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Investigating the associations of age of initiation and other psychosocial factors of singular use of alcohol, tobacco and marijuana on polysubstance use in Jamaica

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Investigating the associations of age of initiation and other psychosocial factors of singular use of alcohol, tobacco and marijuana on polysubstance use in Jamaica

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ABSTRACT

Objectives To examine concurrent polysubstance use of two or more of alcohol, tobacco and marijuana and deduce if there are correlations with the ease of access to marijuana, friends or family members alcohol or illegal drug use habits and the risk perception and age of initiation of the singular use of these substances.

Design A secondary data analysis.

Setting Utilized the Jamaica National Drug Prevalence Survey dataset.

Participants Involved 4,623 randomly selected respondents between 12 and 65 years old.

Outcome measures Primary outcome: concurrent polysubstance use recorded as using two or more of alcohol, tobacco and marijuana. Predictor variables include risk perception and age of initiation of singular alcohol, tobacco and marijuana use, ease of marijuana access and family and friend alcohol and illegal drug use.

Results Approximately 58-66% of respondents commenced singular alcohol, tobacco or marijuana use under seventeen. Participants commencing marijuana use at 11 years and under and between 12 and 17 were 3.483 and 4.564 times more likely to report past month concurrent polysubstance use ($p=0.025$ and $p<0.001$). Respondents who reported low risk perception to smoking marijuana sometimes and often had increased odds of concurrent polysubstance use ($p=0.042$ and $p<0.001$, respectively). Respondents who indicated marijuana access as not easy were 3.571 times less likely to report past month concurrent polysubstance use ($p=0.002$). Participants who negatively indicated that friends or family members get drunk and take illegal drugs were 1.736 and 1.792 times less likely to report past month concurrent polysubstance use ($p=0.004$ and $p=0.027$, respectively).

Conclusions Low risk perception, childhood and adolescent age of initiation, and easy accessibility of marijuana were significantly associated with polysubstance use amongst Jamaicans. The influence of friends and family members' drug and alcohol use behaviours on individuals developing polysubstance use habits further endorses the need for interventions.

(Word count 295)

Keywords: Polysubstance, Marijuana, Jamaica, Risk perception, Age of initiation, Access

Article Summary

Strengths and limitations of this study

- The use of the entire dataset population augmented the strength of the analysis.
- Using logistic regression did allow several variables to be assessed in eliciting appropriate risk and protective factors.
- Substance use information was self-reported, which can be affected by recall bias.
- This study could not establish causality due to the nature of the cross-sectional data.
- The household survey contained respondents from households and, as such, excluded a percentage of the population who were homeless, in prisons and health care institutions.

INTRODUCTION

The latest World Drug Report indicated that almost 285 million people used drugs in 2020 (1), revealing an additional 100 million global drug consumers since the turn of the century (2). Indeed, escalating drug use is a major concern in Jamaica, (3) the largest English-speaking island in the Caribbean Sea. By mere location, the island lies in the path of a multi-billion dollar illicit drug trade (4), through which maritime and air shipments can access major drug corridors en route to destinations in the North and across the Atlantic Ocean (5-7). Consequently, the increasing consumption amongst Jamaicans is likely attributable to the overflow of drugs in transit along the many routes drug traffickers ply their trade (8).

Currently, the three most used substances in Jamaica are alcohol, tobacco and marijuana (9,10). Although the lion's share of drug use research has focused on single-use substances, it is essential to note that many individuals use more than one substance (11,12). According to the World Health Organization, this is defined as polysubstance use (13) and can be either the use of two or more substances on a single occasion (simultaneous), or within a given period (concurrent) (14). The use of alcohol, tobacco or marijuana is associated with an increased likelihood of co-use of either one or both remaining substances (15). Moreover, research highlights that concurrent use is associated with increased quantity and frequency of use of each substance (16,17).

A previous study has examined the sociodemographic factors associated with concurrent polysubstance use in Jamaica and reported increased odds with being male, between the ages of 18-34, and living in rural communities (18). However, there is a paucity of research, both regionally and globally, regarding the effect of psychosocial factors of single substance use on polysubstance use, that speaks to the interaction between individuals and their environment and

its impact on overall health (19). This study, therefore, focused on the influence of selected psychosocial factors of ease of marijuana access, friend and family alcohol and illegal drug use, the risk perception and age of initiation of singular alcohol, tobacco and marijuana use on concurrent polysubstance use.

Risk perception is considered a modifiable risk factor (20) that may impact an individual’s choice to use drugs. Younger individuals are likely to minimize perceived harm compared to older individuals, whose risk perception is likely to change due to health issues or becoming more mature (21,22). A number of studies report that adolescents and young adults who perceive a greater risk of marijuana use are less likely to report having used the drug (23,24). Other studies, however, suggest that individuals perceive this drug as less harmful because of its medicinal potential (25,26). One study highlighted that both young and older individuals perceived alcohol as being associated with less harm, but differing regarding tobacco, which the older population perceived as being more harmful (27). Notwithstanding, most research examining risk perception is substance-specific and not geared towards polysubstance use, an area of concern that this research seeks to investigate. Indeed, widespread polysubstance prevalence affecting the Jamaican population (18) suggests a generally positive attitude towards risk-taking exists.

Previous studies have demonstrated the association between the early age of onset of drug use and subsequent increased use and development of drug addiction (28,29). In particular, engaging in alcohol, tobacco or marijuana at an early age is related to the early onset of either one or the other remaining drugs (30-32). A possible explanation for this association is that specific individuals possess a behavioural or personality susceptibility to engage in problematic behaviour (33), such as polysubstance use. An alternate model, the “gateway hypothesis” (34),

1 suggests that an adolescent's early encounter with one class of drugs predisposes and predicts the
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3 use of other illicit drugs in later life (35,36). However, recent research suggests that the onset of
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5 drug use could occur later in life (37), thus limiting the predictability of early age of initiation as
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7 a risk factor for subsequent drug use (38). Factors accounting for this unique occurrence may
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9 include ease of access, cultural appropriation, family drug use, peer pressure and mental ill-
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11 health (37,39-41). Albeit in a small sample-sized study, recent research reported that individuals
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13 with a later onset of alcohol, tobacco and marijuana engaged in alcohol and marijuana co-use
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15 more frequently than individuals with an earlier age of onset (42). Notwithstanding, analyses
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17 utilizing nationally representative data are minimal, a knowledge gap this study seeks to fill.
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24 It is suggested that the likelihood of substance use initiation is enhanced by the frequency
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26 of use in its community and availability (41,43). Moreover, extant literature indicates that how
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28 youths perceive the ease of access can further elevate the risk of using drugs (44-46), especially
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30 if access is from within their social environments and circle of friends (47,48). Prior research has
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32 identified exposure to drug use by family and friends as being strongly associated with
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34 polysubstance use among adolescents and young adults (49-51). Additionally, the risk of
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36 substance use is further enhanced by being visibly available within an individual's social
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38 environment (52). In Jamaica, the most recent national survey indicated that 40-60 per cent of
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40 adolescents and 60-80 per cent of adults reported marijuana as easy to access (9). This finding is
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42 foreseeable, given Jamaica's recent decriminalization (53), and a strong cultural history of
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44 marijuana cultivation and use as medicine or a religious sacrament (54,55). Despite the relevance
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46 that easier availability of marijuana may have on single-drug dependence (52), literature
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48 regarding its influence on polysubstance use is largely absent.
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No doubt, polysubstance use poses a significant global challenge associated with greater physical and psychiatric maladies and a mortality rate that escalates three-fold versus single substance use (56,57). To date, no studies in the Caribbean have used nationally representative data to assess the ease of marijuana access, friend and family substance use, risk perception and the age of initiation of singular drug usage on polysubstance use. Identifying their influence can allow for constructed interventions to reduce the impact of risk factors and enhance the efficacy of protective factors in preventing or reducing polysubstance habits.

OBJECTIVES

This study aimed to examine concurrent polysubstance use in a nationally representative sample of the Jamaican population and to investigate if there is an association with: 1) risk perception of alcohol, tobacco and marijuana use; 2) age of initiation of alcohol, tobacco and marijuana use; 3) ease of access to marijuana and 4) having friends or family who get drunk and take illegal drugs.

METHODS

Study Design, Participants and Data Source

This research was a secondary data analysis of the population-based National Drug Prevalence Survey 2016 conducted between April and July 2016. It utilized the entire dataset population and extracted variables relevant to drug/polysubstance use patterns and risk perception, age of initiation, ease of access and friend and family drug use from the primary data set for analysis. There was no compensation in this secondary analysis or direct or indirect contact with any respondents.

The original study utilized a structured, regional questionnaire for the data collection on drug use that was developed in collaboration with the Organization of American States/Inter-

American Drug Abuse Control Commission (OAS/CICAD). The sample was nationally representative and comprised 4,623 participants. The survey employed a stratified multi-stage sampling design in which the primary sampling units (PSU) were the Enumeration Areas (EAs). Jamaica consists of 14 parishes and twenty-two (22) EAs per parish. In each EA, systematic random sampling was used to procure 16 households. Thereafter, one participant between the age of 12 and 65 years from each household was randomly selected as the respondent for the survey. Post-stratification weights were applied to ensure that the weighted sample distribution matched the population distribution of sex and age categories (9).

Measures

Concurrent polysubstance use was defined as using two or more of alcohol, tobacco and marijuana, a measure described previously in the literature (58,59). Lifetime, past year and past month use was determined using the target variables related to substance use over the lifetime, in the past 12 months and past 30 days for alcohol, tobacco and marijuana. “Yes” responses were coded as one and “No” were coded as zero. Statistical computations were performed to score concurrent polysubstance, where respondents could only have a score of 0-3. For analytical purposes, 2-3 substances over the past month were considered concurrent polysubstance use and utilized as the dependent variable. Illegal drugs were defined as using any substance other than alcohol or tobacco.

Risk perception was assessed by asking participants, “In your opinion, please indicate the risk level of (a) drinking alcohol sometimes, (b) drinking alcohol often, (c) smoking cigarettes sometimes, (d) smoking cigarettes often, (e) smoking marijuana sometimes and (f) smoking marijuana often”. Participants indicated their risk level along a Likert scale continuum - (1) No risk; (2) Low risk; (3) Moderate risk; (4) High risk, and (5) I don’t know the risk. For the

secondary analysis, response options were re-categorized whereby no and low risk were coded as 0 = Low risk and 1 = Moderate to high risk. “I don’t know the risk”, and missing responses were treated as missing variables.

Regarding the age of initiation of alcohol, tobacco and marijuana, participants were asked to indicate their age in years to the following question for each substance - “How old were you when you tried for the first time?” For this analysis, respondents were arranged into four age groups: 11 years and under, 12-17 years, 18-25 years and 26 years and older to demonstrate distinct phases of childhood, adolescence and adulthood as established elsewhere (60).

For ease of access to marijuana, analysis was conducted for responses to marijuana only. Participants were asked, “How easy would it be to have access to the following drug - Marijuana?” Response options were 1 = Easy; 2 = Difficult; 3 = Could not have access to; 4 = Don’t know. Responses were re-categorized to 0 = Not easy and 1 = Easy. “Don’t know” and missing responses were treated as missing variables.

For friend and family alcohol and illegal drug use, participants were asked, “Do you have friends or family members who get drunk?” and “Do you have friends or family members who take illegal drugs such as marijuana and cocaine?” Response options were 0 = No and 1 = Yes.

Statistical analyses

Statistical analysis was performed on the data using Statistical Package for the Social Sciences (SPSS) version 23. Descriptive statistics included computing frequencies and percentages for categorical variables. Bivariate analysis examining the association between past month concurrent polysubstance use and select psychosocial variables was done using Pearson’s Chi-Square test. In the multivariate analysis, logistic regression was used whereby past month

concurrent polysubstance use was the dependent variable. Factors identified as statistically significant in the bivariate analysis were included to control for their potential confounding effect. Multicollinearity between the study variables was diagnosed using variance inflation factor (VIF) (with multicollinearity being defined as $VIF > 2.5$) and Hosmer-Lemeshow statistic was used to test for model fitness. Odds ratios and 95% confidence intervals were recorded. A p-value of < 0.05 was considered statistically significant. The data was presented in the form of tables and text.

Patient and public involvement

Patients or members of the public were not involved in any aspect of this research, including conceptualization, design, analysis, interpretation of results, and reporting.

Ethical Considerations

The Ministry of National Security approved the National Drug Prevalence Survey 2016, and all participants provided informed consent. To protect confidentiality and anonymity, no names were retained. The research team had access to a secure database where the gathered data was stored. For minors, both parents and guardians provided informed consent, and assent was obtained from the minors themselves. (9). Ethical approval for the current study was granted through the ethics committee of The University of the West Indies, Mona Campus. There were no competing interests.

RESULTS

The study comprised 4,623 respondents, most identified as female ($n=2535$, 54.8%) and 45.2% as males ($n=2088$). Respondents' age range was between 12-65 years, with a mean age of 36.18 ($s.d. \pm 14.815$). The prevalence of substances used in the past month was 54.3% (alcohol), 38%

(tobacco) and 53.9% (marijuana). The earliest mean age of initiation for alcohol, tobacco and marijuana use was for tobacco at 16.73 (SD +/- 5.498), followed by marijuana at 16.78 (SD +/- 5.039), and alcohol at 17.23 (SD +/- 5.132). Lifetime, past year and past month concurrent polysubstance use was reported by 907, 623 and 561 respondents, respectively.

Table 1 shows most respondents reported commencing substance use between 12 to 17 years of age and moderate to high-risk perception as it related to the use of alcohol, cigarettes and marijuana. Concerning friends and family drug use, most respondents had friends or family who get drunk (57.6%) and take illegal drugs (64.8%).

Table 1. Distribution of age of initiation, risk perception and friends/family substance use

Psychosocial factors		Responses (f, %)		
<i>Age of substance use initiation</i>		<i>Alcohol</i>	<i>Tobacco</i>	<i>Marijuana</i>
11 years and under		266 (7.7%)	132 (11.1%)	92 (7.3%)
12-17 years		1714 (49.9%)	651 (54.6%)	707 (55.9%)
18-25 years		1284 (37.4%)	343 (28.8%)	396 (31.3%)
26 years and older		171 (5.0%)	66 (5.5%)	69 (5.5%)
<i>Substance use: risk perception</i>		<i>Low risk</i>	<i>Moderate to high risk</i>	
Drinking alcohol sometimes		370 (20.3%)	1453 (79.7%)	
Drinking alcohol often		37 (19.2%)	156 (80.8%)	
Smoking cigarettes sometimes		87 (15.0%)	494 (85.0%)	
Smoking cigarettes often		25 (22.3%)	87 (77.7%)	
Smoking marijuana sometimes		475 (31.4%)	1037 (68.6%)	
Smoking marijuana often		242 (36.2%)	426 (63.8%)	
<i>Friends/family who get drunk</i>				
Yes		2665 (57.6%)		
No		1658 (42.4%)		
<i>Friends/family who take illegal drugs</i>				
Yes		2998 (64.8%)		
No		1625 (35.2%)		

Regarding access to marijuana, the majority of respondents, 3341 (72.3%), reported that accessing marijuana was ‘easy’.

Table 2 shows a bivariate analysis of select psychosocial factors and past month concurrent polysubstance use. Pearson’s Chi-square analysis revealed statistically significant

associations between the age of initiation of alcohol, tobacco and marijuana and past month concurrent polysubstance use ($p<0.001$, $p=0.049$ and $p<0.001$, respectively). Statistically significant associations were found between past month concurrent polysubstance use and risk perception of smoking cigarettes sometimes, smoking marijuana sometimes, and smoking marijuana often ($p<0.001$, $p<0.001$ and $p<0.001$, respectively). Friends and family who get drunk and take illegal drugs were significantly associated with a higher prevalence of past month concurrent polysubstance use ($p<0.001$ and $p<0.001$) among respondents. Additionally, respondents who stated that marijuana was easy to access reported a greater prevalence of past month concurrent polysubstance use ($p<0.001$).

Table 2. Chi-square analysis of psychosocial factors and past month concurrent polysubstance use

Psychosocial factors	Past month concurrent polysubstance use		χ^2	p value
	no	yes		
<i>Age of initiation: alcohol</i>			18.968	<0.001***
11 years and under	44 (12.9%)	73 (13.1%)		
12-17 years	182 (53.4%)	367 (65.9%)		
18-25 years	105 (30.8%)	109 (19.6%)		
26 years and older	10 (2.9%)	8 (1.4%)		
<i>Age of initiation: tobacco</i>			7.855	0.049*
11 years and under	28 (9.4%)	65 (12.6%)		
12-17 years	157 (52.7%)	298 (58.0%)		
18-25 years	99 (33.2%)	126 (24.5%)		
26 years and older	14 (4.7%)	25 (4.9%)		
<i>Age of initiation: marijuana</i>			41.648	<0.001***
11 years and under	25 (7.7%)	46 (8.5%)		
12-17 years	146 (44.8%)	351 (64.9%)		
18-25 years	131 (40.2%)	128 (23.7%)		
26 years and older	24 (7.4%)	16 (3.0%)		
<i>Risk perception : drinking alcohol sometimes</i>			2.634	0.06
Low risk	146 (35.2%)	269 (64.8%)		
Moderate to high risk	195 (40.5%)	287 (59.5%)		
<i>Risk perception : drinking alcohol often</i>			0.022	0.89

Low risk	23 (39.0%)	36 (61.0%)		
Moderate to high risk	319 (38.0%)	520 (62.0%)		
<i>Risk perception : smoking cigarettes sometimes</i>				
			9.895	<0.001***
Low risk	46 (27.5%)	121 (72.5%)		
Moderate to high risk	296 (40.7%)	432 (59.3%)		
<i>Risk perception : smoking cigarettes often</i>				
			2.275	0.086
Low risk	13 (27.7%)	34 (72.3%)		
Moderate to high risk	328 (38.6%)	521 (61.4%)		
<i>Risk perception : smoking marijuana sometimes</i>				
			35.729	<0.001***
Low risk	138 (29.2%)	335 (70.8%)		
Moderate to high risk	207 (48.6%)	219 (51.4%)		
<i>Risk perception : smoking marijuana often</i>				
			46.546	<0.001***
Low risk	58 (21.4%)	213 (78.6%)		
Moderate to high risk	287 (45.5%)	344 (54.5%)		
<i>Friends/family who get drunk</i>				
			11.097	<0.001***
Yes	226 (34.8%)	424 (65.2%)		
No	120 (46.7%)	137 (53.3%)		
<i>Friends/family who take illegal drugs</i>				
			19.144	<0.001***
Yes	285 (35.6%)	516 (64.4%)		
No	61 (57.5%)	45 (42.5%)		
<i>Accessibility of Marijuana</i>				
			26.859	<0.001***
Easy	308 (36.1%)	545 (63.9%)		
Not easy	33 (75.0%)	11 (25.0%)		

* significant at the p <0.05, ** significant at the p= 0.01 level, ***significant at the p<0.001 level)

Logistic regression analysis was performed on the psychosocial factors found to be significantly associated with past month concurrent polysubstance use in the chi-square analysis, to identify which were predictive of risk or protective factors (Table 3). The model was statistically significant and predicted the dependent variable better than the intercept-only model alone (χ^2 (15) = 148.807, p<0.001). There was no multicollinearity found among the independent variables used in the analysis. The Hosmer-Lemeshow test shows the p value at 0.640 (p >.05) which shows the model fits the data.

Multivariate analysis indicated that participants commencing marijuana use at 11 years and under and between 12 and 17 were 3.483 and 4.564 times more likely to report past month concurrent polysubstance use than participants initiating marijuana use 26 years and older ($p=0.025$ and $p<0.001$). The logistic regression model indicated that respondents with a low risk perception of smoking marijuana sometimes and often were 1.489 and 2.960 times more likely to report past concurrent polysubstance use than those who indicated moderate to high risk perception of smoking marijuana ($p=0.042$ and $p<0.001$ respectively). The model reported no statistically significant associations between the age of initiation and risk perceptions of alcohol or tobacco and polysubstance use ($p>0.05$). The model also highlighted that those respondents who indicated marijuana access as being not easy were 3.571 times less likely to report past month concurrent polysubstance use than those who reported easy access to marijuana ($p=0.002$). In addition, those participants who negatively indicated that friends or family members get drunk and take illegal drugs were 1.736 and 1.792 times less likely to report past month concurrent polysubstance use than those who affirmatively indicated that friends or family members get drunk and take illegal drugs ($p=0.004$ and $p=0.027$ respectively).

Table 3. Regression model of psychosocial factors associated with past month concurrent polysubstance use

Psychosocial factors	Odds Ratio	95% C.I.		p value
		Lower	Upper	
Accessibility of marijuana (easy)	0.280	0.124	0.636	0.002**
Risk perception of smoking cigarettes sometimes (moderate to high)	1.612	0.991	2.623	0.054
Risk perception of smoking marijuana sometimes (moderate to high)	1.489	1.014	2.187	0.042*
Risk perception of smoking marijuana often (moderate to high)	2.960	1.823	4.806	<.001***
Age of initiation for tobacco: 11 years and under	0.513	0.175	1.498	0.222
Age of initiation for tobacco: 12-17 years	0.436	0.174	1.091	0.076
Age of initiation for tobacco: 18-25 years	0.714	0.284	1.795	0.473
Age of initiation for tobacco: 26 years and older	reference			
Age of initiation for alcohol: 11 years and under	1.422	0.384	5.259	0.598
Age of initiation for alcohol: 12-17 years	1.951	0.573	6.650	0.285
Age of initiation for alcohol: 18-25 years	1.095	0.317	3.783	0.886

Age of initiation for alcohol: 26 years and older	reference			
Age of initiation for marijuana: 11 years and under	3.483	1.166	10.401	0.025*
Age of initiation for marijuana: 12-17 years	4.564	1.880	11.079	<.001***
Age of initiation for marijuana: 18-25 years	1.567	0.654	3.754	0.313
Age of initiation for marijuana: 26 years and older	reference			
Friends/family who get drunk (yes)	0.576	0.397	0.834	0.004**
Friends/family who take illegal drugs (yes)	0.558	0.333	0.937	0.027*

* significant at the p <0.05, ** significant at the p= 0.01 level, ***significant at the p<0.001 level)

DISCUSSION

Regarding singular drug use, this research indicates that approximately 95% of the population began using alcohol, tobacco or marijuana at age 25 or younger, with the majority initiating under the age of 17 in adolescence (49.9%, 54.6%, and 55.9% respectively) and childhood (7.7%, 11.1% and 7.3% respectively). The use of either substance is associated with behavioural problems in childhood (61) and depression (62), suicide (63), psychosis (64) and dependence (65) in adolescence, emphasizing a burgeoning public health issue amongst Jamaican children and adolescents. This study, however, is the first in the Caribbean to reveal the impact of risk perception, age of initiation, ease of access and friend or family indulgence of the singular use of alcohol, tobacco and marijuana on polysubstance use.

The present study alludes to participants commencing marijuana use in childhood and adolescence as a risk factor for developing polysubstance use while simultaneously indicating no statistically significant associations with the age of initiation of alcohol or tobacco (p>0.05). The finding presented finds concordance with prior research that highlights the early age of marijuana use as being associated with other drug use and substance use disorders (66-68). However, this finding also finds variance with existing literature that reports alcohol and tobacco initiation precedes the first use of marijuana (69). According to the gateway hypothesis, marijuana use would typically follow alcohol or tobacco use, unlike the common liability model

that explains the interplay of other factors, including accessibility, sociocultural acceptance, genetic predisposition and psychological variables in leading to drug use, irrespective of the choice of initial substance (70). Indeed, within the Jamaican context, the preference for marijuana use is likely a result of strong sociocultural and religious validation and recent legislation that decriminalizes its use (53,55,71) in tandem with legitimate taxation initiatives and mitigation measures that have sought to curb alcohol and tobacco use (72,73). Accordingly, these findings highlight the need for preventative and rehabilitative interventions targeting the younger populace that dually gear towards delaying the onset of marijuana use and reducing the subsequent harm associated with multiple drug co-use.

Consequently, Jamaica's rapidly evolving legal landscape caters to higher access and exposure to marijuana than in previous years. Extant research has acknowledged the ease of access to marijuana as a driving cause of substance abuse (43,74). In this study, respondents who indicated marijuana access as not easy were less likely to report past month concurrent polysubstance use. This finding adds to the dearth of current literature, as previous research has focused on the ease of access to marijuana as an antecedent to marijuana dependence (52,75) and not polysubstance use. Moreover, decriminalization in Jamaica has legitimized establishing a medical marijuana industry that undoubtedly make access easier with the subsequent formation of many marijuana dispensaries across the Jamaican landscape (53,76). Understanding the impact of decriminalization in Jamaica and the rise of the medical marijuana sector on ease of access could inform policy, particularly its impact on polysubstance use.

For this study, the risk perception emphasized using substances sometimes and often. Respondents with low risk perception of smoking marijuana overall, were more likely to report past month concurrent polysubstance use. As such, persons who consider marijuana harmful

would refrain from initiating its use (77). This observation adds to the knowledge gap given that the majority of research in Jamaica would have examined risk perception and its influence on single drug use and dependence (78,79) and not polysubstance use. Recent research, however, has demonstrated the influence of policy shifts regarding marijuana use, with several studies reporting diminishing perceptions of risk and harm (80–83). Legislative changes in 2015 that permitted the personal possession of up to two ounces of marijuana in conjunction with its sociocultural endorsement amongst the populace (53,55,84) is likely to have influenced the individual’s choice to use the substance in being socially acceptable and “normalized” in line with the use of other licit drugs (85,86). This research thus highlights a need for continued public health campaigns and education to reduce the risk of marijuana-related harm and its potential role in leading to polysubstance use.

In the present study, respondents who reported that friends or family members did not get drunk and take illegal drugs like marijuana were significantly less likely to report past month concurrent polysubstance use. These findings follow earlier research emphasizing the impact of friends and family members’ use of legal and illegal substances on young individuals’ preponderance to developing polysubstance use (50,87). Social learning theory suggests repeated exposure to substance-using friends and family members directly influences an individual's drug-seeking behaviour (87,88). The use of protective behavioural strategies including using small amounts of marijuana at a time or consuming alcohol slowly, represent individual harm reduction strategies that have found favour in reducing health repercussions (89,90).

Notwithstanding, this study’s cumulative findings have implications for future research and intervention in recognizing the impact of polysubstance use. A further call to include polysubstance use in the mainstream of interventional efforts is paramount, especially

concerning marijuana policy. Evidence-based interventions consisting of family-focused treatment and individual therapy have found favourable results in reducing marijuana use among the youth populations (91). Implementing a brief intervention within the school setting may prove helpful, especially in ambivalence to substance use, in providing students with a voluntary option to acquire information regarding marijuana-associated harms (92). Indeed, target strategies are needed from a policy level because recent decriminalization in Jamaica has been positively associated with an increased likelihood of first-time marijuana use amongst the youth (71). Evidentiary support exists for harm reduction strategies including co-housing addiction treatment services with supervised drug consumption sites (93) and drug checking services (94,95), especially with regards to tetrahydrocannabinol potency levels, and utilizing the perspectives of personal lived experiences in guiding the further development of policy and legislation in addressing the drug's use (96,97).

Further studies examining polysubstance use pursuant to decriminalization may prove insightful as findings are likely to have changed and evolved since the initial survey in 2016. The COVID-19 pandemic has considerably affected the quality of life in various countries and contributed to changing drug use patterns (98-100). Future household surveys and research can examine how much single-substance and polysubstance use patterns have been impacted by COVID-19-related problems. The findings of this study will aid in understanding substance use profiles in a post-pandemic era.

Given the paucity of research in the global context, this research examines the effects of the age of initiation and other psychosocial factors of singular drug use on polysubstance use within a nationally-representative sample, thereby providing valuable insight towards policy implications on a national scale. The random selection of survey respondents in the initial study

and the use of a large population sample for the current study were significant strengths as the limited research done in Jamaica examining polysubstance use has been conducted examining small and specific samples that produced findings that were unlikely to be generalized to a larger population. The strength of the secondary analysis conducted was augmented by the use of logistic regression for the multivariate analysis.

One of the limitations is that the study utilized a cross-sectional design; thus, only associations could be determined, not causal relationships. Additionally, the household survey contained respondents from households and, as such, excluded a percentage of the population who were homeless, in prisons and healthcare institutions. Lastly, substance use was self-reported and can be affected by recall bias. Notwithstanding, the secondary analysis generated a measure of concurrent polysubstance use, providing the underpinning catalyst for future research endeavours.

CONCLUSION

The present study suggests polysubstance use amongst Jamaicans is significantly associated with childhood and adolescent initiation and easy accessibility of marijuana. The study also provides insight into the population’s perceptions of marijuana risks and harms. Policy perspectives must involve harm reduction strategies and not be restricted to mere preventative measures to guard against escalated habits, given the current legal and sociocultural contexts of marijuana use pervasive within the Jamaican population. Moreover, the strong influence of friends and family members' drug and alcohol use behaviours on individuals developing polysubstance use habits suggests policymakers consider utilizing a social-ecological model to better understand drug-using behaviour in implementing potential intervention strategies and developing public policy.

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Patient consent Consent to participate was requested from the participants in the consent form prior to the collection of data.

Ethics approval The National Drug Use Prevalence Survey 2016 was approved by the ethics committee of the Ministry of National Security in Jamaica.

Data sharing statement Data is available upon reasonable request and with permission of the National Council on Drug Abuse, Jamaica, and the Inter-American Drug Abuse Control Commission (CICAD). For access to the database, contact Mrs Uki Atkinson, research analyst, at uatkinson@ncda.org.jm.

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Reporting checklist for cross sectional study.

Based on the STROBE cross sectional guidelines.

Instructions to authors

Complete this checklist by entering the page numbers from your manuscript where readers will find each of the items listed below.

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			Page
Reporting Item			Number
Title and abstract			
Title	#1a	Indicate the study's design with a commonly used term in the title or the abstract	1,2
Abstract	#1b	Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background / rationale	#2	Explain the scientific background and rationale for the investigation being reported	3-6
Objectives	#3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	#4	Present key elements of study design early in the paper	6,7
Setting	#5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6,7

1	Eligibility criteria	#6a	Give the eligibility criteria, and the sources and methods of selection of participants.	6,7
2				
3				
4		#7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give	7,8
5			diagnostic criteria, if applicable	
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7				
8	Data sources /	#8	For each variable of interest give sources of data and details of methods of assessment (measurement).	6,7,8
9	measurement		Describe comparability of assessment methods if there is more than one group. Give information separately	
10			for for exposed and unexposed groups if applicable.	
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14	Bias	#9	Describe any efforts to address potential sources of bias	9
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17	Study size	#10	Explain how the study size was arrived at	6,7
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19	Quantitative	#11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings	7,8
20	variables		were chosen, and why	
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23				
24	Statistical methods	#12a	Describe all statistical methods, including those used to control for confounding	8,9
25				
26	Statistical methods	#12b	Describe any methods used to examine subgroups and interactions	8,9
27				
28				
29	Statistical methods	#12c	Explain how missing data were addressed	8
30				
31				
32	Statistical methods	#12d	If applicable, describe analytical methods taking account of sampling strategy	7,8,9
33				
34	Statistical methods	#12e	Describe any sensitivity analyses	n/a
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36				
37	Results			
38				
39				
40	Participants	#13a	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for	n/a
41			eligibility, confirmed eligible, included in the study, completing follow-up, and analysed. Give information	
42			separately for for exposed and unexposed groups if applicable.	
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46	Participants	#13b	Give reasons for non-participation at each stage	n/a
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48				
49	Participants	#13c	Consider use of a flow diagram	n/a
50				
51	Descriptive data	#14a	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures	10
52			and potential confounders. Give information separately for exposed and unexposed groups if applicable.	
53				
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56	Descriptive data	#14b	Indicate number of participants with missing data for each variable of interest	n/a
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1	Outcome data	#15	Report numbers of outcome events or summary measures. Give information separately for exposed and	10-14
2			unexposed groups if applicable.	
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4				
5	Main results	#16a	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95%	13,14
6			confidence interval). Make clear which confounders were adjusted for and why they were included	
7				
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9				
10	Main results	#16b	Report category boundaries when continuous variables were categorized	13,14
11				
12	Main results	#16c	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/a
13				
14				
15	Other analyses	#17	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	10,11,12
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18	Discussion			
19				
20				
21	Key results	#18	Summarise key results with reference to study objectives	14
22				
23	Limitations	#19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both	2,18
24			direction and magnitude of any potential bias.	
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27	Interpretation	#20	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from	14-18
28			similar studies, and other relevant evidence.	
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32	Generalisability	#21	Discuss the generalisability (external validity) of the study results	17,19
33				
34	Other Information			
35				
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37	Funding	#22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original	20
38			study on which the present article is based	
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42 None The STROBE checklist is distributed under the terms of the Creative Commons Attribution License CC-BY. This checklist can be completed online
43 using <https://www.goodreports.org/>, a tool made by the [EQUATOR Network](#) in collaboration with [Penelope.ai](#)
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Investigating the associations of age of initiation and other psychosocial factors of singular alcohol, tobacco and marijuana usage on polysubstance use: analysis of a population-based survey in Jamaica

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Investigating the associations of age of initiation and other psychosocial factors of singular alcohol, tobacco and marijuana usage on polysubstance use: analysis of a population-based survey in Jamaica

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ABSTRACT

Objectives To examine concurrent polysubstance use of alcohol, tobacco and marijuana and determine correlations with access to marijuana, friend and familial drug use habits, risk perception and the age of initiation associated with the singular use of these substances.

Design A secondary data analysis.

Setting Utilized the Jamaica National Drug Prevalence Survey 2016 dataset.

Participants Involved the entire dataset comprising of 4,623 randomly selected respondents between 12 and 65 years old.

Outcome measures Primary outcome: concurrent polysubstance use recorded as using two or more of alcohol, tobacco and marijuana. Predictor variables include risk perception and age of initiation of singular alcohol, tobacco and marijuana use, ease of marijuana access and family and friend alcohol and illegal drug use.

Results Approximately 58-66% of respondents commenced singular alcohol, tobacco or marijuana use under seventeen. Participants commencing marijuana use at 11 years and under and between 12 and 17 were 3.346 and 4.560 times more likely to report past month concurrent polysubstance use ($p=0.030$ and $p<0.001$). Respondents who did not believe that smoking tobacco sometimes ($p=0.049$), and smoking marijuana sometimes and often was harmful, had increased odds of concurrent polysubstance use ($p=0.047$ and $p<0.001$, respectively). Respondents who indicated access to marijuana as easy were significantly more likely to report past month concurrent polysubstance use compared to those who reported access as difficult ($p=0.002$). Participants who indicated that friends or family members get drunk and take illegal drugs were associated with 1.722 and 1.864 increased odds of reporting past month concurrent polysubstance use ($p=0.004$ and $p=0.017$, respectively).

Conclusions Decreased perceived risk, childhood and adolescent age of initiation and easy access to marijuana were significantly associated with polysubstance use amongst Jamaicans. The influence of friends and family members' drug and alcohol use behaviours on individuals developing polysubstance use habits further endorses the need for interventions.

(Word count 300)

Keywords: Polysubstance, Marijuana, Jamaica, Risk perception, Age of initiation, Access

Article Summary

Strengths and limitations of this study

- The use of the entire dataset population augmented the strength of the analysis.
- Using logistic regression did allow several variables to be assessed in eliciting appropriate risk and protective factors.
- Substance use information was self-reported, which can be affected by recall bias.
- This study could not establish causality due to the nature of the cross-sectional data.
- The household survey contained respondents from households and, as such, excluded a percentage of the population who were homeless, in prisons and health care institutions.

INTRODUCTION

The latest World Drug Report indicated that almost 285 million people used drugs in 2020 (1), revealing an additional 100 million global drug consumers since the turn of the century (2). Indeed, escalating drug use is a major concern in Jamaica, (3) the largest English-speaking island in the Caribbean Sea. By mere location, the island lies in the path of a multi-billion dollar illicit drug trade (4), through which maritime and air shipments can access major drug corridors en route to destinations in the North and across the Atlantic Ocean (5-7). Consequently, the increasing consumption amongst Jamaicans is likely attributable to the overflow of drugs in transit along the many routes drug traffickers ply their trade (8).

Alcohol, tobacco and marijuana are the three most commonly used substances in Jamaica (9,10). Although the lion's share of drug use research have focused on the use of single substances, it is essential to note that many individuals use more than one substance (11,12). This is referred to as polysubstance use, as defined by the World Health Organization (13), and can either involve the use of two or more substances on a single occasion (simultaneous), or within a given period (concurrent) spanning days or months (14). Using alcohol, tobacco or marijuana increases the likelihood of co-use of either one or both remaining substances (15). Moreover, research highlights that concurrent use of these substances is associated with using them more frequently and in larger amounts (16,17).

A previous study in Jamaica has examined the sociodemographic factors associated with concurrent polysubstance use and reported increased odds among males, individuals between the ages of 18-34, and persons living in rural communities (18). However, there is a paucity of research, both regionally and globally, regarding how psychosocial factors associated with single substance use affect polysubstance use, that speaks to the interaction between individuals and

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3 their environment and its impact on overall health (19). This study, therefore, aimed to
4 investigate the influence of selected psychosocial factors such as ease of access to marijuana,
5 alcohol and substance use among friends and family, risk perception, and age of initiation of
6 alcohol, tobacco and marijuana use on concurrent polysubstance use.
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13 Risk perception is considered a modifiable risk factor (20) that may impact an
14 individual's choice to use drugs. Younger individuals tend to underestimate the potential harm of
15 drug use compared to their older counterparts, whose risk perception is more likely to change
16 due to age-related health issues or becoming more mature (21,22). Some studies report that
17 adolescents and young adults who perceive a greater risk of marijuana use are less likely to
18 report using the drug (23,24). However, other studies, suggest that individuals may perceive this
19 drug as less harmful because of its medicinal potential (25,26). One study highlighted that both
20 young and older individuals perceived alcohol as being associated with less harm, but differed in
21 their perception of tobacco, with the older population considering it to be more harmful (27).
22 Notwithstanding, most research examining risk perception is substance-specific and not geared
23 towards polysubstance use, which is an area of concern that this research seeks to address.
24 Indeed, widespread polysubstance prevalence affecting the Jamaican population (18) suggests a
25 generally positive attitude towards risk-taking exists.
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44 Previous studies have demonstrated the association between starting drug use at a young
45 age and subsequent increased use and development of drug addiction (28,29). In particular,
46 engaging in alcohol, tobacco or marijuana at an early age is related to the early onset of either
47 one or the other remaining drugs (30-32). A possible explanation for this association is that
48 specific individuals possess a behavioural or personality susceptibility to engage in problematic
49 behaviour (33), such as polysubstance use. An alternative theory, the "gateway hypothesis" (34),
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suggests that an adolescent's early encounter with one class of drugs predisposes and predicts the use of other illicit drugs in later life (35,36). However, recent research suggests that the onset of drug use could occur later in life (37), thus limiting the predictability of early age of initiation as a risk factor for subsequent drug use (38). Factors accounting for this unique occurrence may include ease of access, cultural appropriation, family drug use, peer pressure and mental ill-health (37,39-41). Although a small sample-sized study, recent research reported that individuals who started using alcohol, tobacco and marijuana later in life engaged in alcohol and marijuana co-use more frequently compared to those individuals with an earlier age of onset (42). Notwithstanding, analyses utilizing nationally representative data are minimal, a knowledge gap this study seeks to fill.

It is suggested that the likelihood of initiation is enhanced by the frequency and availability of substance use in its community (41,43). Moreover, extant literature show that the perceived ease of access to drugs can further elevate the risk of using drugs (44-46), especially if access is from within an individual's social environment and circle of friends (47,48). Furthermore, prior research has identified exposure to drug use by family and friends as being strongly associated with polysubstance use among adolescents and young adults (49-51). In Jamaica, the most recent national survey indicated that 40-60 per cent of adolescents and 60-80 per cent of adults found marijuana easy to access (9). This finding is foreseeable, given Jamaica's recent decriminalization of marijuana which allows for possession of small quantities (two ounces) for personal use and therapeutic treatment through the establishment of a legal medical marijuana industry (52). Additionally, Jamaica has a rich cultural history of cultivating marijuana for medicinal and religious purposes (53,54). However, while the impact of easier

access to marijuana on single-drug dependence has been studied (55), literature regarding its influence on polysubstance use is largely absent.

No doubt, polysubstance use poses a significant global challenge associated with greater physical and psychiatric maladies and a mortality rate that escalates three-fold versus single substance use (56,57). To date, no studies in the Caribbean have used nationally representative data to assess the ease of marijuana access, friend and family substance use, risk perception and the age of initiation of singular drug usage on polysubstance use. Identifying their influence can allow for constructed interventions to reduce the impact of risk factors and enhance the efficacy of protective factors in preventing or reducing polysubstance habits.

OBJECTIVES

This study aimed to examine concurrent polysubstance use in a nationally representative sample of the Jamaican population and to investigate if there is an association with: 1) risk perception of alcohol, tobacco and marijuana use; 2) age of initiation of alcohol, tobacco and marijuana use; 3) ease of access to marijuana and 4) having friends or family who get drunk and take illegal drugs.

METHODS

Study Design, Participants and Data Source

This research was a secondary data analysis of the population-based National Drug Prevalence Survey 2016 conducted between April and July 2016. It utilized the entire dataset population and extracted variables relevant to drug/polysubstance use patterns and risk perception, age of initiation, ease of access and friend and family drug use from the primary data set for analysis. There was no compensation in this secondary analysis or direct or indirect contact with any respondents.

The original study utilized a structured, regional questionnaire for the data collection on drug use that was developed in collaboration with the Organization of American States/Inter-American Drug Abuse Control Commission (OAS/CICAD). The sample was nationally representative and comprised 4623 participants. The survey employed a stratified multi-stage sampling design in which the primary sampling units (PSU) were the Enumeration Areas (EAs). Jamaica consists of fourteen parishes and twenty-two EAs per parish. In each EA, systematic random sampling was used to procure sixteen households. Thereafter, one participant between the age of 12 and 65 years from each household was randomly selected as the respondent for the survey. Post-stratification weights were applied to ensure that the weighted sample distribution matched the population distribution of sex and age categories (9).

Measures

Lifetime, past year and past month use was determined using the target variables related to substance use over the lifetime, in the past 12 months and past 30 days for alcohol, tobacco and marijuana. “Yes” responses were coded as one and “no” were coded as zero. Lifetime, past year and past month concurrent polysubstance use (CPU) was defined as using two or more of alcohol, tobacco and marijuana over the lifetime, in the past 12 months and past 30 days respectively, measures described previously in the literature (58,59). Statistical computations were performed to score concurrent polysubstance, where respondents could only have a score of 0-3. For analytical purposes, 2-3 substances over the past 30 days were considered past month concurrent polysubstance use and utilized as the dependent variable.

Risk perception was assessed by asking participants, “In your opinion, please indicate the risk level of (a) drinking alcohol sometimes, (b) drinking alcohol often, (c) smoking cigarettes (tobacco) sometimes, (d) smoking cigarettes (tobacco) often, (e) smoking marijuana sometimes

and (f) smoking marijuana often". Participants indicated their risk level along a Likert scale continuum - (1) no risk; (2) low risk; (3) moderate risk; (4) high risk, and (5) I don't know the risk. For the univariate and bivariate analyses, response options were re-categorized whereby 1=no risk to low risk, 2=moderate to high risk and 3=don't know the risk. For the multivariate analysis, response options were re-categorized to examine respondents who had indicated some level of perceived risk. Furthermore, the option "don't know the risk" was excluded as an underrepresented category with insufficient frequencies that may introduce variability and bias in the interpretation of the results (60).

Regarding the age of initiation of alcohol, tobacco and marijuana, participants were asked to indicate their age in years to the following question for each substance - "How old were you when you tried for the first time?" For this analysis, respondents were arranged into four age groups: 11 years and under, 12-17 years, 18-25 years and 26 years and older to demonstrate distinct phases of childhood, adolescence and adulthood as established elsewhere (61).

For ease of access to marijuana, participants were asked, "How easy would it be to have access to the following drug - marijuana?" Response options were 1=easy; 2=difficult; 3=could not have access to; 4=don't know. Missing responses were treated as missing variables.

For friend and family alcohol and illegal drug use, participants were asked, "Do you have friends or family members who get drunk?" and "Do you have friends or family members who take illegal drugs such as marijuana and cocaine?" Response options were 0=no and 1=yes.

Statistical analyses

Statistical analysis was performed on the data using Statistical Package for the Social Sciences (SPSS) version 23. Descriptive statistics included computing frequencies and percentages for

categorical variables. Bivariate analysis examining the association between past month concurrent polysubstance use and select psychosocial variables was done using Pearson’s Chi-Square test. In the multivariate analysis, logistic regression was used whereby past month concurrent polysubstance use was the dependent variable. Factors identified as statistically significant in the bivariate analysis were included to control for their potential confounding effect. Multicollinearity between the study variables was diagnosed using variance inflation factor (VIF) (with multicollinearity being defined as $VIF > 2.5$) and Hosmer-Lemeshow statistic was used to test for model fitness. Odds ratios and 95% confidence intervals were recorded. A p-value of < 0.05 was considered statistically significant. The data was presented in the form of tables and text.

Patient and public involvement

Patients or members of the public were not involved in any aspect of this research, including conceptualization, design, analysis, interpretation of results, and reporting.

Ethical Considerations

The Ministry of National Security approved the National Drug Prevalence Survey 2016, and all participants provided informed consent. To protect confidentiality and anonymity, no names were retained. The research team had access to a secure database where the gathered data was stored. For minors, both parents and guardians provided informed consent, and assent was obtained from the minors themselves. (9). Ethical approval for the current study was granted through the ethics committee of The University of the West Indies, Mona Campus. There were no competing interests.

RESULTS

The study comprised 4623 respondents, most identified as female (n=2535, 54.8%) and 45.2% as males (n=2088). Respondents' age range was between 12-65 years, with a mean age of 36.18 (s.d.±14.815). The prevalence of substances used in the past month was 54.3% (alcohol), 38% (tobacco) and 53.9% (marijuana). The earliest mean age of initiation for alcohol, tobacco and marijuana use was for tobacco at 16.73 (SD +/- 5.498), followed by marijuana at 16.78 (SD +/- 5.039), and alcohol at 17.23 (SD +/- 5.132). Lifetime concurrent polysubstance use was reported by 907 (19.6%) respondents. Among those who reported lifetime use, 623 (68.7%) and 561 (61.9%) respondents reported concurrent polysubstance use in the past year and past month respectively.

Table 1 shows most respondents reported commencing substance use between 12 to 17 years of age and moderate to high risk perception as it related to the use of alcohol, tobacco and marijuana. Concerning friends and family drug use, most respondents had friends or family who get drunk (57.6%) and take illegal drugs such as marijuana and cocaine (64.8%). Regarding access to marijuana, the majority of respondents, 3341 (72.3%), reported that accessing marijuana was 'easy'.

Table 1. Distribution of age of initiation, risk perception and friends/family substance use (n=4623), 2016

Psychosocial factors	Responses (f, %)		
<i>Age of substance use initiation</i>	<i>Alcohol</i>	<i>Tobacco</i>	<i>Marijuana</i>
11 years and under	266 (07.7%)	132 (11.1%)	92 (07.3%)
12-17 years	1714 (49.9%)	651 (54.6%)	707 (55.9%)
18-25 years	1284 (37.4%)	343 (28.8%)	396 (31.3%)
26 years and older	171 (05.0%)	66 (05.5%)	69 (05.5%)
<i>Substance use: risk perception</i>	<i>No risk to low risk</i>	<i>Moderate to high risk</i>	<i>Don't know the risk</i>
Drinking alcohol sometimes	1823 (39.4%)	2743 (59.3%)	57 (1.2%)
Drinking alcohol often	193 (04.2%)	4384 (94.8%)	46 (1.0%)
Smoking tobacco sometimes	581 (12.6%)	4001 (86.5%)	41 (0.9%)
Smoking tobacco often	112 (02.4%)	4469 (96.7%)	42 (0.9%)
Smoking marijuana sometimes	1512 (32.7%)	3033 (65.6%)	78 (1.7%)
Smoking marijuana often	668 (14.4%)	3893 (84.2%)	62 (1.3%)

Friends/family who get drunk

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Yes	2665 (57.6%)
No	1958 (42.4%)
<i>Friends/family who take illegal drugs</i>	
Yes	2998 (64.8%)
No	1625 (35.2%)
<i>Accessibility to marijuana</i>	
Easy	3341 (72.3%)
Difficult	567 (12.3%)
Could not have access to	439 (09.5%)
Don't know	276 (06.0%)

Table 2 shows a bivariate analysis of select psychosocial factors and past month concurrent polysubstance use. Pearson's Chi-square analysis revealed statistically significant associations between the age of initiation of alcohol, tobacco and marijuana and past month concurrent polysubstance use ($p<0.001$, $p=0.049$ and $p<0.001$, respectively). Statistically significant associations were found between past month concurrent polysubstance use and risk perception of smoking tobacco sometimes, smoking marijuana sometimes, and smoking marijuana often ($p=0.007$, $p<0.001$ and $p<0.001$, respectively). Friends and family who get drunk and take illegal drugs were significantly associated with a higher prevalence of past month concurrent polysubstance use ($p<0.001$ and $p<0.001$) among respondents. Additionally, respondents who stated that marijuana was easy to access were significantly associated with a greater prevalence of past month concurrent polysubstance use ($p<0.001$).

Table 2. χ^2 analysis of psychosocial factors and past month CPU (n=907), 2016

Psychosocial factors	Past month concurrent polysubstance use		χ^2	p value
	No (346/907)	Yes (561/907)		
<i>Age of initiation: alcohol</i>			18.968	<0.001***
11 years and under	44 (12.9%)	73 (13.1%)		
12-17 years	182 (53.4%)	367 (65.9%)		
18-25 years	105 (30.8%)	109 (19.6%)		
26 years and older	10 (02.9%)	8 (01.4%)		
<i>Age of initiation: tobacco</i>			7.855	0.049*
11 years and under	28 (09.4%)	65 (12.6%)		
12-17 years	157 (52.7%)	298 (58.0%)		

18-25 years	99 (33.2%)	126 (24.5%)		
26 years and older	14 (04.7%)	25 (04.9%)		
<i>Age of initiation: marijuana</i>			41.648	<0.001***
11 years and under	25 (07.7%)	46 (08.5%)		
12-17 years	146 (44.8%)	351 (64.9%)		
18-25 years	131 (40.2%)	128 (23.7%)		
26 years and older	24 (07.4%)	16 (03.0%)		
<i>Risk perception: drinking alcohol sometimes</i>			3.233	0.199
No risk to low risk	146 (35.2%)	269 (64.8%)		
Moderate to high risk	195 (40.5%)	287 (59.5%)		
Don't know the risk	5 (50.0%)	5 (50.0%)		
<i>Risk perception: drinking alcohol often</i>			0.174	0.917
No risk to low risk	23 (39.0%)	36 (61.0%)		
Moderate to high risk	319 (38.0%)	520 (62.0%)		
Don't know the risk	4 (44.4%)	5 (55.6%)		
<i>Risk perception: smoking tobacco sometimes</i>			10.021	0.007**
No risk to low risk	46 (27.5%)	121 (72.5%)		
Moderate to high risk	296 (40.7%)	432 (59.3%)		
Don't know the risk	4 (33.3%)	8 (66.7%)		
<i>Risk perception: smoking tobacco often</i>			2.525	0.283
No risk to low risk	13 (27.7%)	34 (72.3%)		
Moderate to high risk	328 (38.6%)	521 (61.4%)		
Don't know the risk	5 (45.5%)	6 (54.5%)		
<i>Risk perception: smoking marijuana sometimes</i>			38.061	<0.001***
No risk to low risk	138 (29.2%)	335 (70.8%)		
Moderate to high risk	207 (48.6%)	219 (51.4%)		
Don't know the risk	1 (12.5%)	7 (87.5%)		
<i>Risk perception: smoking marijuana often</i>			47.295	<0.001***
No risk to low risk	58 (21.4%)	213 (78.6%)		
Moderate to high risk	287 (45.5%)	344 (54.5%)		
Don't know the risk	1 (20.0%)	4 (80.0%)		
<i>Friends/family who get drunk</i>			11.097	<0.001***
Yes	226 (34.8%)	424 (65.2%)		
No	120 (46.7%)	137 (53.3%)		
<i>Friends/family who take illegal drugs</i>			19.144	<0.001***

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3	Yes	285 (35.6%)	516 (64.4%)	
4	No	61 (57.5%)	45 (42.5%)	
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7	<i>Accessibility of Marijuana</i>			27.562 <0.001***
8	Easy	308 (89.0%)	545 (97.1%)	
9	Difficult	25 (07.2%)	9 (01.6%)	
10	Could not have access to	8 (02.3%)	2 (00.4%)	
11	Don't know	5 (01.4%)	5 (00.9%)	

12 * significant at the p <0.05, ** significant at the p= 0.01 level, ***significant at the p<0.001 level)

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15 Logistic regression analysis was performed on the psychosocial factors found to be

16 significantly associated with past month concurrent polysubstance use in the chi-square analysis,

17 to identify which were predictive of risk or protective factors (Table 3). The model was

18 statistically significant and predicted the dependent variable better than the intercept-only model

19 alone (χ^2 (17) = 147.664, p<0.001). There was no multicollinearity found among the independent

20 variables used in the analysis. The Hosmer-Lemeshow test shows the p value at 0.775 (p >.05)

21 which shows the model fits the data.

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31 Multivariate analysis indicated that participants commencing marijuana use at 11 years

32 and under and between 12 and 17 were 3.346 and 4.560 times more likely to report past month

33 concurrent polysubstance use than participants initiating marijuana use 26 years and older

34 (p=0.030 and p<0.001). The logistic regression model indicated that respondents with no risk to

35 low risk perception of smoking marijuana sometimes and often were 1.477 and 2.892 times more

36 likely to report past month concurrent polysubstance use than those who indicated moderate to

37 high risk perception of smoking marijuana (p=0.047 and p<0.001 respectively). Similarly,

38 respondents who indicated no risk to low risk perception of smoking tobacco sometimes were

39 associated with a 1,629 increased odds of reporting past month concurrent polysubstance use

40 compared to those who indicated moderate to high risk perception (p=0.049). The model

41 reported no statistically significant associations between the age of initiation of alcohol or

tobacco and polysubstance use ($p>0.05$). The model also highlighted that those respondents who indicated marijuana access as being difficult were 74.9% less likely to report past month concurrent polysubstance use than those who reported easy access to marijuana ($p=0.002$). Alternately, the result can also be interpreted that the odds of past month concurrent polysubstance use is 3.984 times higher among those who reported access to marijuana as easy than those who reported access as being difficult ($p=0.002$). In addition, those participants who indicated that friends or family members get drunk and take illegal drugs were associated with a 1.722 and 1.864 increased odds of reporting past month concurrent polysubstance use than those who reported that friends or family members did not get drunk and take illegal drugs ($p=0.004$ and $p=0.017$ respectively).

Table 3. Regression model of psychosocial factors associated with past month CPU (n=907), 2016

Psychosocial factors	OR	95% C.I.		p value
		Lower	Upper	
Accessibility of marijuana (easy)	reference			
Accessibility of marijuana (difficult)	0.251	0.103	0.615	0.002**
Accessibility of marijuana (could not have access to)	0.515	0.077	3.468	0.496
Accessibility of marijuana (don't know)	1.005	0.215	4.695	0.995
Risk perception of smoking tobacco sometimes (moderate to high)	reference			
Risk perception of smoking tobacco sometimes (no risk to low risk)	1.629	1.001	2.649	0.049*
Risk perception of smoking marijuana sometimes (moderate to high)	reference			
Risk perception of smoking marijuana sometimes (no risk to low risk)	1.477	1.006	2.168	0.047*
Risk perception of smoking marijuana often (moderate to high)	reference			
Risk perception of smoking marijuana often (no risk to low risk)	2.892	1.785	4.685	<0.001***
Age of initiation for alcohol: 11 years and under	1.458	0.395	5.388	0.572
Age of initiation for alcohol: 12-17 years	1.952	0.573	6.644	0.285
Age of initiation for alcohol: 18-25 years	1.087	0.315	3.755	0.894
Age of initiation for alcohol: 26 years and older	reference			
Age of initiation for tobacco: 11 years and under	0.501	0.173	1.455	0.204
Age of initiation for tobacco: 12-17 years	0.447	0.179	1.115	0.084
Age of initiation for tobacco: 18-25 years	0.717	0.285	1.799	0.478
Age of initiation for tobacco: 26 years and older	reference			
Age of initiation for marijuana: 11 years and under	3.346	1.125	9.949	0.030*
Age of initiation for marijuana: 12-17 years	4.560	1.879	11.067	<0.001***
Age of initiation for marijuana: 18-25 years	1.611	0.673	3.859	0.285

Age of initiation for marijuana: 26 years and older	reference			
Friends/family who get drunk (no)	reference			
Friends/family who get drunk (yes)	1.722	1.192	2.487	0.004**
Friends/family who take illegal drugs (no)	reference			
Friends/family who take illegal drugs (yes)	1.864	1.117	3.111	0.017*

* significant at the p <0.05, ** significant at the p= 0.01 level, ***significant at the p<0.001 level)

DISCUSSION

This research suggests that the vast majority (95%) of individuals who used alcohol, tobacco or marijuana at least once, had done so before reaching the age of 25, predominantly in adolescence (49.9%, 54.6%, and 55.9% respectively) and childhood (7.7%, 11.1% and 7.3% respectively). Using any of these substances during these critical phases of development is associated with behavioural problems (62), depression (63), suicide (64), psychosis (65) and dependence (66), emphasizing a burgeoning public health issue among Jamaican youth. This study is unique, however, in that it is the first in the Caribbean to reveal the impact of risk perception, age of initiation, ease of access and friend or family indulgence of the singular use of alcohol, tobacco and marijuana on polysubstance use.

The present study alludes to participants commencing marijuana use in childhood and adolescence as a risk factor for developing polysubstance use while simultaneously indicating no statistically significant associations with the age of initiation of alcohol or tobacco (p>0.05). The finding presented is in concordance with prior research that highlights the early age of marijuana use as being associated with alcohol and tobacco polysubstance use (38,67). However, this finding also finds variance with existing literature that suggests alcohol and tobacco use typically precedes the first use of marijuana (68). According to the gateway hypothesis, using marijuana customarily follows alcohol or tobacco use, whereas the common liability model explains drug use through the interplay of other factors, such as accessibility, sociocultural acceptance, genetic predisposition and psychological variables, irrespective of which substance is used first (69).

Indeed, within the Jamaican context, the preference for marijuana use is likely the result of strong sociocultural and religious validation, recent legislation that decriminalizes its use (52,54,70), and legitimate taxation initiatives and mitigation measures that have sought to curb alcohol and tobacco use (71,72). Accordingly, these findings highlight the need for preventative interventions targeting the younger populace that are geared towards delaying the onset of marijuana use. Providing a brief intervention within the school setting may prove helpful, especially in cases where students are unsure about substance use. This approach allows students to voluntarily be taught drug refusal skills (73) and learn about the harms associated with marijuana use (74). Such targeted strategies are needed at the policy level because recent decriminalization in Jamaica has been linked to an increased likelihood of first-time marijuana use among young individuals (70).

As expected, Jamaica's rapidly evolving legal landscape caters to greater access and exposure to marijuana compared to previous years. Extant research has acknowledged the ease of access to marijuana as a driving cause of substance abuse (43,75). In this study, respondents who indicated marijuana access as easy were more likely to report past month concurrent polysubstance use. This finding is noteworthy, as previous research has focused on the ease of access to marijuana as an antecedent to marijuana dependence (55,76), rather than polysubstance use. Moreover, the decriminalization of marijuana in Jamaica has led to the establishment of a medical marijuana industry, resulting in the subsequent formation of numerous marijuana dispensaries across the Jamaican landscape (52,77). Undoubtedly, this development has made access to marijuana even easier.

Recent research have shown that changes in policies regarding marijuana use, have led to diminishing perceptions of the drug's risks and harms (78–81). Respondents in this study who

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believed that smoking marijuana was not harmful were more likely to report past month concurrent polysubstance use. This observation is significant given that most research in Jamaica would have examined risk perception and its influence on single drug use and dependence (82,83). In 2015, decriminalization permitted the possession of up to two ounces of marijuana (52,84), an amendment that is likely to have encouraged its use as being socially acceptable and “normalized” in line with the use of other legal drugs (85,86). As a result, repeated exposure to substance-using friends and family members can directly influence an individual's drug-seeking behavior (87,88). In the present analysis, respondents who reported that friends or family members used illegal drugs like marijuana and became inebriated were significantly more likely to report past month concurrent polysubstance use. The study findings are in line with earlier research that has emphasized the impact of friends’ and family members’ drug use habits on the young individual’s likelihood of developing polysubstance use (50,87). To reduce health risks, individual harm reduction strategies such as using small amounts of marijuana or consuming alcohol slowly have been found to be effective (89,90). Additionally, evidence-based interventions consisting of family-focused treatment and individual therapy have also found favourable results in reducing marijuana use (91).

Notwithstanding, this study’s cumulative findings have implications for future drug treatment and prevention interventions in recognizing the impact of polysubstance use. In Jamaica, the National Council on Drug Abuse collaborates with the Ministry of Health and Wellness and various public and non-governmental organization partners to establish and execute prevention activities. Acute drug treatment services are available in both public and private hospitals, as well as residential rehabilitation programmes (3). A local drug treatment court was established in Jamaica in the early 2000s to redirect criminal drug offenders towards

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3 treatment, rehabilitation and social integration services (92). However, programs in the area of
4 recovery support still require improvement (93). Additionally, the available services are limited
5 in number and located mainly in metropolitan areas, which makes access to care a challenge
6 (94). Moreover, regulatory measures and quality control protocols must be strengthened to
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treatment, rehabilitation and social integration services (92). However, programs in the area of recovery support still require improvement (93). Additionally, the available services are limited in number and located mainly in metropolitan areas, which makes access to care a challenge (94). Moreover, regulatory measures and quality control protocols must be strengthened to accredit prevention programs and treatment services, which will enable continuous evaluation and monitoring of the services (93).

A further call to include polysubstance use in the mainstream of interventional efforts is paramount, especially concerning marijuana policy. Evidentiary support exists for harm reduction strategies including co-housing addiction treatment services with supervised drug consumption sites (95) and drug checking services (96,97), especially with regards to tetrahydrocannabinol potency levels, and utilizing the perspectives of personal lived experiences in guiding the further development of policy and legislation in addressing the drug's use (98,99).

Further studies examining polysubstance use pursuant to decriminalization may prove insightful as findings are likely to have changed and evolved since the initial survey in 2016. The COVID-19 pandemic has greatly affected the quality of life in many countries, leading to changing drug use patterns (100–102). Future household surveys and research can examine how COVID-19-related issues have affected both single-substance and polysubstance use patterns. The results of this study can provide insights into substance use profiles in a post-pandemic era.

Given the paucity of research in the global context, this research examines the effects of the age of initiation and other psychosocial factors of singular drug use on polysubstance use within a nationally representative sample, thereby providing valuable insight towards policy implications on a national scale. The random selection of survey respondents in the initial study and the use of a large population sample for the current study were significant strengths, as the

limited research done in Jamaica investigating polysubstance use has examined small and specific samples (103,104) that produced findings that were unlikely to be generalized to a larger population. The strength of the secondary analysis conducted was enhanced by the use of logistic regression for the multivariate analysis.

The study had certain limitations, which need to be taken into consideration. Firstly, it employed a cross-sectional design, which allowed only for associations to be determined, not causal relationships. Secondly, the household survey contained respondents from households and, as such, excluded a percentage of the population, who were homeless, those in prisons and healthcare institutions. Thirdly, the frequencies of illicit drugs other than marijuana were minimal and so were not considered as part of the polysubstance combinations. Lastly, the substance use was self-reported which can be influenced by recall bias. Notwithstanding, the secondary analysis generated a measure of concurrent polysubstance use, providing the underpinning catalyst for future research endeavours.

CONCLUSION

The present study suggests polysubstance use amongst Jamaicans is significantly associated with childhood and adolescent initiation and easy accessibility of marijuana. The study also sheds light on how Jamaicans perceive the risks and harms associated with marijuana use. In addressing this issue, policy perspectives must involve harm reduction strategies and not be restricted to mere preventative measures to guard against escalated habits. This is especially important given the current legal and sociocultural contexts of marijuana use pervasive within the Jamaican population. Furthermore, the study highlights the strong influence of friends' and family members' drug use on individuals adopting polysubstance use habits. Policymakers

should therefore consider utilizing a social-ecological model to better understand drug-using behaviour in developing public policy and implementing potential intervention strategies.

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Patient consent Consent to participate was requested from the participants in the consent form prior to the collection of data.

Ethics approval The National Drug Use Prevalence Survey 2016 was approved by the ethics committee of the Ministry of National Security in Jamaica. The secondary analysis was approved by the Ethics Committee at the University of the West Indies, Mona (Ref: CREC-MN,52 20/21).

Data sharing statement Data is available upon reasonable request and with permission of the National Council on Drug Abuse, Jamaica, and the Inter-American Drug Abuse Control Commission (CICAD). Restrictions apply to the availability of these data, which were used under licence for the current study and are not publicly available. For access to the database, contact Mrs Uki Atkinson, research analyst, at uatkinson@ncda.org.jm.

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STROBE Statement

Checklist of items that should be included in reports of observational studies

Section/Topic	Item No	Recommendation	Reported on Page No
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1,3
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-7
Objectives	3	State specific objectives, including any prespecified hypotheses	7
Methods			
Study design	4	Present key elements of study design early in the paper	7-8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-8
Participants	6	(a) Cohort study—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	8
		Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	
		Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) Cohort study—For matched studies, give matching criteria and number of exposed and unexposed	
		Case-control study—For matched studies, give matching criteria and the number of controls per case	N/A
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-9
Data sources/measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	8,10
Study size	10	Explain how the study size was arrived at	7-8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	9-10
		(b) Describe any methods used to examine subgroups and interactions	9-10
		(c) Explain how missing data were addressed	9
		(d) Cohort study—If applicable, explain how loss to follow-up was addressed	8-9
		Case-control study—If applicable, explain how matching of cases and controls was addressed	
		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
	(e) Describe any sensitivity analyses	N/A	

Section/Topic	Item No	Recommendation	Reported on Page No
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	N/A
		(b) Give reasons for non-participation at each stage	N/A
		(c) Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	11
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) Cohort study—Summarise follow-up time (eg, average and total amount)	N/A
Outcome data	15*	Cohort study—Report numbers of outcome events or summary measures over time	N/A
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	N/A
		Cross-sectional study—Report numbers of outcome events or summary measures	8-9
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	14-16
		(b) Report category boundaries when continuous variables were categorized	14-16
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	11-14
Discussion			
Key results	18	Summarise key results with reference to study objectives	14-15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	20
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16-20
Generalisability	21	Discuss the generalisability (external validity) of the study results	20-21
Other Information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	22

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.