%, and the number of amphetamine users ranges from 1.5 to 5.2 million individuals annually, suggesting a broader upward trend in stimulant use [64]. However, the lower prevalence observed in our study points to regional differences in substance availability and enforcement, as well as potential shifts in youth behavior, consistent with the theory of planned behavior, where behavior is shaped by societal norms and perceived control [65].

The prevalence of khat use in our study was 10%, which is lower than the rates reported in studies involving university students, where the prevalence was approximately 14.16% [59]. Khat use was notably high in countries such as Saudi Arabia (18.85%), Ethiopia (13.59%), and Yemen (13.04%) [66], where cultural practices and limited enforcement of prohibitions contribute to its continued use. The differences noted above may be explained by the fact that our meta-analysis included data from countries where khat use is illegal, including Saudi Arabia, Egypt, Morocco, Sudan, and Kuwait [67]. These findings underscore the complexity of addressing khat use, as legal restrictions alone are insufficient without strong enforcement and community engagement, particularly in areas where khat is culturally significant.

Regarding cannabis use, we observed a decline in prevalence in the African region, from 10% before 2019 to 6% after 2019. This finding aligns with previous research [68] and is consistent with decreased cannabis consumption trends in both African and Arab countries. This decline may be attributed to changes in the legal framework for cannabis cultivation in Lebanon and Morocco, the primary cultivators in North Africa. Additionally, a report [69] noted that while cannabis use among 15- to 16-year-olds often exceeds that of the general population aged 15 to 64, Africa is the exception, with similar prevalence rates of 7% in both age groups [68]. This finding is supported by the Public Health Model, which suggests that changes in the legal and social environment can influence health behaviors, including substance use. The model posits that modifying these external factors can lead to changes in individual behavior, including reductions in substance use [70].

The robustness of this review is underscored by the inclusion of a substantial number of studies ( $n=37$ ) across 19 countries, and the focus on substances that constitute the most problematic used worldwide: alcohol, tobacco, khat, cannabis, and stimulants.

In this comprehensive systematic review and meta-analysis, which assessed substance use among school-going youth in African and Arabic countries, we observed significant prevalence rates for various substances: tobacco (16%), alcohol (15%), stimulants (11.4%), cannabis (10%), and khat (10%). Notably, alcohol use was higher in African countries (16.7%) than in Arab countries (7%), with a marked increase observed post-2019. Conversely, smoking prevalence was greater in Arab countries (18%) than in Africa (14%), though it has significantly declined over time. Similarly, stimulant use showed a substantial decrease from 17.4% before 2019 to 3% after 2019. The relatively lower prevalence of khat use (10%) compared to that among university students underscores regional variations and the influence of legal restrictions

[71]. Cannabis use in Africa also decreased from 10% to 6% after 2019. These findings highlight the necessity for targeted educational interventions, policy development, and support programs that take into account regional and cultural factors.

## Strengths and Limitations

A key limitation of this study is its reliance on self-reported data, which may introduce biases due to underreporting or overreporting, as well as social desirability biases that could influence the findings. To mitigate these issues, we included only studies that utilized validated instruments and met a minimum sample size threshold to enhance data reliability. Additionally, the cross-sectional nature of the studies prevents us from drawing causal conclusions, underscoring the need for future longitudinal research. To reduce publication bias, we conducted a comprehensive search across multiple databases, incorporating both grey literature and unpublished studies. Random-effects modeling was applied to address the significant heterogeneity among studies, as indicated by the  $I^2$  statistic. Future research should focus on exploring regional differences and assessing the effectiveness of interventions targeting substance use among youth.

## Study Implications

The clinical implications of this study are significant, particularly in guiding early interventions and prevention strategies for substance use among adolescents. By identifying the prevalence and patterns of substance use in school-going populations across Africa and Arab countries, this research highlights critical areas for targeted interventions. Clinically, the findings underscore the need for healthcare professionals, educators, and policymakers to focus on early screening and intervention programs in schools to mitigate the long-term health impacts of substance use, such as mental health disorders, addiction, and related physical health complications. Furthermore, the study emphasizes the importance of culturally adapted prevention programs that consider regional differences in substance use trends. These findings can inform clinicians about the necessity of integrating mental health services with substance use prevention programs to address co-occurring issues like anxiety, depression, and self-harm, which are often linked with adolescent substance use.

## Conclusion

Substance use among school-going adolescents continues to be a major public health concern in Africa and the Arab countries. The varying prevalence rates of tobacco, alcohol,

cannabis, khat, and stimulant use underscore the necessity for interventions that are specifically designed to meet the unique challenges and resources of each country. It is critical to address socio-environmental factors and to promote preventive strategies through educational and mentorship programs to reduce substance use. Early intervention, especially targeting gateway substances such as tobacco and alcohol, is vital for preventing the progression to more harmful drugs. Collaborative, multi-sectoral efforts are essential to address this escalating problem and safeguard adolescent health.

## Supplementary Material

**Supplementary Material 1.** Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist; **Table S1.** Search details and review forms; **Table S2.** Quality appraisal studies included in the systematic review and meta-analysis according to Joanna Briggs Institute characteristics; **Table S3.** Risk of bias; **Table S4.** The Joanna Briggs Institute criteria used for methodological quality assessment. Supplementary data are available at <https://doi.org/10.24171/j.phrp.2024.0204>.

## Notes

### Ethics Approval

Not applicable.

### Conflicts of Interest

The authors have no conflicts of interest to declare.

### Funding

None.

### Availability of Data

The datasets used and/or analyzed during the current study are cited in this article.

### Authors' Contributions

Conceptualization: CEM; Data curation: CEM, MG; Investigation: CEM; Project administration: MC, AH; Supervision: MC, AH; Validation: CEM, MG; Visualization: CEM, MG; Writing—original draft: CEM, MG; Writing—review & editing: all authors. All authors read and approved the final manuscript.

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