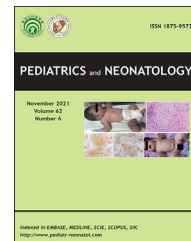


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Original Article

# Mental health and risk behaviors among secondary school students: A study on ethnic minorities

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## Key Words

adolescent;  
ethnicity;  
mental health;  
risk behavior;  
student

**Background:** Mental health disorders are highly correlated with risk behaviors. The objective of the present study is to examine the relationship between risk behaviors and mental health among school-going students with a focus on ethnic minorities.

**Methods:** The National Health and Morbidity Survey (NHMS) 2017 (n = 8230) was used for analyses. It was a nationwide survey conducted in Malaysia. The dependent variables were measured by three risk behaviors (cigarette smoking, alcohol drinking and use of illicit drugs). Probit regressions were utilized to examine the effect of mental health on the probability of smoking, drinking and using illicit drugs. Demographic and lifestyle factors were used as the control variables. Truancy was identified as a mediating variable.

**Results:** Anxiety, depression and suicidal ideation affected cigarette smoking, alcohol drinking and use of illicit drugs through mediation of truancy. After controlling for demographic and lifestyle factors, students with anxiety, depression and suicidal ideation were more likely to smoke, drink and use illicit drugs compared with their peers without any mental health disorders. Furthermore, the likelihood of consuming cigarettes, alcohol and illicit drugs was found to be higher among students who played truant than those who did not.

**Conclusion:** Mental health plays an important role in determining participation in risk behaviors among ethnic minority students in Malaysia. Public health administrators and schools have

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to be aware that students who suffer from mental health disorders are likely to indulge in risk behaviors.

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## Introduction

Risk behavior refers to behavior that has negative impacts on health, such as cigarette smoking, alcohol drinking and use of illicit drugs. Risk behavior among school-going students has been a serious public health issue in Malaysia for more than a decade. It is one of the main contributing factors to poor academic performance and various social problems.<sup>1</sup> Malaysia is well-known for its multi-ethnic population, and it is common to evidence that risk behaviors vary across ethnic groups.<sup>2–7</sup> While the prevalence of risk behaviors in different ethnic groups of students has been clearly estimated, identifying factors affecting participation in risk behaviors among ethnic minority students is a challenge. Ethnic minorities in Malaysia consist of Chinese, Indian, Sarawak natives (i.e., Ibans, Bidayuh and Melanaus) and Sabah natives (i.e., Kadazans, Dusuns and Bajaus).

Implementation of an effective policy directed towards improving the lifestyle of ethnic minority students is important. In order to facilitate this implementation, it is necessary to conduct studies on factors associated with participation in risk behaviors among ethnic minority students. For instance, Tee et al.<sup>4</sup> pointed out that acquiring considerable knowledge of factors determining smoking among Malaysian adolescents served as a useful guideline for the formulation of anti-smoking policies.

Several past studies conducted in the United States found that Black and Asian American adolescents were less likely to consume tobacco, alcohol and illicit drugs than Native American adolescents because of differences in perceived risk, preferences for drugs, community norms and peer influences.<sup>8–10</sup> Hence, it is interesting to explore how risk behaviors vary across ethnic minority groups in Malaysia.

According to the Social Control Theory developed by Hirschi,<sup>11</sup> students who are closely attached to families and schools are unlikely to misbehave. Since ethnic minorities have small-sized families and are carefully monitored by their parents, they are expected to have a low tendency to engage in risk behaviors. However, as pointed out by Peguero et al.,<sup>12</sup> who studied the social control theory and school misbehavior among ethnic minorities in the US, school attachment and commitment possessed a negligible impact on school misbehavior among African American students. Furthermore, school involvement was found to promote school misbehavior among Latina American students and Asian American students.<sup>12</sup> These mixed findings motivated the present study to investigate risk behaviors among ethnic minorities in Malaysia in great detail.

There is evidence suggesting that mental health disorders, such as anxiety and depression, are amongst the main factors influencing decisions of school-going students to engage in risk behaviors.<sup>13–16</sup> Mental health disorders

among school-going students are becoming more prevalent in Malaysia. In 2012, about 8.1% of Malaysian students reported that they felt lonely most of the time and 5.4% reported that they were unable to sleep because of worries.<sup>17</sup> Furthermore, approximately 7.9% and 6.4% of Malaysian students had suicidal ideation and suicidal plan, respectively. Studies suggested that Indian and Chinese students had higher odds of being depressed and having suicidal ideation compared with Malay students.<sup>18,19</sup> Although ethnic minority students are more likely to have mental health disorders compared with their ethnic majority peers, very little is known about how ethnic minority students' mental health status influences their decisions to indulge in risk behaviors.

A recent study by Cheah et al.<sup>6</sup> did not take into account of the influence of mental health on the tendencies of students to engage in risk behaviors. Moreover, it did not focus specifically on ethnic minorities, limiting its contribution to literature and policy development. The objective of the present study is to build on the study by Cheah et al.<sup>6</sup> by utilizing a better empirical design and methodological approach.

Problem Behavior Theory purposed by Richard Jessor is used as the theoretical basis to study risk behaviors.<sup>20</sup> According to the theory, there are numerous variables which can affect risk behaviors. Variables that initiate risk behaviors are named as risk factors, whilst variables that discourage risk behaviors are named as protective factors. In general, the variables can be grouped into three systems: personality system; perceived environment system; and social environment system. Social environment system consists of demographic structure and social context, which are used as explanatory variables in the present study.

The contributions of the present study are several. First, we devote our attention to ethnic minorities in order to identify factors influencing participation in risk behaviors among ethnic minority students. Evidence of any differences or similarities in the determining factors among the four ethnic minority groups (Chinese, Indian, Sabah natives, Sarawak natives) is an important and unique contribution. Second, we add mental health variables to our regressions in an effort to examine the independent effects of mental health disorders on risk behaviors.

## Methods

### Data

The National Health and Morbidity Survey (NHMS) 2017: Adolescent Health Survey is a nationwide survey conducted by the Ministry of Health Malaysia.<sup>21</sup> The survey period was from 26 March to 3 May 2017. The population of the survey

was secondary school students aged between 13 and 17 years. Details of students' health, demographic and lifestyle profiles were surveyed. The targeted respondents were 30,823 students, but only 27,497 participated in the survey. This was equivalent to a response rate of 89.2%. Since the population of the present study was ethnic minority students, only 8230 respondents were used for analyses. Although the NHMS 2017 is not the latest dataset, it is the most comprehensive adolescent health survey to have been conducted in Malaysia. Therefore, it is appropriate to the present study.

The NHMS 2017 was collected based on a two-stage stratified sampling. The first stage of sampling consisted of selection of secondary schools. In this stage, a total of 212 schools were selected based on the probability computed in accordance with school size. In the second stage, systematic random sampling was adopted to choose classes of each selected school. Overall, 4 to 10 classes of each school were selected. All the students in the selected classes were requested to take part in the survey.

Prior to survey, a pilot study and training were conducted. The training consisted of role-plays in carrying out the survey in classrooms. Consent was obtained from students and students' parents. School teachers took responsibility to brief students and students' parents on the consent form. Students who refused to take part in the survey or did not obtain consent from their parents were not eligible to participate in the survey. The survey was approved by the Medical Research and Ethics Committee of the Ministry of Health Malaysia, and the Ministry of Education Malaysia. Multi-lingual questionnaires were prepared and distributed to the respondents for self-administration.

### Dependent variable

Due to data limitation, only three risk behaviors were considered in the present study: (1) cigarette smoking; (2) alcohol drinking; and (3) use of illicit drugs. During the survey, the respondents were asked: 'During the past 30 days, did you smoke any cigarettes?' 'During the past 30 days, did you consume any drinks containing alcohol?' and 'During the past 30 days, did you use any illicit drugs, such as heroin, morphine, glue, amphetamine, ecstasy, methamphetamine, ice and marijuana?' The respondents answered 'yes' or 'no' to these questions.

### Independent variables

Four mental health variables were used: (1) distress; (2) anxiety; (3) depression; and (4) suicidal ideation. The Depression, Anxiety and Stress Scale – 21 items (DASS-21) was used to diagnose distress, anxiety and depression.<sup>22</sup> DASS-21 is a comprehensive self-report questionnaire that consists of numerous items related to mental health disorders. Score of each item is summed in order to determine whether or not a student has distress, anxiety or depression. Students having a total score of  $\geq 10$ ,  $\geq 14$  and  $\geq 19$  are considered to have anxiety, depression and distress, respectively. As identified by Le et al.,<sup>23</sup> the Cronbach Alpha's scores for depression, anxiety and distress were 0.835, 0.737 and 0.761, respectively, indicating that DASS-

21 had good internal consistency. In terms of convergent validity, the correlation coefficients between the factors scores of DASS-21 and the mental health domains of other scales were  $-0.47$  to  $-0.66$ , and this suggested a moderate correlation.<sup>23</sup> For suicidal ideation, it was assessed by asking the respondents: 'During the past 12 months, did you ever seriously consider attempting suicide?'

Students' demographic profiles were measured by five variables: (1) ethnicity; (2) grade level; (3) gender; (4) parental marital status; and (5) locality. Ethnic variable was categorized into four categories: Chinese, Indian, Sarawak natives (i.e., Ibans, Bidayuh and Melanaus) and Sabah natives (i.e., Kadazans, Dusuns and Bajaus). Five grade levels were used: Form 1 to Form 5. Secondary schools in Malaysia are divided into two levels: lower-secondary and upper-secondary. Lower-secondary consists of Form 1 to Form 3, while upper-secondary comprises Form 4 and Form 5. Form 1 is similar to 7th grade in the United States education, while Form 5 is equivalent to 11th grade. Parental marital status was categorized into two categories: married and single. Single referred to widowed or divorced parents.

Two lifestyle variables were used: (1) truancy; and (2) sexual behavior. The survey asked the respondents: 'During the past 30 days, did you miss classes without permission?' If the respondents answered 'yes', they were considered to be truant. With regard to sexual behavior, the respondents were asked: 'Have you ever had sexual intercourse in the past 30 days?' They responded with either 'yes' or 'no'.

### Statistical analyses

Cross-tabulation of cigarette smoking, alcohol drinking and use of illicit drugs by mental health, demographic and lifestyle variables was constructed. Then, Fisher exact tests of independence were performed. In addition, mediational analysis was conducted to assess the relationship between mental health and risk behaviors. The plausible mediator was truancy. In light of the findings of previous studies on mental health and poor attendance at school, it was expected that students who had mental health disorders were likely to play truant, and students who played truant had a high tendency to engage in risk behaviors.<sup>24,25</sup>

Probit regressions were utilized to examine the independent effects of mental health variables on the probability of consuming cigarettes, alcohol and illicit drugs. Demographic and lifestyle factors were treated as control variables, while truancy was used as a mediating variable. For the purpose of a robustness check and to determine whether multiple binary regressions performed better than a single ordinal regression, probit regressions were compared with an ordered probit regression for the number of involvements in risk behavior variable. In this variable, respondents who did not engage in any risk behavior were coded as 0, while those who engaged in one, two or three risk behaviors were coded as 1, 2 or 3, respectively. Hence, the maximum value for the number of involvements in risk behavior variable was 3, while the minimum value was 0. Marginal effects of the independent variables were calculated and presented. Marginal effect is the change in the predicted probability of an outcome of the dependent variable for a unit change in an independent variable. In

addition, likelihood-ratio (LR) test was conducted to evaluate the goodness-of-fit of the models. A significant value of LR implies a good fit model. Furthermore, variance inflation factor (VIF) was calculated to diagnose multicollinearity issue. Multicollinearity occurs if VIF is more than ten.<sup>26</sup> The significance level of all the tests was  $p < 0.05$ . Statistical analyses were performed using Stata.<sup>27</sup>

## Results

The majority of students did not smoke, drink or use illicit drugs. Approximately 10.62% of students had distress. This proportion was quite similar to the proportion of students who had suicidal ideation (10.10%). The proportion of students having anxiety was 38.51%, which was larger than those of students with distress and suicidal ideation. The proportion of students having depression (21.41%) was slightly smaller compared to the proportion of students with anxiety but larger than those of students who had distress and suicidal ideation. The ethnic breakdown consisted of 49.82% Chinese, 17.35% Indians, 21.64% Sabah natives and 11.19% Sarawak natives. The largest proportions of students were Form 1 students. The majority of students were female. More than two-thirds of students had married parents. A large proportion of students resided in urban areas and did not play truant and did not engage in sexual behavior (Table 1).

Cigarette smoking, alcohol drinking and use of illicit drugs were more prevalent among students who had distress, anxiety, depression and suicidal ideation than those who did not have any mental health disorders. Smoking and drinking were most frequent among Sarawak natives, whereas use of illicit drugs was most common among Indians. Form 4 students had the highest prevalence of drinking, while the prevalence of smoking and using illicit drugs was the highest among Form 1 students. Smoking and use of illicit drugs were more prevalent among rural dwellers than urban dwellers. The prevalence of smoking, drinking and illicit drugs use was higher among males, students with single parents and those who played truant and engaged in sexual behavior (Table 2).

Result of mediational analysis showed that truancy was significantly affected by anxiety, depression and suicidal ideation. Furthermore, anxiety, depression and suicidal ideation variables had direct and indirect effects on consumption of cigarettes, alcohol and illicit drugs. Moreover, the estimated coefficients of anxiety, depression and suicidal ideation variables became smaller when truancy was included in the regression. Simply put, after the inclusion of truancy variable, the effects of mental health on risk behaviors were lessened. Collectively, this indicated that mental health affected risk behaviors through mediation of truancy. In other words, truancy could explain the relationship between mental health and risk behaviors (Table 3).

The ordered probit regression for the number of involvements in risk behavior had higher Akaike's Information Criterion (AIC) and smaller Pseudo R-squared than the probit regressions for smoking and use of illicit drugs. Although Pseudo R-squared of the probit regression for drinking was slightly smaller than that of the ordered probit regression, it had lower AIC. Taken together, these

**Table 1** Descriptive statistics of variables (n = 8230).

Variables	Frequency	Percentage
<i>Dependent</i>		
Cigarette		
Smoker	1139	13.84
Non-smoker	7091	86.16
Alcohol		
Drinker	1765	21.45
Non-drinker	6465	78.55
Illicit drugs		
User	346	4.20
Non-user	7884	95.80
<i>Independent</i>		
Distress		
Yes	874	10.62
No	7356	89.38
Anxiety		
Yes	3169	38.51
No	5061	61.49
Depression		
Yes	1762	21.41
No	6468	78.59
Suicide		
Yes	831	10.10
No	7399	89.90
Ethnicity		
Chinese	4100	49.82
Indian	1428	17.35
Sabah natives	1781	21.64
Sarawak natives	921	11.19
Form		
1	1774	21.56
2	1461	17.75
3	1764	21.43
4	1622	19.71
5	1609	19.55
Gender		
Male	4015	48.78
Female	4215	51.22
Parental marital status		
Married	6978	84.79
Single	1252	15.21
Locality		
Urban	5843	71.00
Rural	2387	29.00
Truancy		
Yes	2318	28.17
No	5912	71.83
Sexual behavior		
Yes	632	7.68
No	7598	92.32

Source: NHMS 2017.

indicated that the probit regressions were more appropriate to the present study than the ordered probit regression (Table 4).

Students who had anxiety were 0.9–3.9% more likely to smoke, drink and use illicit drugs than those without anxiety. The likelihood of smoking, drinking and using illicit drugs was



**Table 2** Number and proportion of cigarette smokers, alcohol drinkers and illicit drug users, by mental health, demographic and lifestyle characteristics.

Variables	Cigarette (n = 1139)	Alcohol (n = 1765)	Illicit drugs (n = 346)
<b>Distress</b>			
Yes	207 (23.68)	272 (31.12)	109 (12.47)
No	932 (12.67)	1493 (20.30)	237 (3.22)
<i>p</i> -value	<0.001	<0.001	<0.001
<b>Anxiety</b>			
Yes	593 (18.71)	852 (26.89)	269 (8.49)
No	546 (10.79)	913 (18.04)	77 (1.52)
<i>p</i> -value	<0.001	<0.001	<0.001
<b>Depression</b>			
Yes	404 (22.93)	572 (32.46)	219 (12.43)
No	735 (11.36)	1193 (18.44)	127 (1.96)
<i>p</i> -value	<0.001	<0.001	<0.001
<b>Suicide</b>			
Yes	293 (35.26)	349 (42.00)	185 (22.26)
No	846 (11.43)	1416 (19.14)	161 (2.18)
<i>p</i> -value	<0.001	<0.001	<0.001
<b>Ethnicity</b>			
Chinese	297 (7.24)	1049 (25.59)	128 (3.12)
Indian	241 (16.88)	226 (15.83)	112 (7.84)
Sabah natives	369 (20.72)	250 (14.04)	62 (3.48)
Sarawak natives	232 (25.19)	240 (26.06)	44 (4.78)
<i>p</i> -value	<0.001	<0.001	<0.001
<b>Form</b>			
1	282 (15.90)	341 (19.22)	146 (8.23)
2	196 (13.42)	318 (21.77)	75 (5.13)
3	238 (13.49)	355 (20.12)	42 (2.38)
4	237 (14.61)	402 (24.78)	56 (3.45)
5	186 (11.56)	349 (21.69)	27 (1.68)
<i>p</i> -value	0.006	0.001	<0.001
<b>Gender</b>			
Male	824 (20.52)	1048 (26.10)	244 (6.08)
Female	315 (7.47)	717 (17.01)	102 (2.42)
<i>p</i> -value	<0.001	<0.001	<0.001
<b>Parental marital status</b>			
Married	860	1411	222

**Table 2 (continued)**

Variables	Cigarette (n = 1139)	Alcohol (n = 1765)	Illicit drugs (n = 346)
Single	(12.32) 279 (22.28)	(20.22) 354 (28.27)	(3.18) 124 (9.90)
<i>p</i> -value	<0.001	<0.001	<0.001
<b>Locality</b>			
Urban	660 (11.30)	1270 (21.74)	175 (3.00)
Rural	479 (20.07)	495 (20.74)	171 (7.16)
<i>p</i> -value	<0.001	0.329	<0.001
<b>Truancy</b>			
Yes	541 (23.34)	706 (30.46)	222 (9.58)
No	598 (10.12)	1059 (17.91)	124 (2.10)
<i>p</i> -value	<0.001	<0.001	<0.001
<b>Sexual behavior</b>			
Yes	264 (41.77)	258 (40.82)	192 (30.38)
No	875 (11.52)	1507 (19.83)	154 (2.03)
<i>p</i> -value	<0.001	<0.001	<0.001

Note: Row percentages are shown in parentheses. *p*-values related to Fisher exact tests of independence are presented. Source: NHMS 2017.

higher among students with depression and suicidal ideation than those without these disorders. Compared to Chinese, Indians were 1–9.3% more likely to smoke and use illicit drugs but were 11.5% less likely to drink alcohol. Sabah and Sarawak natives were 15.4–22% more likely to smoke than Chinese. However, Sabah natives had an 11.4% lower probability of consuming alcohol than Chinese. Form 1 students were 1.9% more likely to use illicit drugs but were 5.5% less likely to drink alcohol relative to Form 5 students. The likelihood of consuming cigarettes, alcohol and illicit drugs was higher among males and students with single parents than females and those with married parents. Residing in urban areas was negatively associated with the likelihood of consuming cigarettes and illicit drugs. Students who played truant and engaged in sexual behavior were 7.4–17.7%, 9.4–13.2% and 1.7–10% more likely to smoke, drink and use illicit drugs, respectively, than those who did not play truant and did not engage in sexual behavior.

## Discussion

The relationship between risk behaviors and mental health disorders evidenced in the present study lends support to the findings of previous studies.<sup>13–16</sup> Students who had anxiety, depression or suicidal ideation were more likely to consume cigarettes, alcohol and illicit drugs compared with their counterparts who did not have any mental health disorders. This is perhaps because students who suffer from mental health disorders indulge in risk behavior in an effort to

**Table 3** Direct and indirect effects of mental health on mediating and dependent variables (n = 8230).

Variables	Truancy	Cigarette		Alcohol		Illicit drugs	
		Indirect	Direct	Indirect	Direct	Indirect	Direct
<b>Distress</b>							
Yes	0.018 (0.018) Ref.	0.022 (0.013) Ref.	0.023 (0.013) Ref.	0.012 (0.016) Ref.	0.013 (0.016) Ref.	0.013 (0.007) Ref.	0.014 (0.007) Ref.
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
<b>Anxiety</b>							
Yes	0.027 <sup>a</sup> (0.011) Ref.	0.014 <sup>a</sup> (0.008) Ref.	0.016 <sup>a</sup> (0.008) Ref.	0.038 <sup>a</sup> (0.010) Ref.	0.040 <sup>a</sup> (0.010) Ref.	0.021 <sup>a</sup> (0.005) Ref.	0.022 <sup>a</sup> (0.005) Ref.
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
<b>Depression</b>							
Yes	0.067 <sup>a</sup> (0.014) Ref.	0.039 <sup>a</sup> (0.010) Ref.	0.045 <sup>a</sup> (0.010) Ref.	0.069 <sup>a</sup> (0.013) Ref.	0.075 <sup>a</sup> (0.013) Ref.	0.038 <sup>a</sup> (0.006) Ref.	0.040 <sup>a</sup> (0.006) Ref.
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
<b>Suicide</b>							
Yes	0.159 <sup>a</sup> (0.017) Ref.	0.162 <sup>a</sup> (0.012) Ref.	0.175 <sup>a</sup> (0.012) Ref.	0.159 <sup>a</sup> (0.015) Ref.	0.173 <sup>a</sup> (0.015) Ref.	0.122 <sup>a</sup> (0.007) Ref.	0.128 <sup>a</sup> (0.007) Ref.
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
<b>Truancy</b>							
Yes	— — Ref.	0.083 <sup>a</sup> (0.008) Ref.	— — Ref.	0.093 <sup>a</sup> (0.010) Ref.	— — Ref.	0.040 <sup>a</sup> (0.004) Ref.	— — Ref.
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
<b>Ethnicity</b>							
Chinese	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Indian	0.029 <sup>a</sup> (0.014) Ref.	0.073 <sup>a</sup> (0.010) Ref.	0.075 <sup>a</sup> (0.010) Ref.	−0.121 <sup>a</sup> (0.012) Ref.	−0.118 <sup>a</sup> (0.012) Ref.	0.023 <sup>a</sup> (0.005) Ref.	0.024 <sup>a</sup> (0.005) Ref.
Sabah natives	0.048 <sup>a</sup> (0.013) Ref.	0.124 <sup>a</sup> (0.009) Ref.	0.128 <sup>a</sup> (0.009) Ref.	−0.118 <sup>a</sup> (0.012) Ref.	−0.114 <sup>a</sup> (0.012) Ref.	−0.010 <sup>a</sup> (0.005) Ref.	−0.009 (0.005) Ref.
Sarawak natives	−0.032 (0.017) Ref.	0.169 <sup>a</sup> (0.012) Ref.	0.166 <sup>a</sup> (0.012) Ref.	0.010 (0.015) Ref.	0.007 (0.015) Ref.	0.004 (0.007) Ref.	0.003 (0.007) Ref.
<b>Form</b>							
1	−0.036 <sup>a</sup> (0.015) Ref.	0.008 (0.011) Ref.	0.005 (0.011) Ref.	−0.051 <sup>a</sup> (0.014) Ref.	−0.054 <sup>a</sup> (0.014) Ref.	0.040 <sup>a</sup> (0.006) Ref.	0.038 <sup>a</sup> (0.006) Ref.
2	−0.030 (0.016) Ref.	−0.008 (0.011) Ref.	−0.010 (0.011) Ref.	−0.013 (0.014) Ref.	−0.015 (0.014) Ref.	0.022 <sup>a</sup> (0.006) Ref.	0.021 <sup>a</sup> (0.006) Ref.
3	0.003 (0.015) Ref.	0.001 (0.011) Ref.	0.001 (0.011) Ref.	−0.018 (0.014) Ref.	−0.017 (0.014) Ref.	0.001 (0.006) Ref.	0.001 (0.006) Ref.
4	0.049 <sup>a</sup> (0.015) Ref.	0.012 (0.011) Ref.	0.016 (0.011) Ref.	0.011 (0.014) Ref.	0.016 (0.014) Ref.	0.005 (0.006) Ref.	0.007 (0.006) Ref.
5	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
<b>Gender</b>							
Male	0.033 <sup>a</sup> (0.010) Ref.	0.124 <sup>a</sup> (0.007) Ref.	0.127 <sup>a</sup> (0.007) Ref.	0.081 <sup>a</sup> (0.009) Ref.	0.084 <sup>a</sup> (0.009) Ref.	0.029 <sup>a</sup> (0.004) Ref.	0.030 <sup>a</sup> (0.004) Ref.
Female	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
<b>Parental marital status</b>							
Married	−0.080 <sup>a</sup> (0.014) Ref.	−0.063 <sup>a</sup> (0.010) Ref.	−0.069 <sup>a</sup> (0.010) Ref.	−0.042 <sup>a</sup> (0.012) Ref.	−0.049 <sup>a</sup> (0.012) Ref.	−0.034 <sup>a</sup> (0.005) Ref.	−0.038 <sup>a</sup> (0.005) Ref.
Single	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
<b>Locality</b>							
Urban	−0.061 <sup>a</sup> (0.011) Ref.	−0.032 <sup>a</sup> (0.008) Ref.	−0.037 <sup>a</sup> (0.008) Ref.	0.005 (0.010) Ref.	0.001 (0.010) Ref.	−0.035 <sup>a</sup> (0.004) Ref.	−0.037 <sup>a</sup> (0.005) Ref.
Rural	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
<b>Sexual behavior</b>							
Yes	0.079 <sup>a</sup> (0.019) Ref.	0.213 <sup>a</sup> (0.013) Ref.	0.219 <sup>a</sup> (0.013) Ref.	0.138 <sup>a</sup> (0.017) Ref.	0.146 <sup>a</sup> (0.017) Ref.	0.224 <sup>a</sup> (0.007) Ref.	0.227 <sup>a</sup> (0.007) Ref.
No	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.

Note: Standard errors are shown in parentheses. Ref. refers to reference category. <sup>a</sup>p-value <0.05.

Source: NHMS 2017.

**Table 4** Marginal effects of independent variables on risk behaviors (n = 8230).

Variables	Risk <sup>b</sup>	Cigarette	Alcohol	Illicit drugs
<b>Distress</b>				
Yes	0.014 (0.011)	0.018 (0.012)	0.010 (0.016)	0.003 (0.003)
No	Ref.	Ref.	Ref.	Ref.
<b>Anxiety</b>				
Yes	0.032 <sup>a</sup> (0.008)	0.015 <sup>a</sup> (0.008)	0.039 <sup>a</sup> (0.011)	0.009 <sup>a</sup> (0.002)
No	Ref.	Ref.	Ref.	Ref.
<b>Depression</b>				
Yes	0.055 <sup>a</sup> (0.009)	0.029 <sup>a</sup> (0.010)	0.069 <sup>a</sup> (0.014)	0.011 <sup>a</sup> (0.003)
No	Ref.	Ref.	Ref.	Ref.
<b>Suicide</b>				
Yes	0.135 <sup>a</sup> (0.008)	0.151 <sup>a</sup> (0.016)	0.156 <sup>a</sup> (0.018)	0.039 <sup>a</sup> (0.007)
No	Ref.	Ref.	Ref.	Ref.
<b>Ethnicity</b>				
Chinese	Ref.	Ref.	Ref.	Ref.
Indian	-0.032 <sup>a</sup> (0.009)	0.093 <sup>a</sup> (0.013)	-0.115 <sup>a</sup> (0.010)	0.010 <sup>a</sup> (0.003)
Sabah natives	-0.010 (0.009)	0.154 <sup>a</sup> (0.013)	-0.114 <sup>a</sup> (0.010)	-0.001 (0.002)
Sarawak natives	0.068 <sup>a</sup> (0.010)	0.220 <sup>a</sup> (0.019)	0.010 (0.015)	0.006 (0.004)
<b>Form</b>				
1	-0.021 <sup>a</sup> (0.010)	0.005 (0.011)	-0.055 <sup>a</sup> (0.013)	0.019 <sup>a</sup> (0.006)
2	-0.006 (0.011)	-0.007 (0.011)	-0.013 (0.014)	0.013 <sup>a</sup> (0.005)
3	-0.013 (0.010)	0.002 (0.010)	-0.020 (0.013)	0.001 (0.003)
4	0.008 (0.010)	0.012 (0.011)	0.009 (0.014)	0.004 (0.004)
5	Ref.	Ref.	Ref.	Ref.
<b>Gender</b>				
Male	0.106 <sup>a</sup> (0.007)	0.117 <sup>a</sup> (0.007)	0.085 <sup>a</sup> (0.009)	0.012 <sup>a</sup> (0.002)
Female	Ref.	Ref.	Ref.	Ref.
<b>Parental marital status</b>				
Married	-0.049 <sup>a</sup> (0.009)	-0.055 <sup>a</sup> (0.011)	-0.039 <sup>a</sup> (0.013)	-0.013 <sup>a</sup> (0.003)
Single	Ref.	Ref.	Ref.	Ref.
<b>Locality</b>				
Urban	-0.017 <sup>a</sup> (0.007)	-0.022 <sup>a</sup> (0.008)	0.009 (0.010)	-0.010 <sup>a</sup> (0.003)
Rural	Ref.	Ref.	Ref.	Ref.
<b>Truancy</b>				
Yes	0.085 <sup>a</sup> (0.007)	0.074 <sup>a</sup> (0.008)	0.094 <sup>a</sup> (0.011)	0.017 <sup>a</sup> (0.003)
No	Ref.	Ref.	Ref.	Ref.
<b>Sexual behavior</b>				
Yes	0.150 <sup>a</sup> (0.008)	0.177 <sup>a</sup> (0.019)	0.134 <sup>a</sup> (0.020)	0.100 <sup>a</sup> (0.013)
No	Ref.	Ref.	Ref.	Ref.

**Table 4 (continued)**

Variables	Risk <sup>b</sup>	Cigarette	Alcohol	Illicit drugs
LR	1472.710	1388.210	769.940	1229.020
p-value	<0.001	<0.001	<0.001	<0.001
Pseudo R-squared	0.110	0.210	0.090	0.428
AIC	12057.360	5263.391	7820.059	1675.247
Maximum VIF	1.670			

Note: Standard errors are shown in parentheses. Ref. refers to reference category. <sup>a</sup>p-value <0.05. <sup>b</sup>number of involvements in risk behavior. LR refers to likelihood ratio. AIC refers to Akaike's Information Criterion. VIF refers to variance inflation factor. Source: NHMS 2017.

reduce their stress.<sup>28</sup> These findings have an important implication for a policy directed towards discouraging ethnic minority students from participating in risk behaviors. Policy makers are suggested to devote their attention to Chinese, Indian, Sabah native and Sarawak native students with anxiety, depression and suicidal ideation.

Although the likelihood of consuming cigarettes was lower among Chinese than Indians, Sabah natives and Sarawak natives, Chinese had a higher tendency to consume alcohol. This is not surprising because alcohol is very common in the celebrations and festivals of Chinese, especially wedding ceremonies and New Year celebrations.<sup>29,30</sup> In addition, we found that of all the ethnic minority groups, Indians had the highest probability of consuming illicit drugs. This may be attributable to peer influence or cultural factors. With data availability, future research could explore how ethnicity influences risk behaviors through mediation of these factors. Policy makers must be aware of these ethnic minority variations in risk behaviors. Different ethnic minorities may have different preferences for risk behaviors.

Ethnic minority students who had a high tendency to smoke, drink and use illicit drugs were not only significantly more probable to report mental health problems relative to those having a low tendency but they were more likely to be male than female. Previous studies shared similar findings.<sup>14,31-33</sup> Several reasons may explain gender differences in risk behaviors. Firstly, risk behavior in female school-going students is less acceptable because of cultural issues.<sup>6</sup> Secondly, female adolescents are closely monitored by their parents, resulting in a more serious barrier to participation in risk behaviors.<sup>7</sup> Thirdly, the risk tolerance among males tends to be higher than females; thus the preference for risk behaviors in male students is greater.<sup>34</sup> Therefore, we recommend that public health administrators focus more on discouraging male students than female students of all the ethnic minority groups from engaging in risk behaviors.

The present study found that students who lived in two-parent households were less likely to consume cigarettes, alcohol and illicit drugs than those living in single-parent households, which is consistent with the evidence of past studies.<sup>33,35-37</sup> This may be due to the fact that adolescents who live in two-parent households are more closely

monitored by their parents compared with those who live in single-parent households, making it more difficult to indulge in risk behaviors.<sup>38</sup> Having a poor relationship with parents or family conflict could also be a factor contributing to participation in risk behaviors among students with single parents.<sup>31</sup> Based on our findings, an important implication for practice is that a nationwide policy aimed at reducing engagement in risk behaviors among ethnic minority students who live in single-parent households could be implemented.

Form 1 students were less likely to consume alcohol than Form 5 students, but they were more likely to use illicit drugs. This finding leads to a conclusion that Form 1 students are more prone to riskier behavior than Form 5 students, even though they are less likely to indulge in alcohol drinking. A plausible explanation for this is that Form 1 students are less aware of the negative consequences of illicit drugs use. A qualitative research could be conducted with the aim of gaining a deeper understanding of how grade level predicts risk behaviors in different ethnic groups. Social or environmental factors may be a mediator to explain the relationship between grade level and risk behaviors. Past studies used age rather than grade level as an explanatory variable and found age to be positively correlated with risk behaviors.<sup>6,36,39</sup> While our findings are not completely consistent with those of previous studies, they have important implications for policy. In order to reduce the risk levels among ethnic minority students, schools are advised to devote their attention to discouraging Form 1 students from consuming illicit drugs and reducing alcohol drinking among Form 5 students.

This study's finding related to locality stands in contrast to Bozzini et al.<sup>16</sup> It concludes that while cigarettes and illicit drugs are more available in urban areas than in rural areas, urban dwellers are less likely to indulge in smoking and illicit drugs use compared with rural ones. A plausible explanation is that urban dwellers have better health awareness than rural ones.<sup>40</sup> Policy makers are, therefore, advised to pay special attention to students in rural areas if the goal of reducing participation in risk behaviors among ethnic minority students is to be achieved.

Truancy was associated with an increased likelihood of smoking, drinking and using illicit drugs. This finding is in line with a small number of longitudinal studies.<sup>33,41</sup> It is plausible that students who play truant have a higher time preference and are less likely to take care of their health compared with those who do not play.<sup>42,43</sup> Also, these students may have more time on their hands and opportunities to indulge in risk behaviors. These phenomena reflect that truancy is a complement to risk behaviors. Having a better understanding of how truancy influences risk behaviors is mandatory for designing an effective preventive measure. In other words, truancy factor deserves special attention in lowering the prevalence of smoking, drinking and illicit drugs use among ethnic minority students. We suggest that schools work with public health authorities and take responsibility for monitoring student attendance.

We found that students who engaged in sexual behavior were riskier compared with their peers who did not indulge in sexual intercourse because they were more

likely to consume cigarettes, alcohol and illicit drugs. This finding is in accordance with evidence of Hale and Viner.<sup>33</sup> The explanation is quite straightforward. Students who indulge in sexual behavior are irrational and more likely to take risks compared with those who are not involved in sexual behavior, and consequently they have a higher tendency to engage in risk behaviors.<sup>33</sup> Because of data limitation, we are unable to distinguish between safe and unsafe sex. Otherwise, we could incorporate unsafe sex in the dependent variable for a more comprehensive analysis of risk behaviors. The present study calls for the government's attention to target ethnic minority students who indulge in sexual behavior. School-based intervention measures need to discourage Chinese, Indian, Sabah native and Sarawak native students from engaging in sexual behavior.

Several limitations of the present study are noteworthy. First, the causal relationships between risk behaviors and mental health, demographic, and lifestyle factors cannot be well-identified because of cross-sectional data. If longitudinal data are available, future studies may offer more insight into the causal effects of mental health on risk behaviors. Second, mental health data obtained in the survey were self-reported, so minor reporting errors are unavoidable. Although self-reported information is of sufficiently high quality, it cannot replace clinical assessment. Third, since underage sex is illegal, underreporting of sexual behavior is to be expected.

## Conclusion

Risk behaviors among school-going students are correlated with poor academic performance, as well as many health and social problems. In an effort to discourage students from indulging in risk behaviors, it is essential to understand factors influencing the decisions of students to participate in risk behaviors with a focus on cigarette smoking, alcohol drinking and the use of illicit drugs. The findings of the present study show that mental health disorders play an important role in determining risk behaviors. Furthermore, demographic and lifestyle factor differences in risk behaviors are identified. An important implication is that a multifactorial method is required in an intervention measure directed towards reducing the prevalence of risk behaviors in ethnic minority students. It is noteworthy that mental health affects risk behaviors through mediation of truancy. Simply put, there is a mediating effect of truancy on risk behaviors. Students who have mental health problems are more likely to play truant compared with those without these problems, and they consequently have a higher tendency to indulge in risk behaviors. This finding implies that policy makers need to make a concerted effort to discourage students with mental health disorders from playing truant. If the likelihood of truancy among these students can be lowered, the overall prevalence of risk behaviors may be reduced.

## Declaration of competing interest

The authors have no competing interests to declare.



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