

BMJ Open Tobacco use and behaviour among South African adolescents and young adults: systematic review and meta-analysis

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ABSTRACT

Objective Tobacco use, particularly the initiation of smoking during adolescence and young adulthood, represents a significant public health concern in South Africa. This study aims to conduct a comprehensive review of published literature about tobacco use and behaviour among adolescents and young adults and to determine an aggregated prevalence estimate of tobacco use within this demographic.

Design Systematic review and meta-analysis.

Data sources PubMed/MEDLINE, EMBASE, Cochrane Library, Scopus and Google Scholar were searched from 1 January 2000 through 31 October 2023.

Eligibility criteria Studies were eligible for inclusion if they were cross-sectional studies conducted in South Africa and measured the prevalence and determinants of tobacco use among adolescents and young adults aged 12–24 years.

Data extraction and synthesis Two reviewers independently extracted information for each article and saved it into an Excel spreadsheet. Risk of bias analysis was conducted using the Risk of Bias Assessment Tool for non-randomised studies. The methodology quality of each selected study was evaluated using the Joanna Briggs Institute checklist. The heterogeneity of prevalence estimates was assessed using I² statistic (random-effects DerSimonian-Laid approach).

Results Out of 73 articles identified, 12 articles were included in the analysis. The pooled prevalence of current tobacco use among South African adolescents and young adults was estimated to be 22%. The pooled prevalence of tobacco use among school dropouts, university students and secondary school learners was 51%, 20% and 16%, respectively. Stratifying using gender, boys (26%) were two times more likely to use tobacco than girls (13%).

Conclusion The elevated occurrence of tobacco usage among South African adolescents and young adults is a relevant public health concern. There is a need for more population-based prevalence studies at a national level to estimate the burden of tobacco use in South Africa.

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INTRODUCTION

Tobacco use is one of the most significant public health concerns for both users and society and often begins early in adult life.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study was based on a comprehensive search of peer-reviewed studies on the prevalence and determinants of tobacco use among adolescents and young adults in South Africa.
- ⇒ Study selection was done by two independent reviewers to ensure all relevant studies were included.
- ⇒ Self-administrated questionnaires were used in some of the included studies; thus, the prevalence of tobacco use may have been under-reported or over-reported.
- ⇒ Only peer-reviewed studies were included; we may have missed important tobacco use evidence from grey literature.

Globally, tobacco use has been recognised as an important risk factor for non-communicable diseases and increased level of mortality.^{1 2} Despite international initiatives to reduce tobacco use, the WHO estimated tobacco as the cause of more than 8 million deaths annually.³ Nonetheless, there are more than one billion people smoking every day, and more than 80% of those people are found in low and middle-income countries.^{4–6} Furthermore, it has been estimated that about 80% of established adult smokers started smoking before the age of 18 years.^{7–9} Based on the Centers for Disease Control and Prevention, 8.2% and 23.9% of middle school students and high school students, respectively, reported smoking tobacco in 2009.¹⁰ As such, other studies have shown an increase in tobacco use among adolescents and young adults residing in developing countries, especially in Sub-Saharan Africa.^{11–13}

South Africa, on the other hand, had a higher prevalence of tobacco smoking among all ethnic groups since 1976,^{14 15} which was the highest smoking rate in the continent.^{16 17} According to the South African Global Adult Tobacco Survey conducted in 2021, it was found that 12.7 million people aged 15 years

and above were currently using tobacco, making up one-third of the adult population.¹⁸ Tobacco smoking accounts for a large burden of preventable diseases and causes of premature death in South Africa. Statistics South Africa reported that tobacco use contributed to approximately 20% of total deaths in 2017.¹⁹ Each year, approximately 83 957 people die from tobacco-related diseases¹⁹ in South Africa: tuberculosis as the leading cause of death, followed by hypertensive diseases and chronic lower respiratory diseases.²⁰ This number is expected to rise to 250 000 in the next few years, if new interventions and tobacco controls are not implemented.¹⁵ In addition to risks posed by tobacco users, non-smokers are also at health risks related to exposure to secondhand smoke.²¹

Tobacco use among adolescents and young adults constitutes a significant public health problem globally. Adolescence represents a period when several changes occur in the brain and body (eg, onset of puberty), and young adults experimenting other sociopsychological changes.²² This is a special vulnerable group that often engages in several risky behaviour, such as tobacco use, alcohol use, drug abuse and unsafe sex.^{23–26} In South Africa, it is reported that smoking initiation occurs at a young age, and it seldom extends past that period.²⁷ South African researchers successfully developed strong tobacco control legislation to reduce the prevalence of tobacco smoking in the late 1980s and early 1990s.²⁸ These laws also prohibited the sale of tobacco products to minors.¹⁶ However, Chandora *et al* found that in 2011 around 53% of South African adolescent smokers purchased cigarettes from the stores or shops, and over 68% of those were not refused to buy due to age.²⁹ Moreover, the use of tobacco smoking keeps increasing among this group, where the prevalence has increased from 16.5% in 2008 to 16.9% in 2011. Thus, there is a necessity for newer studies to emerge, allowing for a better understanding of how effective, restricting and enforcing the South African Tobacco Control policies are and the efforts taken to reduce tobacco smoking in South Africa.

Factors associated with tobacco use among young people include cultural and social status, parental smoking, psychological factors (eg, gender and parental divorce)^{30–31} and socialising with smokers.³² In South Africa, school factors such as failing in school, dropping out or low commitment to school may be associated with tobacco use.^{33–34} In addition, a lack of satisfaction with school also contributes to low performance, which is also related to adolescent smoking behaviour.³⁵ Therefore, a better understanding of the epidemiology of tobacco smoking and behaviour among adolescents and young adults is required to develop more effective tobacco-focused interventions in South Africa. To the best of our knowledge, there is limited evidence from systematic review and meta-analysis that explores tobacco use and behaviour among South African adolescents and young adults. This review addresses the abovementioned gaps by systematically reviewing published articles on tobacco use and behaviour among adolescents and young adults

to estimate the prevalence of tobacco use and to inform targeted intervention efforts aimed at reducing the level of smoking and associated harms in South Africa. The current tobacco use was defined as smoking once or more than once every day or every other day within 30 days. This study included adolescents and young adult smokers who are school going and school dropouts.

METHODS

Overall approach

A systematic review was performed using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines³⁶ on studies concerning tobacco use and behaviour among adolescents and young adults in South Africa (see online supplemental file 1). This approach was followed to describe the studies' identification, selection and inclusion in the review.

Search strategy

South African relevant articles, published in the English language, were identified by searching five international scholarly databases, namely PubMed/MEDLINE, EMBASE, Cochrane Library and Scopus (see online supplemental file 2). Google Scholar was also searched to increase the chances of finding more relevant articles related to tobacco use. To successfully retrieve relevant articles, the following key terms were used during the search: (tobacco use OR tobacco consumption OR cigarette smoking) AND (adolescents OR young people OR school learners OR young adults OR youth OR teenage) AND (South Africa OR Gauteng OR Western Cape OR Mpumalanga OR Limpopo OR North-West OR Free-State OR Eastern Cape OR Northern Cape OR Kwazulu-Natal). Relevant articles published between 1 January 2000 and 31 October 2023 were identified, by searching different databases. Google Scholar was last searched on 5 November 2023.

Article screening

The article screening process involved a multistep approach. First, titles and abstracts were screened to identify relevant studies on tobacco use and behaviour among South African adolescents and young adults. Two reviewers carefully scanned and read the titles, abstracts and keywords of all the articles retrieved from the databases to check their relevancy and eligibility. The unrelated articles were removed. Any discrepancies between the reviewers were investigated and discussed, and where there were disagreements, the full text was reviewed. Furthermore, the full articles for the relevant abstracts were checked and cross-checked for eligibility. At each stage, reasons for study exclusion were documented. This rigorous and methodical screening process ensures that the results of the review and meta-analysis are robust and reliable.

Inclusion and exclusion criteria

Studies were included if they were conducted in South Africa or South African provinces (Gauteng, Western

Cape, Mpumalanga, Limpopo, North-West, Free-State, Eastern Cape, Northern Cape, and Kwazulu-Natal) and included prevalence and determinants of tobacco use among adolescents and young adults aged 12–24 years. In addition, studies were selected if published in peer-reviewed journals, full text, open access, conducted between 1 January 2000 and 31 October 2023, published in the English language, and designed as cross-sectional.

Studies were excluded if they were conducted outside South Africa, conducted before the year 2000, explored electronic cigarette use, did not have full articles, were published as part of books or conference proceedings, and had not been peer-reviewed. Studies were also excluded if they were qualitative, lacked quantitative details, designed as longitudinal, randomised clinical trials and systematic reviews.

Data extraction tool

The data extraction included the surname of the first author, the year the study was published, study location and setting, design of the study, sampling technique, study population (general population, secondary school learners (or those who are currently enrolled in school) and university students), sample size, mean age of adolescents and young adults, prevalence of tobacco use and gender. Two reviewers independently extracted information for each article and saved it into an Excel spreadsheet.

Risk of bias assessment

The risk of bias was assessed qualitatively concerning selection bias (sample population), selection bias (participation rate), reporting bias (selective outcome reporting), performance bias (analytical methods for bias control) and other biases. Risk of bias analysis was conducted by rating studies using low, unclear and high risk of bias using the Risk of Bias Assessment Tool for non-randomised studies.³⁷ Two reviews independently assessed the risk of bias in the included studies, and all the disagreements were resolved through consensus. The full risk of bias assessment is available in online supplemental figure 1.

Quality assessment tool

The Joanna Briggs Institute checklist for studies reporting prevalence data³⁸ was used to thoroughly evaluate the quality of the selected studies. To achieve these, nine questions posed on the checklist were explored. These questions were (a) sample frame appropriate to address the target population, (b) study participants sampled appropriately, (c) sample size adequate, (d) study subjects and setting described in detail, (e) data analysis conducted with sufficient coverage of identified sample, (f) valid methods used for the identification of condition, (g) condition measured in a standard, reliable way for all participants, (h) appropriate statistical analysis and (i) response rate adequate, and if not, was it managed appropriately. The four possible replies to these questions were 'yes', 'no', 'unclear' or 'not applicable'. Two

reviews independently assessed the study methodological quality of the included studies, and all the disagreements were resolved through consensus. The full methodological quality assessment is available in online supplemental table 1.

The reasons for excluding articles before the year 2000

South African government has taken steps to pass comprehensive tobacco control legislation in 1993 and amended the act in 1999.^{39–42} The amended act included the printing of warnings on cigarette packaging, banning tobacco advertising, sponsorships, promotions and restriction of smoking in enclosed public places. Most of all, the act prohibited the sale of tobacco products to minors.¹⁶ Therefore, this study included articles published from the year 2000 after the amendment of the 1993 act in 1999, to illustrate whether the implementation of these measures reduced tobacco use, over time, among adolescents and young adults in South Africa.

Data synthesis and analysis

The extracted data were reported in the descriptive table to show the study characteristics. The table showed authors, year of study, location, study participants, gender, sample size, number of men and women, mean age and prevalence (%). The pooled prevalence of current tobacco use among South African adolescents and young adults was measured using STATA.⁴³ The heterogeneity of prevalence estimates was assessed using I^2 statistic (DerSimonian-Laid approach). The high I^2 statistic values showed that most of the variability in included studies is due to heterogeneity rather than chance.⁴⁴ The I^2 statistic value across studies was considered low if 25%, moderate if 50% and high if 75%. Studies were reported in different groups, such as the general population, men and women. Furthermore, to analyse any time trend of tobacco use prevalence, the study period was split into before 2010 and after 2010 for men and women. All the prevalences were reported with computed 95% CIs. The values of $p < 0.05$ were considered significant heterogeneity. Sensitivity analysis was performed by excluding one study at a time to determine any change before and after the analysis and to see if any study influenced the significance of observed estimates. Funnel plot in terms of asymmetry and Egger's linear regression test were used to assess publication bias.^{45 46} Finally, for each moderator variable, a meta-regression analysis was performed according to the year of study and sample size to estimate their impact on the prevalence of tobacco use.

RESULTS

Seventy-three published articles were pooled from five databases, of which 16 were excluded because they were duplicates. Thus, 57 abstracts were initially screened for eligibility to identify adolescents and young adults studies conducted in South Africa and South African provinces. Forty-five relevant abstracts of studies were identified.

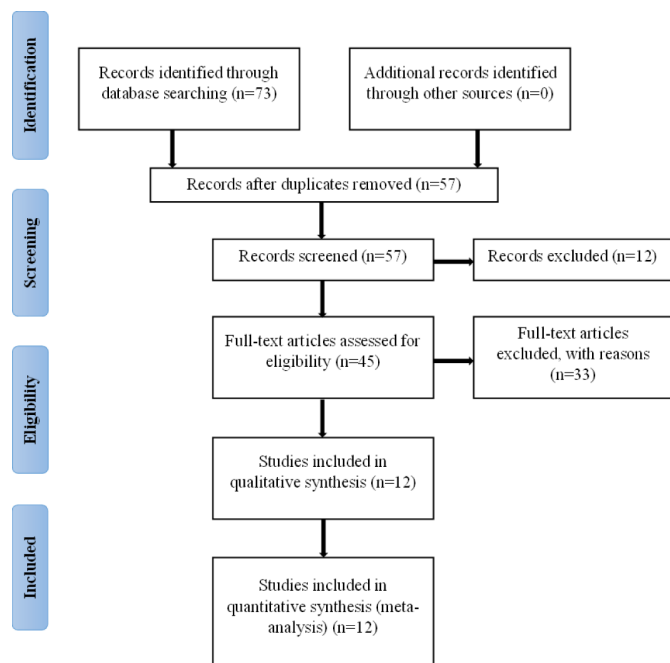


Figure 1 Flowchart of systematic search process for studies of tobacco use among adolescents and young adults.

Further screening of full-text articles was conducted for studies reporting tobacco use and led to the inclusion of 12 eligible articles in the meta-analysis. Among other reasons, articles were excluded because they did not

report quantitative data or did not have enough information regarding tobacco use. The process of study extraction and selection is illustrated in figure 1.

Studies included in the meta-analysis were conducted between 2003 and 2019, assessing a total sample of 59 287 South African adolescents and young adults (table 1). Eight studies were conducted among secondary school learners (grades 8 to 11) and included 26 248 boys and 27 387 girls, and two studies were among university students and school dropouts, respectively. The mean age ranged from 14.6 to 21 years. All the selected studies reported current tobacco use and were cross-sectional. More than half of the studies used probability sampling technique (58.33%),^{28 47–52} and five used non-probability sampling technique.^{53–57} Finally, three studies were conducted in the general South African population; three in Western Cape; two in Limpopo; two in three provinces (KwaZulu Natal, Western Cape, Mpumalanga and Gauteng); one in KwaZulu Natal and one in Gauteng. The characteristics of studies included in the systematic review and meta-analysis are shown in table 1, whereas results of their quality are reported in online supplemental table 1.

Online supplemental figure 1 shows summary risk of bias of included studies. All studies recruited participants from a representative population, selection bias was low. Selection bias for participation rate was low for 10 studies and unclear for 2 studies. Performance bias due to outcome bias was low for six studies and high for

Table 1 Characteristics of studies included in systematic review and meta-analysis of tobacco use prevalence among South African adolescents and young adults

Authors	Year	Location	Study design	Sample size	Number of men	Number of women	Mean age	Prevalence (%)
Taylor <i>et al</i> ⁵⁷	2003	Kwazulu Natal	Cross-sectional study	1318	593	725	17.04	–
Swart <i>et al</i> ⁵²	2003	South Africa	Two-stage cluster design	6045	2859	2924	15.1	23.0
Madu <i>et al</i> ⁴⁸	2003	Limpopo	Stratified cluster sampling	435	192	243	17.25	10.6
Flisher <i>et al</i> ⁴⁷	2003	Western Cape	Multistage sampling	2930	1313	1617	–	27.0
Gordon <i>et al</i> ⁵⁵	2010	Western Cape	Cross-sectional study	375	236	139	21	23.0
Rantao <i>et al</i> ⁵⁰	2012	Limpopo	Cluster sampling strategy	1878	905	908	14.6	7.6
Moodley <i>et al</i> ⁴⁹	2012	Gauteng	Cross-sectional study	809	402	407	16.2	12.4
Reddy <i>et al</i> ²⁸	2013 (1999, 2002, 2008 and 2011)	South Africa	Cross-sectional school-based survey	6045, 8935, 8602, 8499	2859, 4074, 4078, 4137	2924, 4781, 4422, 4306	–	23, 18.5, 16.5, 16.9
Reddy <i>et al</i> ⁵¹	2014	South Africa	Stratified two-stage cluster sampling design	10270	4976	5164	16.2	12.40
Kruger <i>et al</i> ⁵⁶	2016	Western Cape	Self-administered online survey	4578	–	–	–	17.7
Desai <i>et al</i> ⁵³	2019	Kwazulu Natal, Western Cape, Mpumalanga and Gauteng	Cross-sectional design	4222	2506	1716	17.4	50.2
Desai <i>et al</i> ⁵⁴	2019	Kwazulu Natal, Western Cape, Mpumalanga and Gauteng	Cross-sectional design	391	213	174	17.83	53.5

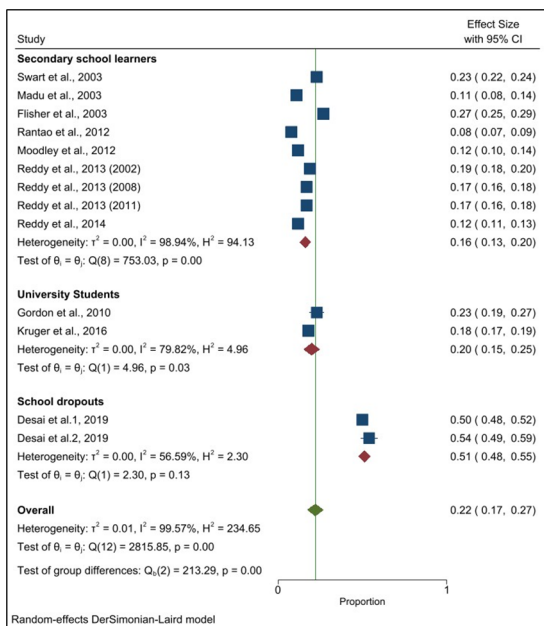


Figure 2 The forest plot of the studies included in the systematic review and meta-analysis of total (both gender) current tobacco use prevalence among South African adolescents and young adults using random-effects DerSimonian-Laird model.

six studies. Performance bias due to statistical analysis/confounding was unclear in the nine studies and low for three studies. Finally, the risk of bias due to other potential bias was unclear for five studies, high for four studies, and low for three studies.

Meta-analysis of tobacco use prevalence

Figure 2 illustrates the prevalence of reported total current tobacco use by the population group, including secondary school learners, university students, school dropouts and the general population. The overall pooled prevalence (95% CI) of current tobacco users among South African adolescents and young adults using the random-effects DerSimonian-Laird model was computed to be 22% (95% CI 17 to 27%) with high, statistically significant heterogeneity ($I^2=99.57\%$). The highest prevalence of current tobacco use was reported in the studies among school dropouts (51%; 95% CI 48% to 55%) with $I^2=56.59\%$, followed by the prevalence in the two studies among university students (20%–95% CI 15% to 25%) with $I^2=79.82\%$. However, the lowest prevalence was observed among secondary school learners (16%; 95% CI 13% to 20%) $I^2=98.94\%$. In totality, only the study by Rantao *et al*⁵⁰ had a prevalence of less than 10% (8%; 95% CI 7% to 9%).⁵⁰

Among the 12 included studies, 10 studies (8 secondary school learners, 1 university student and 1 dropout) were found to have prevalence for both men and women. Stratifying using gender, boys (prevalence: 26%; 95% CI 18% to 34%, with $I^2=99.57\%$) were two times more likely to use tobacco as compared with girls (prevalence: 13%; 95% CI 8% to 18%, with $I^2=98.54\%$) (figures 3 and 4). The

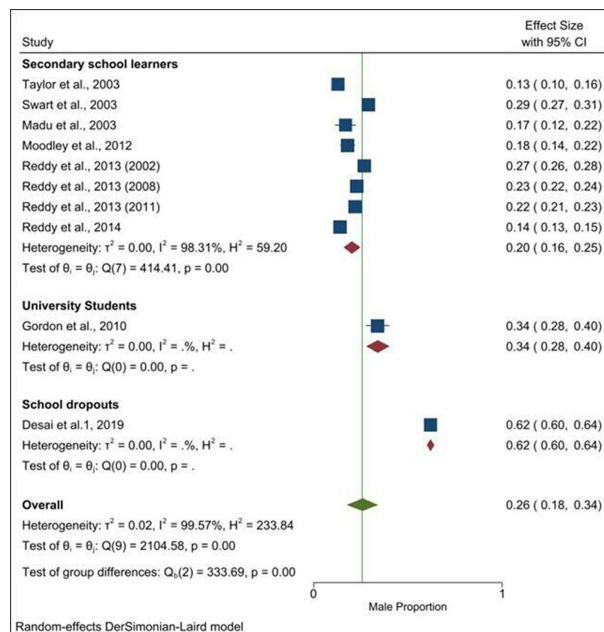


Figure 3 The forest plot of the studies included in the systematic review and meta-analysis of current use prevalence among South African men.

prevalence of current tobacco users among secondary school learners' boys was 20% (95% CI 16% to 25%), with heterogeneity of $I^2=98.31\%$, and among girls was 10% (95% CI 8 to 13%), with heterogeneity of $I^2=94.22\%$. The remaining subgroups (university students and school dropouts) contained one study each and did not report the heterogeneity based on I^2 statistic, therefore, the pooled prevalence cannot be reported. In addition, other determinants (such as age, race, etc) of tobacco

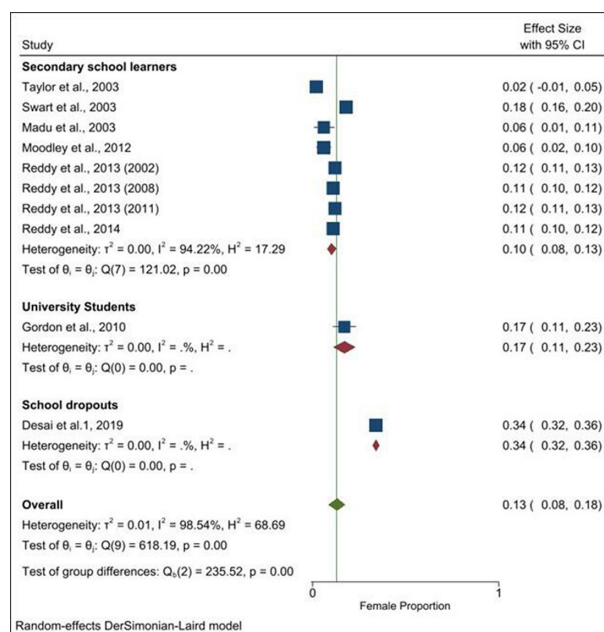


Figure 4 The forest plot of the studies included in the systematic review and meta-analysis of current use prevalence among South African women.

use among adolescents and young adults were also not included in this analysis because of a lack of information.

Sensitivity analyses were carried out by excluding one study at a time to determine any change before and after the analysis. All point estimates were within the 95% CIs in the combined analysis, indicating that no single study had an excessive influence on the pooled prevalence of tobacco use. Moreover, the studies showed no evidence of publication bias according to the visual inspection of the funnel plot and the Egger's linear regression test ($p=0.081$).

Meta-regression was performed according to the year of study and sample size to estimate the impact of tobacco use prevalence. Both moderator variables showed no impact on the prevalence (year of study, $p=0.106$; sample size, $p=0.441$). However, the results of meta-regression analysis according to the year of study among adolescents and young adult tobacco users showed a marked increase throughout the years, whereas according to sample size, tobacco use showed a marked decrease (online supplemental figure 2).

The results of the prevalence trend of tobacco use by subgroup analysis, based on gender and year of study, are illustrated in online supplemental table 2. The findings showed an increase for both men and women between 2000 and 2020. So, the overall trend of the prevalence of tobacco use, between 2000 and 2010, was 23% and 11% for men and women, respectively. This trend increased to 28% for men and 14% for women between 2011 and 2020. However, these results should be interpreted with caution and only as suggestive of trends, in that the sample sizes are small in some of the studies, and their 95% CIs are quite wide and partially overlapping. Also, the included studies were conducted in different settings among different participants.

DISCUSSION

Adolescents and young adults are vulnerable to engaging in several risky behaviours, such as tobacco use, alcohol use, drug abuse and unsafe sex.^{23–26} This current systematic review and meta-analysis study was conducted to estimate the pooled prevalence of tobacco use among South African adolescents and young adults. Through rigorous screenings, we included 12 eligible articles in this study, with a total of 59 287 participants. Among South African adolescents and young adults, we found that the pooled prevalence of tobacco use was estimated to be 22%. These results suggested that one in five adolescents and young adults had used tobacco in the last 30 days in South Africa. Our results are similar to the results of smoking prevalence among South African adults, aged 15+ years.⁵⁸ However, compared with other African studies, our results were lower than the prevalence reported in Mauritania (24.6%) and Zimbabwe (37.9%),⁵⁹ but similar to results found in studies conducted in Djibouti (20.5%), Madagascar (20.3%) and Seychelles (21.6%),⁵⁹ and more than the estimates found in meta-analysis conducted in

East Africa (9%).⁶⁰ Moreover, compared with international studies, the results were lower than the prevalence reported in Chile (39.9%),⁶¹ Italy (35.6%)⁶² and Croatia (28.6%),⁶³ but more than the findings of studies in Poland (20.5%),⁶⁴ India (11.9%),⁶⁵ Viet Nam (2.5%)⁶⁶ and meta-analysis conducted in Iran (9%).³⁰ This could be because each country has its tobacco control policies and countries may have different cultural and social factors which influence the prevalence of tobacco use.

In 1993, South Africa progressively passed more stringent tobacco control laws. These laws were amended in 1999 to include bans on labelling, sale of tobacco products to minors, complete bans on tobacco advertising, promotion and sponsorship, and smoking in public places.^{16 39–42} Despite this, South Africa had the highest smoking rate in Sub-Saharan Africa, with over 5.5 million smokers.^{16 67} Worryingly, Groenewald *et al* highlighted that tobacco smoking is one of the leading risk factors for preventable disease burden and death in South Africa.⁶⁸ Each year, approximately 83 957 South Africans die from tobacco-related diseases.¹⁹ However, this number has gradually increased when compared with 20 000 and 31 800 annual deaths in 2004 and 2010, respectively.⁶⁷ Therefore, our findings recommend the strengthening of tobacco control efforts among South Africans, especially adolescents and young adults.

Our results also show that the prevalence of tobacco use among men (26%) was much higher than among women (13%). The same pattern was observed in other African countries, except for Mauritania where female adolescent smokers (24.6%) were more than male adolescent smokers (23.6%).⁵⁹ Our results confirm the statements made by Reddy *et al*²⁸ that there is a 2:1 smoking ratio among South African male and female adolescents. This shows a rising prevalence among female adolescents if compared with adult smokers (which is 3:1 ratio). Nonetheless, smoking among male adolescents may be caused by the risk of exposure to cigarettes, the high influence of friends, curiosity, seeing smoking as a sign of adulthood, lack of awareness about the danger of smoking, social acceptability and experiencing high-risk situations.^{69–72} Moreover, environmental variables, such as the perception that tobacco use is the norm, peer and sibling smoking attitudes and lack of parental support, were found to be stronger predictors of smoking among male adolescents.^{73 74} Female smokers, on the other hand, appeared to smoke less than men because of their different reasons for smoking, such as stimulation and tension reduction^{75 76} and also because of cultural reasons and stigma.³⁰

The meta-regression analysis results showed a marked overall increase in tobacco use prevalence analysis according to the year of study among South African adolescents and young adults. This increase was also seen between 2008 and 2011 among South African learners in grades 8–10.²⁸ In the report by the WHO, the same upward trend of tobacco use prevalence is found, but among South African male adults, aged 15+ years.⁷⁷ The

increasing trend may signal growth in tobacco consumption among South African adolescents and young adults, and also in other African countries.⁷⁸ This growth might be associated with a lack of tobacco rules tailored for this age group.⁷⁹ To this end, our findings showed that the amendment of tobacco control laws in 1999 rarely reduced tobacco use among adolescents and young adults in South Africa. This reveals critical insights into the public health challenge posed by tobacco use.

School dropouts also appeared to be the biggest contributor to the higher prevalence of tobacco use as compared with secondary school learners and university students. Adolescents and young adults who dropped out of school had a pooled prevalence of 51%, which was much higher than the prevalence of secondary school learners (16%) and university students (20%) but lower than the prevalence found by Wang *et al*,⁸⁰ where 58% of school dropouts were smokers. In South Africa, school drop out usually occurs due to socioeconomic reasons, such as poor academic performance, early pregnancy among girls, having limited funds to attend school, and in need of work to take care of family.^{22 81} These stressors could lead to tobacco use as a way to relieve stressful life experiences. Many studies affirmed that school dropouts are often positively associated with tobacco use,^{33 82} and always have a higher prevalence than school-going learners.^{83 84} This could be due to a lack of guidance, school-based interventions and supervision from teachers, hence, highly possible to smoke.³³ Therefore, urgent attention for targeted interventions is needed to counteract the rising prevalence of tobacco use in both in-school learners and school dropout groups, associated with significant health risks.

Although a meta-analysis approach was used to synthesise existing evidence on South African adolescents and young adults engaging in tobacco use, there are some potential limitations. Some of included studies used self-administrated questionnaires and self-reported tobacco use (especially among school-going adolescents), this could be under-representative and unreliable. Also, we found few quantitative studies countrywide and no studies in some provinces (such as the Eastern Cape, Northern Cape, Free State and North-West). This could be an indication that tobacco use among adolescents and young adults is under-researched in South Africa. This study only searched published studies and may have missed important tobacco use evidence from grey literature. Finally, this study merely focused on South African tobacco use studies among adolescents and young adults, rather than the broader context of substance use, such as drugs and alcohol.

CONCLUSION

There is a notable scarcity of empirical studies in South Africa that systematically examine the prevalence of tobacco usage among adolescents and young adults. The high incidence of tobacco use unearthed in this

investigation underscores the need for vigorous discussion around interventions aimed at curbing tobacco use, particularly among male teenagers. These deliberations could significantly contribute to the shaping of effective tobacco policies with a direct impact on minimising tobacco-related harms. Policymakers ought to pay particular attention to those who have dropped out of school.

It is crucial to deepen our understanding of the factors that influence tobacco use in both in-school and out-of-school youth. By using a meta-analysis approach, we can more accurately quantify the effects and relative success rates of policy interventions, thereby informing best practices in this arena. South Africa's diverse socioeconomic and cultural landscape makes it a valuable lens through which these findings can potentially inform global strategies. While South Africa's governmental efforts to curtail tobacco usage have yielded some results, our study's findings underscore the need for a broader approach. This includes not only regulatory efforts but also education, support services and community initiatives. These findings offer valuable insights into the evolution of further policy development and may serve as a useful reference for other nations dealing with similar public health concerns.

Protocol and registration

The systematic review and meta-analysis was registered in the International Prospective Register of Systematic Reviews registration date: 3 June 2023.⁸⁵

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