

Parental monitoring and adolescent health risk behaviors: A comparative analysis of nine Southeast Asian countries

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Research article

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Posted Date: April 30th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-23553/v1>

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RESEARCH

Parental monitoring and adolescent health risk behaviors: A comparative analysis of nine Southeast Asian countries

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Abstract

Background: Strong parental monitoring is thought to protect adolescents from engaging in health risk behaviors. However, differing levels of economic development and regulatory systems suggest that findings from Western countries may not generalize to Southeast Asia. This study analyzed the relationship between parental monitoring and health risk behaviors among adolescents in nine Southeast Asian countries.

Methods: Cross-sectional data for 52,803 adolescents (aged 11–18 years; 51.4% female) were obtained from the World Health Organization's Global School-Based Student Health Survey. Data collected between 2007 and 2015 was available for Indonesia, Myanmar, Thailand, The Philippines, Malaysia, Vietnam, Brunei, Timor-Leste, and Laos. Univariate and multivariate logistic regression analyses were conducted to assess the relationships between parental monitoring, sexual risk behaviors, and substance use. Age, gender, country differences in sexual risk behaviors, and substance use were also examined.

Results: The results revealed that adolescents who reported regular parental monitoring had a lower probability of engaging in sexual risk behaviors and substance use. Using alcohol, prohibited substances, and tobacco was significantly associated with engaging in sexual risk behaviors. Males and older participants were more likely than females and younger participants to report all forms of health risk behavior. Significant differences existed in risk behavior between countries, with participants in Timor-Leste the most likely to engage in most forms of health risk behavior.

Conclusion: We considered the results in the context of the economic and regulatory environments in each country. In developing countries, particularly those with relatively strong economic growth and relaxed drug and alcohol regulations, parental monitoring, and other factors such as culture, education, and the health system play a crucial role in protecting adolescents from risky behaviors.

Keywords: Parental monitoring; adolescents; risky behavior; Southeast Asia

1 **Background**

2 Adolescents are more likely to be at risk of engaging in risky behaviors than in-
3 dividuals in any other developmental stage [1]. Teenagers develop risky behaviors
4 during adolescence due to both individual and environmental factors [2, 3, 4]. Ado-
5 lescents do not have much experience in life, and together with the biological and
6 psychological changes they experience, this increases the potential for impulsive
7 sexual behaviors [5, 6, 7] and the use of substances [8], which can lead to accidental
8 self-harm [9, 10]. At the same time, the influence of peers and even sexual partners
9 makes it even more difficult for teenagers to control their behavior [11, 12, 13].
10 Factors such as community [14, 15], religious beliefs [16, 17, 18], and also the media
11 [19, 20] can influence behavior during adolescence. Notably, the literature shows
12 that the family has a crucial role in providing timely intervention and correction
13 to adolescents' risky behaviors, along with appropriate direction [21, 22, 23, 24].
14 Parental monitoring is an essential factor determining the safety of the health risks
15 of adolescents [25, 26, 27, 28].

16 Parental monitoring is defined as “a set of correlated parenting behaviors involving
17 attention to and tracking of the children’s whereabouts, activities, and adaptation
18 [27].” Although another study suggested that the concept of parental monitoring
19 would be more appropriately termed “parental understanding [26],” later studies do
20 not put too much emphasis on the terminology used and use definitions consistent
21 with the measurement criteria [29, 30, 25, 31, 32].

22 The social development model argues that adolescents’ relationships with school
23 and family, which are influenced by parental behaviors, play a critical role in chil-
24 dren’s social development before and during adolescence, including use of illicit sub-
25 stances and unsafe sex behaviors [33]. When teenagers become aware of parental
26 monitoring, they may modify their own behaviors, such as who they spend their
27 free time with. A lack of parental monitoring is associated with increased health
28 risk behaviors, including recent use of marijuana and alcohol, violent acts, unsafe
29 sexual practices such as not using a condom and having multiple sexual partners,
30 and a positive test for sexually transmitted diseases [25]. Several subsequent studies

31 have shown similar results [23, 34, 35, 36, 37].

32 While parental monitoring occurs at the family level, macro-level factors, such as
33 national policies and the failure of the health benefits system, also contribute to
34 adolescent health risk behaviors [38, 39, 40]. Such factors are particularly crucial
35 in developing countries, where the quality of children's health and development is
36 closely linked to poverty, as well as ineffective intervention policies [41, 42, 43].
37 Among developing regions, Southeast Asian countries need to direct more effort
38 into protect the young generation in the process of economic development [44].

39 The issue of health risk behaviors among adolescents in Southeast Asian countries
40 has received some attention (e.g., [45]; [46]; [47]). For example, in Thailand, one
41 study found a link between parental monitoring, belief in Buddhism, and drug use
42 and sexual risk taking in teenagers aged 13 and 14 years old [48]. In Vietnam,
43 research showed that strong parental attention protects children from health risk
44 behaviors, especially those living in urban areas [49]. Also in Vietnam, another
45 study showed a positive correlation between alcohol use and sexual risk behavior
46 among young people aged 16 to 24 years [50]. Other prominent studies have been
47 conducted in Laos and Cambodia [51, 52], Malaysia and the Philippines [53, 54,
48 55] and Timor-Leste [56, 57].

49 Previous studies of health risk behaviors among adolescents in Southeast Asia
50 have reviewed the health risk behaviors independently. Researchers have focused on
51 adolescent risk behaviors in single countries, often at the provincial or regional level.
52 Few studies have considered the role of parental monitoring in adolescent health risk
53 behavior in Southeast Asia, and those that have employed various methods, making
54 it difficult to compare the results across countries. Hence, this study becomes the
55 first attempt to analyze the relationship between parental monitoring and health
56 risk behaviors among adolescents across multiple countries in the Southeast Asian
57 region. This study is also the first to conduct a cross-country analysis of the cor-
58 relation between sexual risk behavior and substance use among adolescents in the
59 Southeast Asian region.

60 **Method**

61

62 Participants and data collection

63 The Global School-Based Student Health Survey (GSHS) was developed by the
64 World Health Organization (WHO) and the Centers for Disease Control and Pre-
65 vention in collaboration with UNICEF, UNESCO, and UNAIDS. The GSHS uses a
66 standardized scientific sample selection process; common school-based
67 methodology; and core questionnaire modules, core-expanded questions, and
68 country-specific questions that are combined to form a self-administered
69 questionnaire that can be administered during one regular class period. (Details
70 are provided in the CDC's website). This study used cross-sectional data collected
71 between 2007 and 2015 from nine Southeast Asian countries: Indonesia (2007),
72 Myanmar (2007), Thailand (2008), the Philippines (2011), Malaysia (2012),
73 Vietnam (2013), Brunei (2015), Timor-Leste (2015) and Laos (2015).

74 Among the nine countries surveyed in Southeast Asia, 52,803 adolescents (51.4%
75 female) participated in the interviews. Participants were school attendees aged be-
76 tween 11 and 18 years old, the majority of which were teenagers aged 13 to 18:
77 18.38% aged 13 years, 22.72% aged 14 years, 22.14% aged 15 years, and 33.44%
78 aged 16 to 18 years. There is not much difference between countries in age and
79 gender.

80

81 Measurement

82 The GSHS questionnaire contains 10 core self-administered modules that measure
83 the leading causes of death and disability among young people and adults, globally.
84 The modules cover a wide range of risk factors, as well as physical and mental
85 health. For the purpose of the current study, we selected relevant items from the
86 modules for alcohol use, drug use, and protective factors.

87

88 *Independent variable: parental monitoring*

89 To assess parental monitoring, participants were asked two questions about whether
90 or not their parents know how they spend their spare time and how much their

91 parents understand their concerns and problems. For the former, the question was
92 “During the past 30 days, how often did your parents or guardians really know what
93 you were doing with your free time?” For the latter, the question was “During the
94 past 30 days, how often did your parents or guardians understand your problems and
95 worries?” Responses to both questions ranged from 1 = “Never” to 5 = “Always.”
96 For the purpose of the current study, responses to both questions were combined
97 into a single binary variable. Regular parental monitoring (value = 1) included
98 participants who responded “Almost all the time” or “Always” to both questions.
99 Lack of parental monitoring (value = 0) included all remaining participants.

101 *Dependent variables*

102 A single question was used to assess whether participants had ever had sexual
103 intercourse: “Have you ever had sex?” Responses were coded as 0 = “No” and 1 =
104 “Yes.”

105 Condom use and number of sexual partners were assessed as indicators of sexual
106 risk behavior. Condom use was assessed with the question “During the most recent
107 sexual intercourse, did you or your partner use a condom?” The response options
108 were “Yes,” “No,” and “I have never had sex.” For the purpose of the current study,
109 responses were divided into two groups: 0 = “Yes” or 1 = “I have never had sexual
110 intercourse” or “No.” Number of sexual partners was assessed with the question
111 “During your life, with how many people have you had sexual intercourse?” Re-
112 sponse options were “I have never had sexual intercourse” followed by the numbers
113 1 to 6. For the purpose of the current study, responses were divided into two cate-
114 gories: 0 = “0 to 1 sexual partner” and 1 = “2 or more sexual partners.” The latter
115 group was considered to be at higher risk of unsafe sex behaviors [58]. Alcohol or
116 alcoholic beverage use was measured by asking how many days a participant had
117 drunk at least one bottle of alcoholic beverage in the last 30 days. Participants were
118 divided into two groups: the first group consisted of children who consumed alcohol
119 or other alcoholic beverages for more than one day and were assigned a value of
120 one; the second group, that is, the non-user group, was assigned a value of zero.

121 Use of prohibited substances was measured as the number of times participants
122 had ever used marijuana or illicit stimulants. Marijuana use was determined with
123 the question “During your life, how many times have you used marijuana?” Illicit
124 stimulant use was determined with the question “During your life, how many times
125 have you used amphetamines or methamphetamines?” Response options to both
126 questions ranged from 1 = “0 times” to 5 = “20 or more times.” For the purpose of
127 the current study, responses to both questions were combined into a single binary
128 variable. Never used prohibited substances (value = 0) included participants who
129 responded “Never” to both questions. Use of prohibited substances (value = 1)
130 included all remaining participants [59, 60, 61, 62].

131 Tobacco use was measured as the number of days that participants had smoked
132 tobacco in the last 30 days: “During the past 30 days, on how many days did you
133 smoke cigarettes?” Response options ranged from 1 = “0 days” to 7 = “All 30 days.”
134 For the purpose of the current study, responses were recoded into two categories: 0
135 = “0 days” and 1 = “1 or more days” [63, 64, 65].

136

137 *Control variables*

138 The two control variables used were gender and age at the time of
139 the survey. The gender variable was a binary variable: 0 = males and 1 =
140 females. Prior to 2008, the GSHS participants were aged 11 to 16 years
141 old. From 2008, the age range was extended and included participants
142 aged 11 to 18 years old. For the purpose of the current study, age was
143 categorized into six categories: 1 = 11 years old, 2 = 12 years old, 3 = 13
144 years old, 4 = 14 years old, 5 = 15 years old, and 6 = 16 to 18 years old.

145

146 *Country*

147 To account for the differences between countries, eight dummy variables were cre-
148 ated to correspond to the nine countries. Each dummy variable was coded 0 and 1,
149 with Vietnam used as the base category (value = 0).

150

151

Research models

152

The research was designed as a cross-sectional study that aimed to test two models.

153

The first model was designed to study the relationship between parental monitoring

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and health risk behaviors among adolescents, including unsafe sex and the use of

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substances. The second model looked at the association between substance use and

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unsafe sex behaviors.

157

Call Y_i the variable that indicates the i^{th} health risk behavior. Y_i equals 1 or

158

0, where 1 indicates the presence of a health risk behavior, and 0 indicates the

159

absence. Call $\pi = p(Y_i = 1)$ the probability that $Y_i = 1$. Thus, the probability that

160

an individual did not report a given health risk behavior ($Y_i = 0$) is defined as

161

$p(Y_i = 0) = 1 - p(Y_i = 1) = 1 - \pi$. The value of π varies from 0 to 1. When π

162

= 1, the health risk behavior is certainly present, and when $\pi = 0$, the health

163

risk behaviors is certainly absent.

164

The odds ratio (OR) is defined as the probability that an event occurred divided

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by the probability that it did not occur. The OR has a value between 0 and $+\infty$. If

166

Odds = 0, the event never occurred. If *Odds* = 1, the probability of it occurring or

167

not occurring is the same. When the odds increase from 0 to almost 1, the

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probability of the event occurring is increasing, but still less than the probability of

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no occurrence. When the odds increase from 1 to $+\infty$, the probability of the event

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occurring is greater than the probability of no occurrence [66, 67].

171

For adolescent health risk behaviors, the OR ($Y_i = 1$) was defined as follows:

172

$$ODD(Y_i = 1) = \frac{p(Y_i = 1)}{p(Y_i \neq 1)} = \frac{p(Y_i = 1)}{p(Y_i = 0)} = \frac{\pi}{1 - \pi}$$

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Model (1) examined the relationship between parental monitoring and health risk behaviors among adolescents as follows:

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$$ODDS(Y_i = 1) = \beta_1 + \beta_2 Age + \beta_3 Gender + \beta_4 Parent + \beta_x Country + \varepsilon \quad (1)$$

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The coefficient β_k ($k = 2:4$) in Model (1) represents the degree of change in the probability of Y_i (i th health risk behavior). Therefore, if $\beta_k < 1$, the corresponding independent variable reduced the $ODDS(Y_i = 1)$, or reduced the probability that the given health risk behavior occurred (i.e., the two variables were negatively related). While $\beta_k > 1$ indicates a positive relationship, $\beta_k = 1$ means that the two variables do not have any association [66, 67]. The coefficient β_x ($x = 5:13$) corresponds to the dummy variable of *Country*, representing the difference in health risk behaviors (Y_i) between the *Country* and Vietnam.

187

188

189

Model (2) examined the relationship between substance use and sexual risk behaviors and was defined as follows:

190

$$ODDS(Y_j = 1) = \beta_1 + \beta_2 Age + \beta_3 Gender + \beta_4 Alco$$

191

$$+ \beta_5 Subs + \beta_6 Smoke + \beta_x Country + \varepsilon \quad (2)$$

192

193

194

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196

Where Y_j is the variable that indicates whether or not the j^{th} risky sexual behavior occurred. j^{th} has the values of 1 and 0, where 1 indicates that the j^{th} risky sexual behavior occurred, and 0 indicates the opposite. The coefficient β_k ($k = 2:6$) in model 2 shows the degree of change in the OR of Y_j (j^{th} risky sexual behavior) due to the influence of the corresponding independent variable with the coefficient β_k .

197

198

Data analysis

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Data were analyzed using Stata 16 in sequential steps. Data from each country was processed and combined into a unified data set, incomplete or missing data were excluded. Next, we examined the difference in prevalence of each health risk behavior between those with regular parental monitoring compared to those lacking parental monitoring. Following this, a series of univariate and multivariate logistic regression analyses were performed to test the impact of parental monitoring

(independent variable) on each of the health risk behaviors (dependent variables). With the multivariate analyses, we adjusted for differences in gender, age, and country. We also conducted logistic regressions to examine the difference in health risk behavior between the categories of gender, age, and country. The results from univariate models, which showed the correlation between the two separate variables, were used as the basis for building the multivariate models. Thus, the regression results in the multivariate model were mainly used for interpreting the empirical results [66, 25, 67].

Results

Descriptive statistics

Table 1 and 2 present the descriptive results for age, gender, parental monitoring, substance use, and risky sexual behaviors of 52,803 adolescents in nine countries in Southeast Asia. The majority of participants reported that they did not receive regular parental monitoring (78.32%). Experience of sexual intercourse was reported by 6.94% of the sample. Of those who had ever had sexual intercourse, the proportion of female participants who reported that they used to have sex was 40.27% compared to 59.73% of male participants. Among adolescents who had ever had sex ($n = 3,662$), the proportion who did not use condoms during the last sexual encounter was quite high (22.04%). Use of prohibited substances was reported by 13.95% of participants, alcohol use was reported by 13.64%, and tobacco smoking as reported by 11.22%.

(Tables 1 and 2 near here)

Parental monitoring and health risk behaviors

Table 3 shows that participants who regularly received parental monitoring were less likely to exhibit health risk behaviors than those who lacked parental monitoring. Specifically, for the group who regularly received parental monitoring, 8.29% reported alcohol use, compared to 15.12% of those who lacked parental monitoring. Prohibited substance use and tobacco use were reported by 10.25% and 6.99%, respectively, of those with regular parental monitoring and 14.97% and 12.39%,

235 respectively, of those who lacked parental monitoring. Participants with regular
236 parental monitoring also reported lower levels of risky sexual behaviors. Ever hav-
237 ing had sex was reported by 4.45% of those with regular parental monitoring and
238 7.62% of those with a lack of parental monitoring. No condom used during the
239 most recent sexual encounter was reported by 1.04% of those with regular parental
240 monitoring and 2.24% of those lacking parental monitoring.

241 (Table 3 near here)

242 Table 3 also presents the results from the univariate and multivariate logistic re-
243 gression models, in which the independent variable was parental monitoring. The
244 results for the univariate analyses show that regular parental monitoring was asso-
245 ciated with reduced health risk behaviors among adolescents. Specifically, regular
246 parental monitoring significantly reduced the likelihood of using prohibited sub-
247 stances ($OR = 0.64$), tobacco smoking ($OR = 0.53$), and alcohol use ($OR = 0.50$).
248 Regular parental monitoring also reduced the likelihood of ever having had sex
249 ($OR = 0.56$), not using a condom during the last sexual encounter ($OR = 0.45$),
250 and having two or more sexual relationships.

251 Next, we compared the prevalence of health risk behaviors between males and
252 females (Table 4). Results from the multivariate model showed that, compared
253 to males, females were significantly less likely to report ever having had sex
254 ($OR = 0.62$), not using a condom during the last sexual encounter ($OR = 0.57$),
255 and having two or more sexual partners ($OR = 0.36$). Females were also less likely
256 to have use prohibited substances ($OR = 0.46$), alcohol ($OR = 0.51$), and tobacco
257 ($OR = 0.12$). In the univariate analyses of prohibited substances, males and fe-
258 males reported almost the same prevalence of prohibited substance use (11.19% vs.
259 11.72%, respectively; $OR = 0.93$). In the multivariate model, however, females were
260 almost 50% less likely to use prohibited substances than males ($OR = 0.046$).

261 (Table 4 near here)

262 Table 5 shows the association between age and health risk behaviors. Participants
263 aged 12 had a significantly lower probability of ever having had sex ($OR = 0.55$).
264 No other category of age was significantly associated with ever having had sex.

265 Older age groups had a higher rate of condom use ($OR = 1.39$). There was a
266 significant association between age and substance use, with younger participants
267 being less likely to use alcohol ($OR = 1.25$) and smoke tobacco ($OR = 1.33$).
268 However, younger children had a higher probability of using prohibited substances
269 ($OR = 0.91$). Participants aged 13 ($OR = 0.40$) and 14 years ($OR = 0.41$) had the
270 highest likelihood of using prohibited substances.

271 (Table 5 near here)

272 Association between substance use and risky sexual behaviors

273 Table 6 shows the results for the multivariate analyses examining the relationships
274 between age, gender, and substance use with risky sexual behaviors. Reported use
275 of alcohol, prohibited substances, and tobacco smoking were all significantly asso-
276 ciated with a higher probability of risky sexual behaviors. Participants who used
277 prohibited substances were most at risk of sexual behaviors, particularly having
278 two or more sexual partners ($OR = 7.86$). Participants who reported alcohol use
279 ($OR = 2.3$) and tobacco smoking ($OR = 2.11$) were also more likely to report
280 multiple sexual partners. Use of prohibited substances ($OR = 3.10$), tobacco smok-
281 ing ($OR = 1.85$), and alcohol ($OR = 1.49$) were all associated with an increased
282 likelihood of ever having had sex. The probability of not using a condom during
283 the last sexual encounter was significantly higher among participants who reported
284 smoking tobacco ($OR = 2.84$), prohibited substances ($OR = 2.63$), and alcohol use
285 ($OR = 1.95$). Compared to males, females reported significantly fewer risky sexual
286 behaviors: ever had sex ($OR = 0.76$) and two or more partners ($OR = 0.53$). The
287 rate of reporting no condom use was not significantly different between males and
288 females ($OR = 0.87$).

289 (Table 6 near here)

291 Differences in health risk behaviors across countries

292 Table 7 compares the prevalence of risky sexual behavior across the nine Southeast
293 Asian countries. Each country was coded as a dummy variable with Vietnam as the
294 reference category. Compared to Vietnam, Timor-Leste had the highest rate of ever

295 having had sex ($OR = 3.86$), followed by Laos ($OR = 2.27$), Brunei ($OR = 2.21$),
296 and Malaysia ($OR = 1.41$). Participants in Indonesia were the least likely, among
297 all nine countries, to report ever having had sex ($OR = 0.12$). Regarding condom
298 use, participants in Indonesia ($OR = 4.74$) and Thailand ($OR = 4.61$) were most
299 likely to report not using a condom during the last sexual encounter, followed by
300 Timor-Leste ($OR = 3.28$). Multiple sexual partners was reported most frequently
301 by participants in Timor-Leste ($OR = 7.02$), followed by Thailand ($OR = 6.58$),
302 Laos ($OR = 2.02$), and Brunei ($OR = 1.76$).

303 (Table 7 near here)

304 Table 8 compares the prevalence of substance use in each country, with Vietnam as
305 the reference group. Only Thailand had a higher prevalence of reported alcohol use
306 than Vietnam ($OR = 1.23$). Indonesia ($OR = 0.24$), Malaysia ($OR = 0.24$), Brunei
307 ($OR = 0.19$) and Myanmar ($OR = 0.17$) all showed lower rates of alcohol use than
308 Vietnam. There was no significant difference in alcohol use between Vietnam and
309 the Philippines ($OR = 0.92$), Timor-Leste ($OR = 0.91$) and Laos ($OR = 1.08$).
310 For prohibited substance use, the country with the highest risk was Timor-Leste
311 ($OR = 13.09$), followed by Thailand ($OR = 3.54$), Malaysia ($OR = 1.99$, Brunei
312 ($OR = 1.94$), and Laos ($OR = 1.39$). The two countries with the lowest risk of
313 prohibited substance use were Indonesia ($OR = 0.34$) and Myanmar ($OR = 0.24$).
314 Vietnam had the lowest rate of tobacco smoking, and the highest rate of smoking
315 was in Timor-Leste ($OR = 7.32$), followed by Indonesia ($OR = 5.02$), Thailand
316 ($OR = 4.24$), the Philippines ($OR = 3.78$), Brunei ($OR = 3.03$), Malaysia ($OR =$
317 2.88), and finally Myanmar ($OR = 1.73$).

318 (Table 8 near here)

319 Discussion

320 Few studies have considered the effect of parental monitoring on health risk behav-
321 iors during puberty and adolescence, and no studies have conducted a cross-country
322 analysis of this relationship in the Southeast Asian region. This study aimed to
323 address this gap. The results showed that regular parental monitoring protected
324 adolescents from risky behaviors, including sexual and substance use risk behav-

325 iors. This study also found that substance use was associated with increased risky
326 sexual behavior. At the same time, the prevalence of adolescent health risk behavior
327 varied between males and females, age groups, and Southeast Asian countries.

328 These findings are consistent with previous studies in which parental monitoring
329 is associated with reduced health risk behaviors among adolescents [25, 26, 68, 69].
330 However, while Borawski et al., [63] found that parental monitoring was associated
331 with risky behavior in a univariate model, when other parental characteristics were
332 added to the model, parental monitoring did not show a strong correlation with
333 health risk behaviors. They concluded that parental monitoring alone is not suf-
334 ficient to protect children from dangerous behaviors. However, it should be noted
335 that the authors only surveyed adolescents in grades 9 and 10 in the US [63]. This
336 was a group of children at the height of puberty, when the effects of parenting may
337 be more complex.

338 The positive relationship between substance use and unsafe sex found in this study
339 was similar to previous studies [70, 59, 71, 72, 64]. However, this result was different
340 from one study of Valera et al., [73] who found that heavy use of alcohol and drugs
341 did not lead to an increased risk of unsafe sex and HIV. The study by Valera et
342 al., [73] focused on young, mature men. It is possible that a greater understanding
343 of the risks and lower impulsiveness made their behavior different from the group
344 surveyed in the current study.

345 The differences in health risk behaviors between the nine countries we studied may
346 be explained by several social vulnerability factors [39, 40]. These factors include
347 the level of development of the health and welfare system, economic development,
348 culture, market characteristics of prohibited substances (e.g., production, distribu-
349 tion, and consumption), and the regulatory system. Based on our research results,
350 combined with data from the World Bank and WHO on alcohol and health in
351 Southeast Asia [74], we examined the differences between Southeast Asian coun-
352 tries in two aspects: (1) the economic environment, as shown by the GDP index of
353 the countries in the period from 2000 to 2018, corresponding to the time the GSHS
354 was conducted in that country, and (2) the regulatory environment, as shown by
355 alcohol regulations and policies (Table 9).

(Table 9 near here)

Among the nine countries covered by this study, the association between economic growth and adolescent health risks was unclear. Except for Brunei, which has exceptionally high per capita incomes, countries with higher per capita GDP (Thailand, Timor-Leste, Indonesia, and Malaysia) mostly had a higher prevalence of adolescent health risk behavior. Countries with lower incomes (the Philippines, Vietnam, Laos, and Myanmar) had relatively lower levels of risky behaviors. Although it is inconclusive, this suggests the possibility that economic growth can have adverse effects on adolescents.

(Figure 1 near here)

Regarding the regulatory environment, although all countries imposed special excise taxes on alcoholic beverages, there were differences in various regulations (Table 9). Specifically, Timor-Leste had almost no strict legal policies to control the use of alcoholic beverages; this may have affected adolescents' behavior directly. In Thailand and Indonesia, however, there were stricter rules. The minimum age for consuming alcohol was 20 years, higher than the age of 18 in the middle-income countries. All countries had regulations on limiting the number of products sold, except Vietnam and Timor-Leste. This may explain the reason for the significantly high level of alcohol use among Vietnamese and Timor-Leste adolescents. Thus, we propose that although there were differences in country-specific regulations, in general, regulatory factors had an impact on adolescents' health risk behaviors.

Notably, although Thailand and Indonesia are both higher middle-income countries, participants in Thailand reported more risk behavior than those in Indonesia. This was despite the strict laws in Thailand and the relatively relaxed regulations in Indonesia. This suggests that, apart from economic and legal factors, other factors such as culture, or the education and health system, play a crucial role in the health of a nation and its adolescent population [75, 76].

The finding that health risk behaviors were greatest in Timor-Leste can be explained by all of the above. Although the average GDP was quite high in Southeast Asia between 2007 and 2015, Timor-Leste was a country with an outdated economic

387 system with a very low total GDP. In fact, it had the lowest GDP in the region,
388 with unstable economic growth rate and a significant gap between the rich and the
389 poor [77, 78]. Due to regaining independence in 2002, education in this country was
390 facing numerous challenges because people spoke many different languages. Just
391 over half of Timor-Leste's population was literate. The percentage of school-aged
392 children not attending school was also high, resulting in deficient access to infor-
393 mation and education for Timor-Leste adolescents [79, 80]. This also explains the
394 "looseness" in Timor-Leste's alcohol laws. There was almost no regulation on the
395 use of drugs and alcohol, in general, and the government lacked interest in funding
396 supportive programs and developing national action plans [74]. Due to the limita-
397 tions of the GSHS questionnaire, this study did not include factors that may have
398 influenced the relationship between parental monitoring and health risk behaviors,
399 such as culture, family structure, education, or parents' income [81]. Some risk be-
400 haviors, such as certain contraception methods, were not considered due to data
401 heterogeneity across countries. Some of the variables studied only captured infor-
402 mation from the 30 days prior to taking the survey; therefore, risk behaviors that
403 occurred more than 30 days earlier were omitted, which could have affected the
404 results. Since the analysis was based on self-reported data of students, the findings
405 cannot be generalized to youth who are not attending schools. In addition, because
406 only cross-sectional data was used, the results should not be interpreted as causal
407 effects.

409 **Conclusion**

410 There has been limited cross-country research on the relationship between parental
411 monitoring and health risk behaviors among adolescents in Southeast Asia. We
412 aimed to bridge this gap by examining this relationship in a large, representative
413 sample of adolescents from nine Southeast Asian countries. Moreover, this study
414 is the first to provide cross-country evidence for the correlations between parental
415 monitoring, substance use, and health risk behaviors among adolescents in the re-
416 gion. Together with our analysis of the economic and regulatory environment in

417 each country, the results suggest that economic growth may have adverse effects on
418 adolescents' behavior, and this may be compounded when there are relaxed regula-
419 tions on drug and alcohol use. Therefore, in such countries, parental monitoring may
420 play a particularly crucial role in protecting adolescents from health risk behaviors,
421 along with the nation's education and healthcare systems.

423 **List of abbreviations**

424 ASEAN: Association of South-East Asian Nations

425 GDP: Gross Domestic Product

426 GSHS: Global School-Based Student Health Survey

427 WHO: World Health Organization

430 **Declarations**

431 Ethics approval and consent to participate: Not applicable

432
433 Consent for publication: Not applicable

434 Availability of data and materials:

435 Authors can confirm that all relevant data are included in the article and/or its
436 supplementary information files

437 Competing interests: The authors declare that they have no competing interests.

438
439 Funding:

440 This research did not receive any specific grant from funding agencies in the public,
441 commercial, or not-for-profit sectors.

442
 443 Authors' contributions: TTV (the sole author involved in the design of the study)
 444 processed the data, conducted the analysis, interpreted the results, and prepared,
 445 read, and approved the final manuscript.

446
 447 Acknowledgements: I would like to thank the University of Economics Ho Chi Minh
 448 City for its generosity in financing this paper's submission. Additional thanks go to Dang
 449 Quoc Cuong for his excellent assistance with data. Any errors are solely mine.

453 **References**

- 454 1. Galvan, A., Hare, T., Voss, H., Glover, G., Casey, B.: Risk-taking and the
 455 adolescent brain: Who is at risk? *Developmental science* 10(2), 8–14
 456 (2007)
- 457 2. DiClemente, R.J., Crittenden, C.P., Rose, E., Sales, J.M., Wingood,
 458 G.M., Crosby, R.A., Salazar, L.F.: Psychosocial predictors of hiv-
 459 associated sexual behaviors and the efficacy of prevention interventions
 460 in adolescents at-risk for hiv infection: what works and what doesn't
 461 work? *Psychosomatic Medicine* 70(5), 598–605 (2008)
- 462 3. Sheeran, P., Abraham, C., Orbell, S.: Psychosocial correlates of
 463 heterosexual condom use: a meta-analysis. *Psychological bulletin* 125(1),
 464 90 (1999)
- 465 4. Williams, R.L., Fortenberry, J.D.: Update on adolescent condom use.
 466 *Current Opinion in Obstetrics and Gynecology* 23(5), 350–354 (2011)
- 467 5. Herbenick, D., Reece, M., Schick, V., Sanders, S.A., Dodge, B., Fortenberry,
 468 J.D.: Sexual behavior in the united states: Results from a national
 469 probability sample of men and women ages 14–94. *The Journal of Sexual*

- 470 Medicine 7, 255–265 (2010)
- 471 6. Scott-Sheldon, L.A.J., Johnson, B.T.: Chapter 9 - the sexual health of
472 adolescents: When, where, and why adolescents use contraceptives. In:
473 Bromberg, D.S., O'Donohue, W.T. (eds.) Handbook of Child and
474 Adolescent Sexuality, pp. 221–251. Academic Press, San Diego (2013)
- 475 7. Fortenberry, J.D.: Chapter 7 - sexual development in adolescents. In:
476 Bromberg, D.S., O'Donohue, W.T. (eds.) Handbook of Child and Adolescent
477 Sexuality, pp. 171–192. Academic Press, San Diego (2013)
- 478 8. Donovan, J.E., Jessor, R., Costa, F.M.: Adolescent health behavior and
479 conventionality-unconventionality: An extension of problem-behavior
480 therapy. *Health Psychology* 10(1), 52 (1991)
- 481 9. Hoyle, R.H., Fejfar, M.C., Miller, J.D.: Personality and sexual risk taking:
482 A quantitative review. *Journal of personality* 68(6), 1203–1231 (2000)
- 483 10. Bri`ere, F.N., Rohde, P., Seeley, J.R., Klein, D., Lewinsohn, P.M.:
484 Adolescent suicide attempt and adult adjustment. *Depression and
485 Anxiety* 32(4), 270–276 (2014)
- 486 11. Henry-Reid, L.M., O'Connor, K.G., Klein, J.D., Cooper, E., Flynn, P.,
487 Futterman, D.C.: Current pediatrician practices in identifying high-risk
488 behaviors of adolescents. *Pediatrics* 125(4), 741–747 (2010)
- 489 12. Ali, M.M., Amialchuk, A., Dwyer, D.S.: Social network effects in
490 contraceptive behavior among adolescents. *Journal of Developmental &
491 Behavioral Pediatrics* 32(8), 563–571 (2011)
- 492 13. Kenyon, D.B., Sieving, R.E., Jerstad, S.J., Pettingell, S.L., Skay, C.L.:
493 Individual, interpersonal, and relationship factors predicting hormonal
494 and condom use consistency among adolescent girls. *Journal of
495 Pediatric Health Care* 24(4), 241–249 (2010)
- 496 14. Kerrigan, D., Witt, S., Glass, B., Chung, S.-e., Ellen, J.: Perceived
497 neighborhood social cohesion and condom use among adolescents
498 vulnerable to hiv/sti. *AIDS and Behavior* 10(6), 723–729 (2006)
- 499 15. Ford, J.L., Browning, C.R.: Neighborhood social disorganization and the
500 acquisition of trichomoniasis among young adults in the united states.

- 501 American journal of public health 101(9), 1696–1703 (2011)
- 502 16. Rostosky, S.S., Wilcox, B.L., Wright, M.L.C., Randall, B.A.: The impact of
503 religiosity on adolescent sexual behavior: A review of the evidence.
504 Journal of Adolescent Research 19(6), 677–697 (2004)
- 505 17. Sinha, J.W., Cnaan, R.A., Gelles, R.J.: Adolescent risk behaviors and
506 religion: Findings from a national study. Journal of adolescence 30(2),
507 231–249 (2007)
- 508 18. Landor, A., Simons, L.G., Simons, R.L., Brody, G.H., Gibbons, F.X.: The role
509 of religiosity in the relationship between parents, peers, and adolescent risky
510 sexual behavior. Journal of youth and adolescence 40(3), 296–309 (2011)
- 511 19. Hust, S.J., Brown, J.D., L'Engle, K.L.: Boys will be boys and girls better be
512 prepared: An analysis of the rare sexual health messages in young
513 adolescents' media. Mass communication & society 11(1), 3–23 (2008)
- 514 20. Johnson, B.T., Scott-Sheldon, L.A.J., Carey, M.P.: Meta-synthesis of
515 health behavior change meta-analyses. American Journal of Public Health
516 100(11), 2193–2198 (2010)
- 517 21. Rosenberger, J.G., Bell, D.L., McBride, K.R., Fortenberry, J.D., Ott,
518 M.A.: Condoms and developmental contexts in younger adolescent
519 boys. Sexually transmitted infections 86(5), 400–403 (2010)
- 520 22. Commendador, K.A.: Parental influences on adolescent decision
521 making and contraceptive use. Pediatric Nursing 36(3), 147–158 (2010)
- 522 23. DiClemente, R.J., Wingood, G.M., Crosby, R., Cobb, B.K., Harrington, K.,
523 Davies, S.L.: Parent-adolescent communication and sexual risk behaviors
524 among african american adolescent females. The Journal of pediatrics
525 139(3), 407–412 (2001)
- 526 24. Krauss, B.J., Miller, K.S.: In: Pequegnat, W., Bell, C.C. (eds.) Parents as
527 HIV/AIDS Educators, pp. 97–120. Springer, New York, NY (2012)
- 528 25. DiClemente, R.J., Wingood, G.M., Crosby, R., Sionean, C., Cobb, B.K.,
529 Harrington, K., Davies, S., Hook, E.W., Oh, M.K.: Parental monitoring:
530 Association with adolescents' risk behaviors. Pediatrics 107(6), 1363–
531 1368 (2001)

- 532 26. Stattin, H., Kerr, M.: Parental monitoring: A reinterpretation. *Child Development* 71(4), 1072–1085
533 (2000)
- 534 27. Dishion, T.J., McMahon, R.J.: Parental monitoring and the prevention
535 of child and adolescent problem behavior: A conceptual and empirical
536 formulation. *Clinical child and family psychology review* 1(1), 61–75
537 (1998)
- 538 28. Simons, L.G., Sutton, T.E., Simons, R.L., Gibbons, F.X., Murry, V.M.:
539 Mechanisms that link parenting practices to adolescents' risky sexual
540 behavior: A test of six competing theories. *Journal of Youth and
541 Adolescence* 45(2), 255–270 (2015)
- 542 29. Thompson, K., Roemer, A., Leadbeater, B.: Impulsive personality, parental
543 monitoring, and alcohol outcomes from adolescence through young
544 adulthood. *Journal of Adolescent Health* 57(3), 320–326 (2015)
- 545 30. Eaton, N.R., Krueger, R.F., Johnson, W., McGue, M., Iacono, W.G.: Parental
546 monitoring, personality, and delinquency: Further support for a
547 reconceptualization of monitoring. *Journal of Research in Personality* 43(1),
548 49–59 (2009)
- 549 31. Padilla-Walker, L.M., Nelson, L.J., Madsen, S.D., Barry, C.M.: The role of
550 perceived parental knowledge on emerging adults' risk behaviors. *Journal
551 of Youth and Adolescence* 37(7), 847–859 (2008)
- 552 32. Branstetter, S.A., Furman, W.: Buffering effect of parental monitoring
553 knowledge and parent-adolescent relationships on consequences of
554 adolescent substance use. *Journal of Child and Family Studies* 22(2), 192–
555 198 (2013)
- 556 33. Lonczak, H.S., Abbott, R.D., Hawkins, J.D., Kosterman, R., Catalano, R.F.:
557 Effects of the seattle social development project on sexual behavior,
558 pregnancy, birth, and sexually transmitted disease outcomes by age 21
559 years. *Archives of Pediatrics & Adolescent Medicine* 156(5), 438 (2002).
560 doi:10.1001/archpedi.156.5.438
- 561 34. Schuster, R.M., Mermelstein, R., Wakschlag, L.: Gender-specific
562 relationships between depressive symptoms, marijuana use, parental

- 563 communication and risky sexual behavior in adolescence. *Journal of youth*
 564 *and adolescence* 42(8), 1194–1209 (2013)
- 565 35. Lansford, J.E., Yu, T., Erath, S.A., Pettit, G.S., Bates, J.E., Dodge, K.A.:
 566 Developmental precursors of number of sexual partners from ages 16 to 22.
 567 *Journal of Research on Adolescence* 20(3), 651–677 (2010)
- 568 36. Ellis, D.A., Podolski, C.-L., Frey, M., Naar-King, S., Wang, B., Moltz, K.:
 569 The role of parental monitoring in adolescent health outcomes: Impact on
 570 regimen adherence in youth with type 1 diabetes. *Journal of Pediatric*
 571 *Psychology* 32(8), 907–917 (2007)
- 572 37. Frisco, M.L.: Parental involvement and young women’s contraceptive use. *Journal of Marriage and*
 573 *Family*
 574 67(1), 110–121 (2005)
- 575 38. Blum, R.W.: Young people: not as healthy as they seem. *The Lancet* 374(9693), 853–854 (2009)
- 576 39. Rehm, J., Baliunas, D., Borges, G.L.G., Graham, K., Irving, H., Kehoe, T.,
 577 Parry, C.D., Patra, J., Popova, S., Poznyak, V., Roerecke, M., Room, R.,
 578 Samokhvalov, A.V., Taylor, B.: The relation between different dimensions
 579 of alcohol consumption and burden of disease: an overview. *Addiction*
 580 105(5), 817–843 (2010)
- 581 40. Blas, E., Kurup, A.S.: Equity, Social Determinants and Public Health
 582 Programmes. World Health Organization, Switzerland (2010)
- 583 41. Blum, R.W., Nelson-Mmari, K.: The health of young people in a global context. *Journal of Adolescent*
 584 *health*
 585 35(5), 402–418 (2004)
- 586 42. Babor, T.F., Caulkins, J.P., Edwards, G., Fischer, B., Foxcroft, D.R.,
 587 Humphreys, K., Obot, I.S., Rehm, J., Reuter, P.: *Drug Policy and the*
 588 *Public Good*. Oxford university press, New York (2010)
- 589 43. Fatusi, A.O., Hindin, M.J.: Adolescents and youth in developing countries:
 590 Health and development issues in context. *Journal of Adolescence* 33(4),
 591 499–508 (2010)
- 592 44. Hardee, K., Pine, P., Wasson, L.T.: Adolescent and youth reproductive
 593 health in the asia and near east region: status issues policies and programs.

- 594 (2003)
- 595 45. Al-Sadat, N., Misau, A.Y., Zariyah, Z., Maznah, D., Su, T.T.: Adolescent
596 tobacco use and health in southeast asia. *Asia Pacific Journal of Public*
597 *Health* 22(3 suppl), 175–180 (2010)
- 598 46. Hong, S.A., Peltzer, K.: Early adolescent patterns of alcohol and tobacco use
599 in eight association of south-east asian nations (ASEAN) member states.
600 *Substance Use & Misuse* 54(2), 288–296 (2018)
- 601 47. World Health Organization: Substance use in south-east asia: knowledge,
602 attitudes, practices and opportunities for intervention: summary of baseline
603 assessments in thailand, philippines and viet nam (2003)
- 604 48. Chamratrithirong, A., Miller, B.A., Byrnes, H.F., Rhucharoenpornpanich,
605 O., Cupp, P.K., Rosati, M.J., Fongkaew, W., Atwood, K.A., Chookhare, W.:
606 Spirituality within the family and the prevention of health risk behavior
607 among adolescents in bangkok, thailand. *Social Science & Medicine* 71(10),
608 1855–1863 (2010)
- 609 49. Phuong, T.B., Huong, N.T., Tien, T.Q., Chi, H.K., Dunne, M.P.: Factors
610 associated with health risk behavior among school children in urban
611 vietnam. *Global Health Action* 6(1), 18876 (2013)
- 612 50. Le, H.T., Singhasivanon, P., Kaewkungwal, J., Kaljee, L.M., Charoenkul, C.:
613 Sexual behaviors of alcohol drinkers and non-drinkers among adolescents
614 and young adults in nha trang, vietnam. *Southeast Asian journal of tropical*
615 *medicine and public health* 38(1), 152 (2007)
- 616 51. Le, T.N., Kato, T.: The role of peer, parent, and culture in risky sexual
617 behavior for cambodian and lao/mien adolescents. *Journal of Adolescent*
618 *Health* 38(3), 288–296 (2006)
- 619 52. Sychareun, V., Thomsen, S., Faxelid, E.: Concurrent multiple health risk
620 behaviors among adolescents in luangnamtha province, lao PDR. *BMC*
621 *Public Health* 11(1) (2011)
- 622 53. Chen, P.C., Lee, L.K., Wong, K.C., Kaur, J.: Factors relating to adolescent
623 suicidal behavior: a cross-sectional malaysian school survey. *Journal of*
624 *Adolescent Health* 37(4), 337–11 (2005)

- 625 54. Omar, K., Hasim, S., Muhammad, N.A., Jaffar, A., Hashim, S.M., Siraj,
626 H.H.: Adolescent pregnancy outcomes and risk factors in malaysia.
627 International Journal of Gynecology & Obstetrics 111(3), 220–223 (2010)
- 628 55. Morrow, M., Barraclough, S.: Tobacco control and gender in
629 southeast asia. part i: Malaysia and the philippines. Health
630 Promotion International 18(3), 255–264 (2003)
- 631 56. Sarmiento, D.R., Yehadji, D.: An analysis of global youth tobacco survey
632 for developing a comprehensive national smoking policy in timor-leste.
633 BMC Public Health 16(1) (2015)
- 634 57. Siziya, S., Muula, A., Rudatsikira, E.: Prevalence and correlates of
635 current cigarette smoking among adolescents in east timor-leste.
636 Indian pediatrics 45(12) (2008)
- 637 58. Valois, R.F., Oeltmann, J.E., Waller, J., Hussey, J.R.: Relationship between
638 number of sexual intercourse partners and selected health risk behaviors
639 among public high school adolescents. Journal of Adolescent Health 25(5),
640 328–335 (1999)
- 641 59. Storholm, E.D., Ewing, B.A., Holliday, S.B., Stein, B.D., Meredith, L.S.,
642 Shadel, W.G., D'Amico, E.J.: Using marijuana, drinking alcohol or a
643 combination of both: the association of marijuana, alcohol and sexual risk
644 behaviour among adolescents. Sexual Health 15(3), 254 (2018)
- 645 60. Bryan, A., Ray, L.A., Cooper, M.L.: Alcohol use and protective sexual
646 behaviors among high-risk adolescents. Journal of Studies on Alcohol and
647 Drugs 68(3), 327–335 (2007)
- 648 61. Johnston, L.D., Miech, R.A., O'Malley, P.M., Bachman, J.G., Schulenberg,
649 J.E., Patrick, M.E.: Monitoring the future national survey results on drug
650 use, 1975-2018: Overview, key findings on adolescent drug use. Institute for
651 Social Research (2019)
- 652 62. Bryan, A.D., Schmiege, S.J., Magnan, R.E.: Marijuana use and risky
653 sexual behavior among high-risk adolescents: Trajectories, risk
654 factors, and event-level relationships. Developmental Psychology
655 48(5), 1429–1442 (2012)

- 656 63. Borawski, E.A., Ievers-Landis, C.E., Lovegreen, L.D., Trapl, E.S.: Parental
657 monitoring, negotiated unsupervised time, and parental trust: the role of
658 perceived parenting practices in adolescent health risk behaviors. *Journal of*
659 *Adolescent Health* 33(2), 60–70 (2003)
- 660 64. Champion, H., Foley, K., Durant, R., Hensberry, R., Altman, D., Wolfson,
661 M.: Adolescent sexual victimization, use of alcohol and other substances,
662 and other health risk behaviors. *Journal of Adolescent Health* 35(4), 321–
663 328 (2004)
- 664 65. Kaltiala-Heino, R., Fröjd, S., Marttunen, M.: Depression, conduct
665 disorder, smoking and alcohol use as predictors of sexual activity in
666 middle adolescence: a longitudinal study. *Health Psychology and*
667 *Behavioral Medicine* 3(1), 25–39 (2015)
- 668 66. Long, S.J., Long, J.S., Freese, J.: *Regression Models for Categorical*
669 *Dependent Variables Using Stata*. Stata press, The United States of
670 America (2006). Chap. 4
- 671 67. Hill, R.C., Griffiths, W.E., Lim, G.C., Lim, M.A.: *Principles of Econometrics*
672 vol. 5, p. 603. Wiley Hoboken, NJ, The United States of America (2008).
673 Chap. 16
- 674 68. Abar, C.C., Jackson, K.M., Colby, S.M., Barnett, N.P.: Parent–child
675 discrepancies in reports of parental monitoring and their relationship to
676 adolescent alcohol-related behaviors. *Journal of Youth and Adolescence*
677 44(9), 1688–1701 (2014)
- 678 69. Ryan, J., Roman, N.V., Okwany, A.: The effects of parental monitoring
679 and communication on adolescent substance use and risky sexual
680 activity: A systematic review. *The Open Family Studies Journal* 7(1), 12–
681 27 (2015)
- 682 70. Ellickson, P.L., McCaffrey, D.F., Ghosh-Dastidar, B., Longshore, D.L.:
683 New inroads in preventing adolescent drug use: Results from a large-scale
684 trial of project ALERT in middle schools. *American Journal of Public*
685 *Health* 93(11), 1830–1836 (2003)
- 686 71. Kaljee, L., Genberg, B., Minh, T., Tho, L., Thoa, L., Stanton, B.: Alcohol

- 687 use and hiv risk behaviors among rural adolescents in khang hoa province
688 viet nam. *Health education research* 20(1), 71–80 (2004)
- 689 72. Metrik, J., Kahler, C.W., Reynolds, B., McGeary, J.E., Monti, P.M., Haney,
690 M., de Wit, H., Rohsenow, D.J.: Balanced placebo design with marijuana:
691 Pharmacological and expectancy effects on impulsivity and risk taking.
692 *Psychopharmacology* 223(4), 489–499 (2012)
- 693 73. Valera, P., Epperson, M., Daniels, J., Ramaswamy, M., Freudenberg, N.:
694 Substance use and HIV-risk behaviors among young men involved in the
695 criminal justice system. *The American Journal of Drug and Alcohol Abuse*
696 35(1), 43–47 (2009)
- 697 74. World Health Organization: *Global Status Report on Alcohol and Health*,
698 2018. World Health Organization, Switzerland (2019)
- 699 75. Chongsuvivatwong, V., Phua, K.H., Yap, M.T., Pocock, N.S., Hashim, J.H.,
700 Chhem, R., Wilopo, S.A., Lopez, A.D.: Health and health-care systems in
701 southeast asia: diversity and transitions. *The Lancet* 377(9763), 429–437
702 (2011)
- 703 76. Summerskill, W., Horton, R.: Health in southeast asia. *The Lancet* 377(9763), 355–356 (2011)
- 704 77. Macaulay, J.: Timor leste: Newest and poorest of asian nations. *Geography*, 40–46 (2003)
- 705 78. Rasiah, R., Miao, Z.: Reducing poverty in timor-leste through
706 stimulating growth and structural change. *Institutions and Economies*,
707 39–66 (2017)
- 708 79. Molnar, A.K.: *Timor Leste: Politics, History, and Culture*. Routledge, New York (2009)
- 709 80. Taylor-Leech, K.: Sustaining language policy and language rights in east timor: where to from here?
710 (2007)
- 711 81. Blum, R.W., Beuhring, T., Shew, M.L., Bearinger, L.H., Sieving, R.E., Resnick, M.D.: The effects of
712 race/ethnicity, income, and family structure on adolescent risk behaviors. *American journal of public*
713 *health* 90(12), 1879 (2000)
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Tables

Table 1 Age and gender of respondents by countries

Country	Age*		Gender		Freq.
	Mean	S.D.	Mean	S.D.	
Brunei	4.52	1.24	0.53	0.50	2599
Indonesia	3.77	0.89	0.52	0.50	3116
Laos	5.31	0.91	0.54	0.50	3683
Malaysia	4.72	1.18	0.50	0.50	25507
Myanmar	4.27	1.26	0.50	0.50	2806
The Philippines	4.51	1.20	0.56	0.50	5290
Thailand	3.59	1.06	0.50	0.50	2767
Timor-Leste	4.94	1.39	0.51	0.50	3704
Vietnam	5.19	0.87	0.53	0.50	3331
Total	4.64	1.22	0.51	0.50	52803

Note: *Number 3, 4, and 5 represent the age of 13, 14, and 15, respectively.

Table 2 Summary of key variables ($n = 52,803$)

Variables	Note	Mean	S.D.	Min.	Max.
Age	Groups 1–6 respectively include participants aged 13–16 and 18 years	4.635	1.222	1	6
Gender	Girl (Value = 1)	0.514	0.499	0	1
Parental monitoring	Perceived parental monitoring	0.216	0.412	0	1
Alcohol	At least once consumed alcohol in the past 30 days	0.136	0.343	0	1
Substance	At least once used substance during life	0.139	0.346	0	1
Smoke	At least once consumed tobacco in the past 30 days	0.112	0.315	0	1
Had sex	Ever had sex	0.069	0.254	0	1
Condomless	Did not use condom during the last sex	0.019	0.139	0	1
Partners	At least two sexual partners	0.187	0.390	0	1

Note: Myanmar and the Philippines do not provide information on adolescents' sexual behavior. Additionally, the Philippines does not have information on substance use.

Table 3 Association between perceived parental monitoring and adolescents' health risk behaviors

	Perceived Monitoring			Univariate Analysis		Multivariate Analysis		
	Less	More	OR	(95%CI)	<i>p</i> value	OR	(95%CI)	<i>p</i> value
	%	%						
Sexual behavior								
Ever had sex	7.62	4.45	0.56	(0.51–0.62)	0.000	0.72	(0.65–0.79)	0.000
Condomless	2.24	1.04	0.45	(0.37–0.55)	0.000	0.55	(0.45–0.67)	0.000
Partners	17.66	22.74	1.37	(1.30–1.44)	0.000	0.75	(0.65–0.86)	0.000
Substance use								
Alcohol	15.12	8.29	0.50	(0.47–0.54)	0.000	0.62	(0.58–0.67)	0.000
Substance	14.97	10.25	0.64	(0.60–0.69)	0.000	0.72	(0.63–0.83)	0.000
Smoking	12.39	6.99	0.53	(0.49–0.57)	0.000	0.61	(0.56–0.66)	0.000

Note: *Multivariate analysis is adjusted for age, gender, and country.*

Table 4 Health risk behaviors in girls

	Gender			Univariate Analysis		Multivariate Analysis		
	M	F	OR	(95%CI)	<i>p</i> value	OR	(95%CI)	<i>p</i> value
	%	%						
Sexual behavior								
Ever had sex	8.53	5.43	0.61	(0.57–0.65)	0.000	0.62	(0.57–0.66)	0.000
Condomless	2.56	1.43	0.55	(0.23–0.51)	0.000	0.57	(0.50–0.65)	0.000
Partners	19.49	18.08	0.91	(0.87–0.95)	0.000	0.36	(0.32–0.40)	0.000
Substance use								
Alcohol	17.20	10.28	0.55	(0.52–0.58)	0.000	0.51	(0.49–0.54)	0.000
Substance	11.19	11.72	0.93	(0.89–0.98)	0.014	0.46	(0.42–0.51)	0.000
Smoking	19.18	3.12	0.13	(0.08–0.12)	0.000	0.12	(0.11–0.13)	0.000

Note: *Multivariate analysis is adjusted for age, gender, and country.*

Table 5 Health risk behaviors of different ages

	Age				Age (by group)							
	Generally		12		13		14		15		16–18	
	OR	<i>p</i>	OR	<i>p</i>	OR	<i>p</i>	OR	<i>p</i>	OR	<i>p</i>	OR	<i>p</i>
Sexual behavior												
Ever had sex	1.15	0.000	0.55	0.016	0.73	0.136	0.77	0.208	0.80	0.290	1.12	0.554
Condomless	1.39	0.000	0.28	0.000	0.28	0.000	0.34	0.000	0.43	0.003	0.91	0.761

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Partners	1.05	0.008	0.47	0.001	0.48	0.000	0.39	0.000	0.43	0.000	0.61	0.015
Substance use												
Alcohol	1.25	0.000	0.32	0.000	0.35	0.000	0.44	0.000	0.53	0.000	0.77	0.094
Substance	0.91	0.000	0.33	0.000	0.40	0.000	0.41	0.000	0.35	0.000	0.34	0.000
Smoke	1.33	0.000	0.25	0.000	0.33	0.000	0.45	0.000	0.61	0.000	0.87	0.000

Note: Multivariate analysis is used; 11 years is the base age.

Table 6 Association between using substance and sexual risk behaviors

	Ever had sex			Condomless			Partners		
	OR	(95%CI)	p value	OR	(95%CI)	p value	OR	(95%CI)	p value
Demographic									
Age	1.14	(1.10–1.17)	0.000	1.33	(1.25–1.41)	0.000	1.04	(1.00–1.09)	0.043
Gender	0.76	(0.71–0.82)	0.000	0.87	(0.76–1.01)	0.074	0.53	(0.47–0.59)	0.000
Substance									
Alcohol	1.49	(1.35–1.63)	0.000	1.95	(1.67–2.28)	0.000	2.30	(2.04–2.59)	0.000
Substance	3.10	(2.76–3.48)	0.000	2.63	(2.18–3.38)	0.000	7.86	(6.90–8.96)	0.000
Smoking	1.85	(1.68–2.03)	0.000	2.84	(2.43–3.32)	0.000	2.11	(1.86–2.39)	0.000

Note: Multivariate regression with Model (2); the dependent variables are sex behaviors.

Table 7 Difference of sexual risky behavior in Southeast Asia

	Ever had sex			Condomless			Partners		
	OR	(95%CI)	p value	OR	(95%CI)	p value	OR	(95%CI)	p value
Brunei	2.21	(1.82–2.68)	0.000	1.46	(0.99–2.15)	0.052	1.76	(1.28–2.43)	0.000
Indonesia	0.11	(0.07–0.29)	0.000	4.74	(3.42–6.57)	0.000	0.98	(0.68–1.40)	0.934
Laos	2.27	(1.90–2.71)	0.000	1.30	(0.92–1.84)	0.123	2.02	(1.51–2.70)	0.000
Malaysia	1.41	(1.21–1.65)	0.000	1.03	(0.77–1.37)	0.829	1.21	(0.94–1.56)	0.123
Myanmar	1.00			1.00			1.00		
The	1.00			1.00			1.00		
Philippines									
Thailand	1.16	(0.92–1.46)	0.185	4.61	(3.29–6.45)	0.000	6.58	(4.99–8.66)	0.000
Timor-Leste	3.86	(3.26–4.58)	0.000	3.28	(2.42–4.44)	0.000	7.02	(5.42–9.09)	0.000

Note: Multivariate regression with Model (1); the dependent variables are sex behaviors.

Table 8 Difference of substance use in Southeast Asia

	Alcohol			Substance			Smoking		
	OR	(95%CI)	p value	OR	(95%CI)	p value	OR	(95%CI)	p value
Brunei	0.19	(0.15–0.22)	0.000	1.94	(1.38–2.72)	0.000	3.03	(2.45–3.73)	0.000
Indonesia	0.24	(0.20–0.28)	0.000	0.34	(0.20–0.57)	0.000	5.02	(4.11–6.13)	0.000
Laos	1.08	(0.97–1.20)	0.158	1.39	(0.99–1.95)	0.053	1.02	(0.81–1.27)	0.850
Malaysia	0.24	(0.20–0.28)	0.000	1.99	(1.52–2.60)	0.000	2.88	(2.43–3.41)	0.000
Myanmar	0.17	(0.14–0.21)	0.000	0.24	(0.13–0.45)	0.000	1.73	(1.37–2.18)	0.000
The Philippines	0.92	(0.83–1.02)	0.128	1.00			3.78	(3.14–4.55)	0.000
Thailand	1.23	(1.08–1.39)	0.001	3.54	(2.60–4.82)	0.000	4.24	(3.45–5.22)	0.000
Timor-Leste	0.91	(0.81–1.02)	0.109	13.09	(9.94–17.24)	0.000	7.32	(6.10–8.80)	0.000

Note: Multivariate regression with Model (1); the dependent variable is substance use.

Table 9 Policies and interventions of alcohol in Southeast Asia

Index	Indo	Thai	Timo	Brun	Lao	Mala	Myan	The Phili	Viet
Alcohol/GDP (%)	0.8	8.3	2.1	0.4	10.4	0.9	4.8	6.6	8.3
Written national policy	Yes	Yes	No	-	Yes	Yes	No	Yes	Yes
National Action Plan	No	Yes	-	-	No	Yes	Yes	Yes	Yes
Excise tax	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
National legal minimum age for on premise	20	20	No	-	18	21	18	18	18
Restriction for on premise sales of alcoholic beverage	Yes	Yes	No	-	Yes	Yes	Yes	Yes	No
National maximum legal BAC* when driving a vehicle	No	0.05	0.05	-	0.08	0.08	0.08	0.05	0.05
Legally binding regulations on alcohol advertising	Yes	Yes	No	-	Yes	Yes	Yes	No	Yes
Legally binding regulations on alcohol sponsorship	Yes	Yes	No	-	Yes	No	Yes	No	Yes
Legally require health warning labels on advertisements	No	No	No	-	Yes	No	No	Yes	No
National government support for community action	Yes	Yes	Yes	-	No	Yes	No	Yes	Yes
National monitoring systems	No	Yes	No	-	No	Yes	Yes	No	Yes

Source: Data were collected and summarized from the World Health Organization [74]. - = no information. *: Blood Alcohol Concentration

Figure Legends

Figure 1 - GDP per capital of each country when the survey was conducted, \$US.

Figures

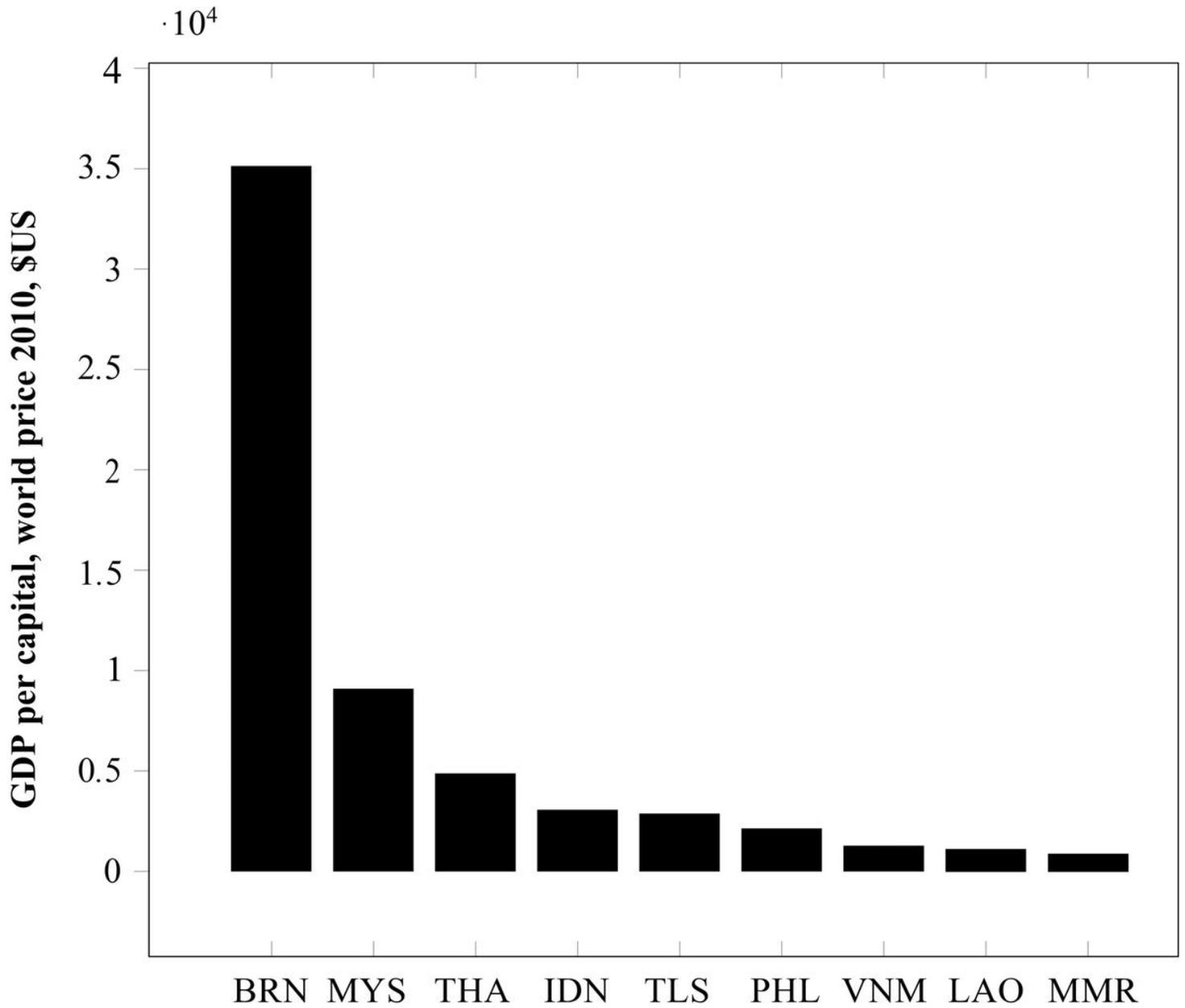


Figure 1

GDP per capita of each country when the survey was conducted, \$US.