



# Timing of Family Adversity During Adolescence and its Impact on Alcohol and Tobacco Initiation: A Longitudinal Study Among Taiwanese Adolescents

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## Abstract

We examined the impact of time-varying exposure to family adversity, including parental conflict, parental absence from home, divorce, and parental death, on the timing of drinking and smoking initiation among Taiwanese youth between ages 14 and 22 years. We used six waves of data from a longitudinal panel study conducted in northern Taiwan between 2001 and 2009, and included 5446 students. The analysis demonstrated that exposure to parental conflict, divorce, and parental death increased the risk of drinking and smoking initiation. The odds ratios (OR) for smoking and drinking initiation among youth experiencing conflict between parents were 1.33 (95% CI 1.10–1.73) for smoking and 2.00 (1.26–3.20) for drinking. The OR for parental death were 2.96 (1.69–5.18) for smoking and 8.07 (1.79–36.49) for drinking. The association becomes more pronounced at age 18 (i.e., the legal age for drinking and smoking in Taiwan), and lasts until early adulthood.

**Keywords** Family adversity · Family structure · Adolescence · Substance use · Asian

## Introduction

“Family adversity” refers to a range of adverse early life-course exposures, spanning punitive parenting, emotional and physical neglect, parental conflict and divorce, family financial difficulties, loss of significant family members, and even physical/sexual abuse. Substantial evidence exists to demonstrate that these adverse experiences have a deleterious impact on the development, behavioral, psychosocial, and physical outcomes of the child [1]. Moreover, growing evidence points to the association between exposure to early life adversity and engagement in risky health behaviors, especially substance abuse [2]. Adolescence is a critical period of development during which smoking and drinking is initiated. In the United States, around 90% of

adult smokers began smoking by the age of 18 [3]. In contrast, smoking initiation age tends to be later in East Asian countries due to prevailing social norms (where smoking is frowned upon as an antisocial behavior), and strong parental disapproval [4].

Several theories have been proposed to explain the higher prevalence of substance use among individuals who experience adverse circumstances in early life. Stress-coping theory proposes that children or adolescents who experience adversity seek substances to cope with their stress [5, 6]. Social learning theory, in contrast, suggests that people who face more adversity tend to have parents or close friends who are also substance users [7, 8]. Furthermore, adversity usually occurs more frequently in dysfunctional families and communities that lack conventional commitment and social attachment that help regulate deviant behaviors [5]. Several family risk factors, such as divorce, remarriage [9, 10], and unstable family structure [11], have been associated with a higher risk of substance use during adolescence. Whereas, having parents with substance use problems increases the risk of familial dysfunction [7, 12]. A family history of substance abuse contributes to an environmental and genetic predisposition to substance use behavior among offspring [13, 14]. Family adversity and its impacts tend to

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be intergenerational, i.e., parents who grew up with family dysfunction are themselves more likely to develop difficult relationships [15]. It is important to consider a family's history of substance abuse and adversity when evaluating the relationship between adverse family experiences and substance abuse.

Time is a critical component when studying substance use behavior and the impact of early life adversity in adolescents. For example, studies have found that parental smoking became less important than peers' smoking behavior as a source of initiation after age 13 [11, 16]. Moreover, a previous study found that participants exposed to life adversity in childhood or early adolescence experienced marijuana and alcohol initiation at an earlier age [17].

Nonetheless, there is no clear evidence linking specific types of early life adversity with substance use. Most studies on early life adversity and substance use have been conducted in Western countries. Thus, there is a gap in the understanding of this issue in an Asian context, where the culture, school system, and policies on adolescent substance use may have a different impact on substance use behavior.

This study aimed to estimate (1) the influence of early life adversity on substance use during adolescence and early adulthood and (2) the age of alcohol and tobacco initiation and the impact of time-varying exposure to adversity. This research is a longitudinal study of Taiwanese middle school students in the northern regions of the country. In general, Taiwan is a group-oriented and relationship-based society that is a hybrid blend of Chinese, Taiwanese aborigines, and Japanese cultures (dating back to the colonial occupation). The family is central to society; therefore, exposure to family adversity may have a different impact on Taiwanese youth when compared to Western countries. The enforcement of societal and school regulations of substance use among Taiwanese students may offer new insights into the prevention of substance use, and inform interventions among youth exposed to early life adversity.

## Method

### The Taiwan Youth Project

Our data are derived from a longitudinal panel study titled "Taiwan Youth Project (TYP)," conducted by the Institute of Sociology, Academia Sinica, Taiwan, between 2000 and 2009. The sample includes two cohorts, one of seventh-graders (Junior 1, J1) and the other of ninth-graders (Junior 3, J3), in three regions of northern Taiwan from the year 2000. In total, nine annual surveys were conducted for the J1 cohort and eight annual surveys for the J3 cohort.

## Survey Administration Procedure

To ensure the validity and reliability of the information collected by the survey, TYP developed a standardized protocol for survey administration. The research assistants who were responsible for data collection and in-person interview received standardized training.

The questionnaires were conducted in multiple ways. The questionnaires from the first wave of the J3 cohort and the first three waves of the J1 cohort were filled by the participants and collected in the classrooms. In the later waves, questionnaires were administered by trained research assistants through phone or in-person interviews at home. The interviews were conducted separately from the parents to avoid potential response bias.

In first six waves, the research questionnaires were reviewed by the school principals, the designated teachers, and the parents, and opt-in informed consent was obtained from parents. After the sixth wave, informed consent was reviewed and approved by the IRB committee of Taiwan Sinica Academia. Before the participants turned 18 years old, parents provided separate opt-in informed consent for their children, and the participants provided assent. The surveys were anonymous, and did not contain any identifiable information that could be linked to individuals.

## Sampling Method

Participants in the three regions were sampled independently. The study used multistage stratified cluster random sampling to obtain school-based representative samples. During the first stage, the level of urbanization was used to determine the sampling strata, which divided Taipei City and Taipei County into three tiers and Yilan County into two tiers. During the second stage, the sample size of each stratum was determined based upon the number of students in that stratum out of all the students in the city or county. During the third stage, the number of schools sampled was based on the principle that each school would contribute students from two classes.

The final sample comprised 40 junior high schools, with 16 from Taipei City, 15 from Taipei County, and nine from Yilan County.

## Participants

There were 5446 participants in total, which included 2689 seventh-graders and 2757 ninth-graders. Out of which, a total of 2045 students were from Taipei City, which is the capital of Taiwan; 1215 students were from Yilan County, which is an agricultural area; and 2186 students were from

Taipei County, where the main economic activities are agriculture and manufacturing industries. The J1 cohort response rates at each follow-up wave were 99.5% (time 1), 87.3% (time 2), 75.2% (time 3), 67.7% (time 4), 64.5% (time 5), and 69.6% (time 6). The corresponding response rates for the J3 cohort were 98.7% (time 1), 84.8% (time 2), 71.1% (time 3), 65.5% (time 4), 66.9% (time 5), and 62.2% (time 6).

We included data from the survey waves when the students were ages 14, 15, 16, 18, 20, and 22 years old. These waves were chosen because they contained the most data on drinking and smoking behavior and family adversity. At age 14 (phase 1), there were 5435 participants; at phase 2, there were 4888 participants; at phase 3, there were 4475 participants; at phase 4, there were 4257 participants; at phase 5, there were 3930 participants; and at phase 6, there were 3757 participants. The general follow-up rate throughout the study period was around 70%. We excluded 155 participants (2.7% of the total study population) from the J1 cohort and 119 participants (2.1% of the total study population) from the J3 cohort due to missing data (of any type) across each wave.

## Materials

The data used in this study were downloaded from the website of Academia Sinica, Taiwan, with the approval of the institution. All the information was obtained from self-reported questionnaires that took approximately 1 h to complete.

## Measures

All the questionnaires used in TYP were standardized to ensure the respondents received the same stimuli, and that the order of the questions and response formats were consistent across waves. Furthermore, the research assistants had been trained conduct interviews consistently if the survey was administrated by phone interview.

### Family Adversity During Adolescence

The experience of adolescent family adversity during the previous year was assessed by four questions for each wave: (1) parental death, (2) parent separated or divorced, (3) interparental conflict, (4) parental absence. The answers were categorized separately for each item, and answered “yes” if participants had experienced that event during the previous year. All the questions were regarding exposure during the previous year except for age 15, when we only asked about exposure during the past 6 months.

## Alcohol/Tobacco Use

The surveys from the first four waves asked participants to report their smoking and drinking frequency during the previous year. The question asked: “Have you smoked during the previous year?” The participants reported “yes” if they had consumed alcohol or tobacco. However, in the final two surveys, the question about tobacco use asked: “In the previous week, how many packets of cigarettes have you smoked?” The responses included: “none,” “less than a pack,” “one to two packs,” “three to four packs,” “five to six packs,” and “more than seven packs.” For alcohol use, the question asked: “In the previous month, how many times have you consumed alcohol?” The responses included none, one to two times, three to four times, five to six times, and more than seven times.

To keep the responses consistent, we re-coded the answers into “yes” if participants had used alcohol/tobacco, and “no” if they had not used these substances.

## Covariates

The covariates used for analysis were obtained from the data at the baseline. These variables included monthly household income, parental education level, school urbanity, and school location. Monthly household income was categorized into < \$1700; \$1700 to \$3300; and above \$3300. The definition of the parental education level was the highest level of educational attainment by either parent. Education level was classified as below high school (9 years of education); high school (12 years); and college or graduate (16–20 years). School urbanity was categorized as urban, suburban, and rural. School location was Taipei City, Taipei County, or Yilan County.

## Data Analysis

Our analysis examined the relationship between the experience of family adversity and the onset of smoking and drinking. The study focused on the timing of occurrence and exposure. In addition, time during the study was measured discretely; hence, we applied a discrete-time survival analysis [18, 19].

We used a life-time table for preliminary analysis of the initiation of smoking or drinking. This analytic approach began with participants who had never smoked or consumed alcohol and estimated the risk of smoking/drinking initiation with the passage of time. Once a participant reported that they had begun smoking or drinking, they were censored. Thus, we calculated the probability that an individual would initiate smoking or drinking for each survey wave, given that they had not previously smoked or consumed alcohol. Finally, we plotted the graphs of hazard probabilities of

smoking or drinking initiation across age and compared the exposed and the unexposed respondents.

The next step was to conduct logistic regression to control the effect of other covariates in the association. Firstly, the analysis tested whether the covariates, including gender, family household income, parental education level, school urbanity, and school location, were significantly associated with drinking/smoking behavior. Secondly, we tested the proportional hazard assumption by determining the interaction term between time and exposure to events of family adversity. Finally, we examined the interaction between the experience of adversity and the following variables: gender, annual household income, and urbanity. Moreover, we performed a Chi square test to examine which factors were associated with a higher risk of loss during follow-up. The statistical analysis was conducted using STATA14.0 [20].

## Results

### Descriptive Statistics

Among the 5435 participants, 50.8% (n = 2759) were male; 22.7% (n = 1234) started smoking and 44.1% (n = 2397) started consuming alcohol during the follow-up period. Males were significantly more likely to use tobacco

[ $\chi^2(1) = 297.6$ ,  $p$  value < 0.001] and alcohol [ $\chi^2(1) = 66.2$ ,  $p$  value < 0.001]. The occurrence of family adversity revealed that 22.7% (n = 1234) experienced interparental conflict; 39.6% (n = 2152) experienced parental absence from home; 11.1% (n = 603) experienced parental divorce; and 3.1% (n = 168) experienced parental loss during the study period. The sociodemographic characteristics are presented in Table 1.

Chi square tests found that parental education level was associated with the risk of loss during follow-up throughout the study period ( $p < 0.001$ ) (see Supplement Table S1).

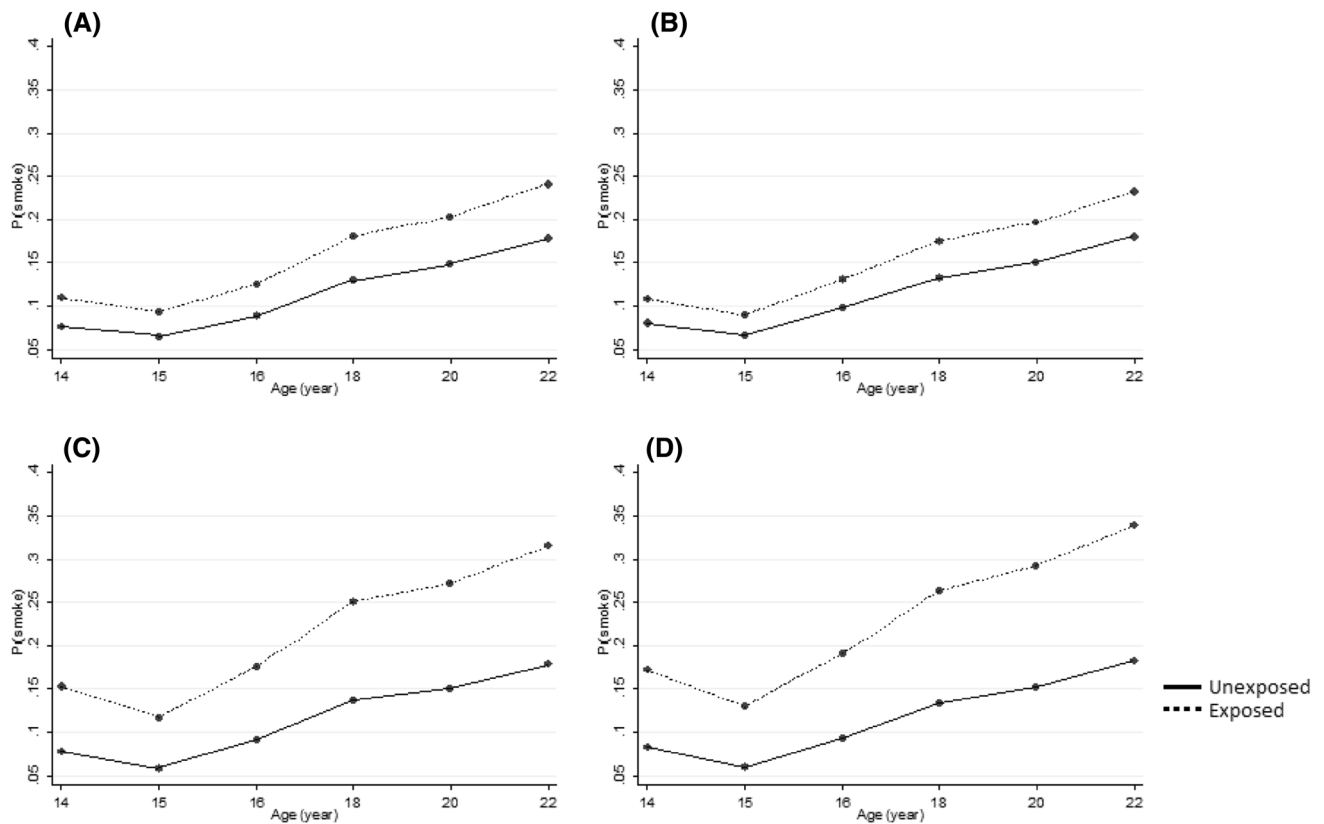
### Onset of Alcohol Use During Adolescence

Figure 1 shows the estimated rate of alcohol drinking among participants who experienced family adversity during adolescence, including interparental conflict, parental absence from home, divorce, and parental loss. Trends in the rate of alcohol use during the four different types of adversity were similar; it dipped slightly at age 15 and increased steadily thereafter.

There was a sharp increase in the rate of alcohol use at age 18 (i.e., the legal age of drinking in Taiwan). Compared to those participants without family adversity, participants who had experienced family adversity had a higher rate of alcohol use compared to those without this

**Table 1** Characteristics of participants

	J1 Cohort (n = 2689)	J3 Cohort (n = 2746)	Total (n = 5435)	Percentage
Sex				
Male	1384	1375	2759	50.8
Female	1305	1371	2676	49.2
Monthly household income				
< \$1700	835	984	1,819	33.5
\$1700–\$3300	1,424	1,270	2,694	49.6
> \$3300	368	383	751	13.8
Missing	62	109	171	3.1
Urbanity				
Urban	1315	2165	3480	64.0
Suburban	764	319	1083	19.9
Rural	345	217	562	10.3
Missing	265	45	310	5.8
Parent's education level				
Below middle school	929	959	1888	34.7
High school	1112	1057	2169	39.9
College and graduate school	609	661	1270	23.4
Missing	39	69	108	2.0
School location				
Taipei City	1031	1004	2045	37.6
Taipei County	1063	1122	2185	40.1
Yilan County	595	620	1215	22.3



**Fig. 1** The impact of family adversity on smoking initiation. Family adversity includes **a** parental absence, **b** interparental conflict, **c** parental divorce, and **d** parental death. Compared to those without

family adversity (solid line), adolescents experiencing family adversity (dotted line) had a higher hazard of smoking initiation

experience. The gap in the rate of alcohol use widened after participants turned 18 years.

A comparison of the four types of family adversity revealed that those participants who were not exposed to the four types of adversity had similar risk of alcohol use over time, ranging from around 0.03–0.05 at age 15 to 0.38–0.39 at age 22. The difference in alcohol use between the exposed and the unexposed participants was largest for those experiencing parental loss.

### Onset of Tobacco Use During Adolescence

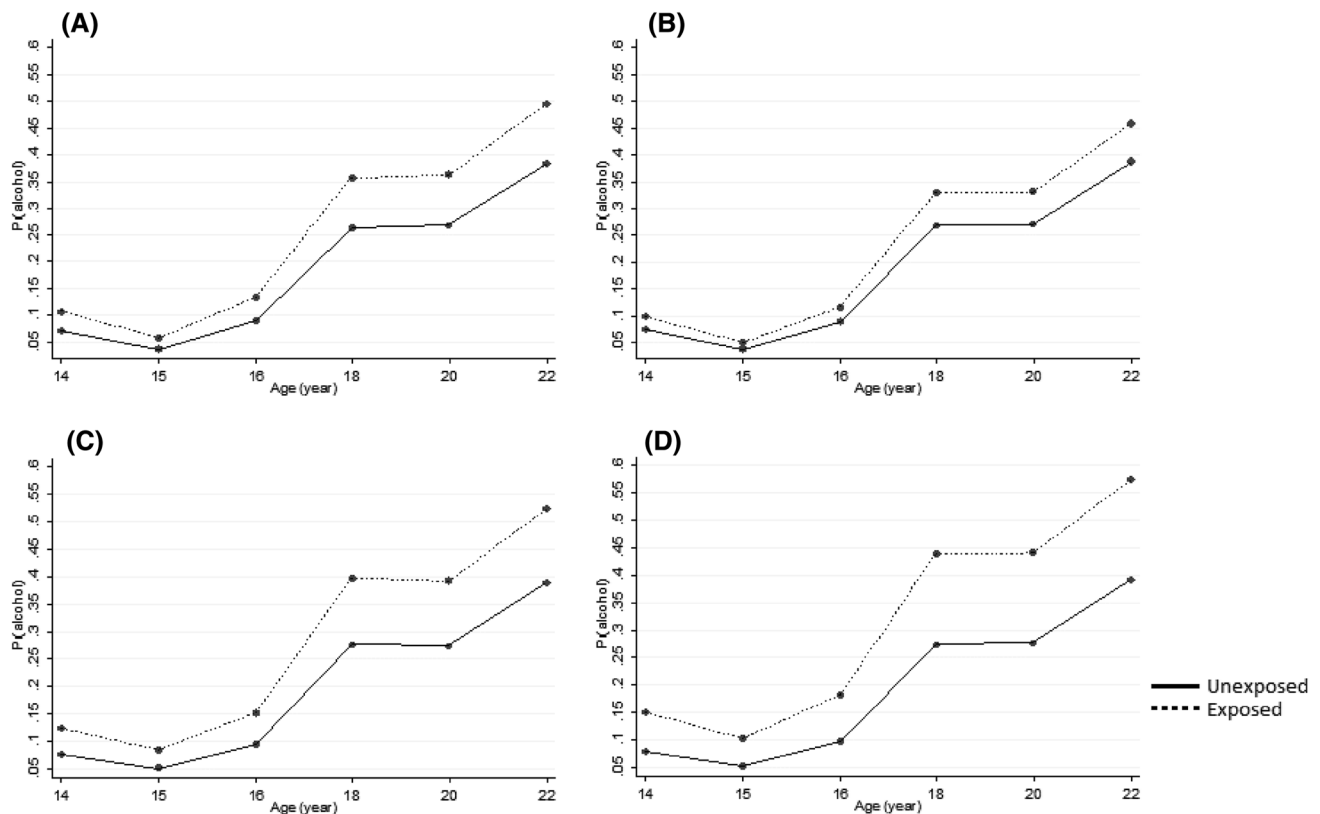
The risk of tobacco use at various ages when exposed to the four different kinds of family adversity is summarized in Fig. 2. The trends in tobacco use were similar across four types of family adversity. Similar to trends in alcohol use, the risk dipped slightly at age 15 and steadily increased thereafter. The gap the rate of tobacco use between the exposed and the unexposed also widened after age 18 years.

### Discrete-Time Varying Analysis

The experience of conflict between parents (OR 1.33, 95% CI 1.103–1.73 for smoking; OR 2.00, 95% CI 1.26–3.20 for drinking); divorce (OR 1.90, 95% CI 1.26–2.86 for smoking; OR 1.55, 95% CI 1.05–2.30 for drinking); and parental death (OR 2.96, 95% CI 1.69–5.18 for smoking; OR 8.07, 95% CI 1.79–36.49 for drinking); were all associated with a higher risk of drinking and smoking behavior among participants.

We examined the effects of potential covariates and interaction terms in the discrete-time varying model (Tables 2 and 3). Being male was associated with increased risk of tobacco use (OR 3.13, 95% CI 2.63–3.64) and alcohol use (OR 1.37, 95% CI 1.21–1.53). Having a parent with at least a college or a graduate degree was associated with lower risk of smoking (OR 0.58, 95% CI 0.46–0.73). Studying at schools in Taipei County (OR 0.84, 95% CI 0.73–0.97) and Yilan County (OR 0.75, 95% CI 0.62–0.91) was associated with lower risk of alcohol use.

After testing proportionality assumptions for family adversity and time, we found a significant interaction



**Fig. 2** The impact of family adversity on drinking initiation. Family adversity includes **a** parental absence, **b** interparental conflicts, **c** parental divorce, and **d** parental death. Compared to those without

family adversity (solid line), participants experiencing family adversity (dotted line) had a higher hazard of drinking initiation

between exposure to interparental conflict and time for drinking behavior (OR 0.86, 95% CI 0.77–0.96).

Since lower parental education level is associated with higher risk of loss to follow-up, we performed subgroup analysis to test if differential attrition could bias the study result. We compared the association between experiencing family adversities and substance use among participants across parental education level, controlling for potential covariates and interaction terms (Supplement Table S2, S3.). We defined lower parental education level as below high school, and higher parental education level as high school graduate or above. We found that among the higher education level group, experiencing parental absence (OR 1.38, 95% CI 1.06–1.79), parental divorce (OR 2.04, 95% CI 1.25–3.34), and parental death (OR 2.21, 95% CI 1.01–4.83) were associated with higher risk of smoking. Higher risk of alcohol drinking was observed from exposure to parental conflicts (OR 1.58, 95% CI 1.27–1.95) and parental divorce (OR 1.88, 95% CI 1.18–3.00). Among the lower parental education group, experiencing parental absence (OR 1.73, 95% CI 1.19–2.51) and parental death (OR 4.05, 95% CI 1.77–9.28) were associated with higher risk of smoking. For drinking, we found elevated risks from exposure to parental

conflicts (OR 1.82, 95% CI 1.30–2.55) and parental divorce (OR 3.37, 95% CI 1.49–7.64).

## Discussion

Experiencing interparental conflict, divorce, and parental death increases the risk of tobacco and alcohol initiation among adolescents. Among the four types of family adversity, parental loss had the greatest impact on the initiation of both drinking and smoking, followed by parental divorce. However, parental absence did not seem to have a significant impact on drinking and smoking behavior among adolescents. When adolescents reach the minimum legal age for drinking and smoking, there is an increase in the use of both substances. Furthermore, the exposed group had a higher risk of initiating drinking and smoking than their counterparts. The gap in the probability of initiation of both behaviors between the exposed and the unexposed group then kept widening during early adulthood.

The relationship between the experience of family adversity and a higher risk of tobacco and alcohol use supports the findings of previous studies conducted in Western countries



**Table 2** Risk of smoking initiation in discrete time-varying model

Smoking initiation	Univariable analysis		Multivariable analysis	
	OR	95% CI	OR	95% CI
Age (years)	1.28	1.25–1.31	1.21	1.16–1.26
Sex (male vs. female)	3.68	3.34–4.07	3.13	2.63–3.64
Parental education level				
Below high school	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
High school graduate	0.82	0.73–0.93	0.95	0.80–1.12
College or graduate schools	0.49	0.41–0.59	0.58	0.46–0.73
Monthly household income				
< \$1700	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
\$1700–\$3300	0.93	0.85–1.02	1.08	0.91–1.28
> \$3300	0.85	0.74–0.99	1.06	0.82–1.37
Urbanity				
Urban	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Suburban	0.91	0.83–1.01	0.82	0.68–1.00
Rural	1.39	1.24–1.55	1.16	0.90–1.49
School location				
Taipei City	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Taipei County	1.19	1.08–1.32	0.96	0.80–1.15
Yilan County	1.11	0.99–1.25	0.77	0.59–1.00
Family adversities				
Parental conflicts (yes vs. no)	1.31	1.11–1.55	1.33	1.03–1.73
Parental absence (yes vs. no)	1.29	1.14–1.46	0.86	0.50–1.48
Divorce (yes vs. no)	1.74	1.40–2.15	1.90	1.26–2.86
Parental death (yes vs. no)	2.49	1.61–3.84	2.96	1.69–5.18

Odds ratio and 95% confidence intervals are shown

[1, 21]. The current study further compared the impact of different types of family adversity. Previous studies have shown an increased risk of tobacco and alcohol use among adolescents who experience lower parental supervision due to their absence from home [22, 23], interparental conflict [24], and parental divorce [25]. Interestingly, one study found that conflict during divorce has a more significant impact on substance use than divorce in itself [26], with results suggesting that an unstable family structure may present a greater risk factor for substance use behavior. However, we found that divorce appeared to have a greater impact on substance use, which might be explained by the stronger negative perception and stigma of divorce in Taiwanese culture, meaning that the experience of parental divorce might result in higher stress for offspring. Moreover, the divorce rate in Taiwan during the study period was around 20–25% [27]. Divorce remains less common in Taiwanese society than in Western countries such as the United States, where the divorce rate is around 40–50% [28]. Therefore, the experience of parental divorce is less normative (and more stigmatizing) for children, resulting in higher stress and feelings of shame.

One unique research finding was that gaps in the onset of drinking and smoking between adolescents exposed or

unexposed to family adversity dips at around the age of 15, and widens after they turn 18 years old. Studies conducted in Western countries found a similar onset of smoking from mid- to late adolescence [17]. However, the difference in substance use between those exposed to early life adversity and those who were not exposed decreased during late adolescence [6]. There are several possible explanations for our discrepant findings. First, access to tobacco and alcohol is highly regulated in Taiwan for individuals less than 18 years. Second, at the age of 18, youth typically leave a highly protected environment where parents and high school teachers strictly monitor their behavior. Third, there is a lack of socioemotional education in Taiwan that could help adolescents adjust to stressors, and, needless to say, limited sources are devoted to support the mental well-being of adolescents that experience family adversity. The lack of legal regulations and factors mitigating the risk of substance use, and the lack of education about how to cope with stress could all contribute to the surge in alcohol and tobacco use among young adults.

The mechanism of substance use among offspring who experience family adversity indicates that family emotional stressors stemming from marital discord and the loss of support from parents, including emotional backing, guidance,

**Table 3** Risk of drinking initiation in discrete time-varying model

Smoking initiation	Univariable analysis		Multivariable analysis	
	OR	95% CI	OR	95% CI
Age (years)	1.70	1.66–1.74	1.57	1.53–1.65
Sex (male vs. female)	1.53	1.43–1.65	1.37	1.21–1.53
Parental education level				
Below high school	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
High school graduate	1.03	0.93–1.14	1.00	0.87–1.15
College or graduate schools	0.96	0.84–1.08	0.93	0.78–1.10
Monthly household income				
< \$1700	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
\$1700–\$3300	1.10	1.01–1.19	1.08	0.91–1.28
> \$3300	0.85	0.74–0.99	1.06	0.82–1.37
Urbanity				
Urban	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Suburban	0.91	0.83–1.01	1.09	0.94–1.26
Rural	1.39	1.24–1.55	1.20	0.98–1.47
School location				
Taipei City	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Taipei County	1.19	1.08–1.32	0.84	0.73–0.97
Yilan County	1.11	0.99–1.25	0.75	0.62–0.91
Family adversities				
Interparental conflicts (yes vs. no)	1.31	1.11–1.55	2.00	1.26–3.20
Parental absence (yes vs. no)	1.29	1.14–1.46	0.91	0.59–1.41
Divorce (yes vs. no)	1.74	1.40–2.15	1.55	1.05–2.30
Parental death (yes vs. no)	2.49	1.61–3.84	8.07	1.79–36.49

Odds ratio and 95% confidence intervals are shown

supervision, and role modeling, may be the cause for the increasing risk of substance use among exposed adolescents [29]. Adolescents with more family adversity are exposed to higher levels of stress and concurrently receive less support from significant others to help them adjust to adversity. However, the impact could diminish in late adolescence and early adulthood due to the maturation of cognitive control and emotional and behavioral regulation skills [30]. There is evidence to support the notion that stress management education and socioemotional learning can help cultivate resilience in those children and adolescents experiencing adversity. Thus, it appears that the lack of socioemotional education can lead to an increased risk of substance use.

The study results suggest that a minimum legal drinking/smoking age policy and oversight by family and school might possibly delay the initiation of drinking and smoking among Taiwanese adolescents. Evidence from the United States has demonstrated that increasing the minimum legal drinking age to 21 years old was associated with lower alcohol consumption and fewer traffic crashes among youth [31]. However, this protective effect does not extend beyond the minimum legal age. A comparison of substance use prevention and intervention programs for adolescents shows that there are very few programs specifically designed for

young adults in Taiwan. The study offers insight into how to identify a population with a high need for substance use prevention and intervention strategies.

This study found that the experience of divorce and parental death greatly enhances the risk of substance use initiation. The results suggest that separation from parents causes substantial stress among adolescents. In addition to the protective effect of having a stable, two-parent family, Taiwanese culture values the integrity of the family, and divorce is seen as damaging to family honor. Divorce can cause high stress levels and a greater exposure to stigma during the experience of parental separation. One study found that Taiwanese adolescents who had experienced parental divorce reported more depressive symptoms than those who did not [32]. Notably, parental absence from home did not seem to be a significant predictor for alcohol and tobacco initiation. One possible explanation could be that in the absence of parental monitoring, other adults, such as relatives or neighbors, assumed parenting responsibilities. This phenomenon is common in Taiwanese and Chinese cultures, where other family adults take care of the children when one or both parents are absent [33]. Previous studies have also found that children experiencing healthy bonds with adults who are able to assume parenting responsibilities is a strong



protective factor against low self-esteem, substance use, and delinquent behaviors in those facing family adversity [34].

Additionally, we found the probabilities for both drinking and smoking declined between ages 15 and 16, and then rose afterward. There are several explanations for this finding. First, the question about alcohol and tobacco use for that wave asked about behavior during the previous 6 months instead of the previous year. Therefore, the data did not capture those who had smoked or used alcohol between 6 months and 1 year prior to the time of follow-up. Second, this age-group coincides with the intensive preparation period for the Taiwanese high school entrance examinations.

Also, this study found significant interactions between school location and parental absence for alcohol and tobacco use. Parents living in Yilan County or Taipei County might have to leave home to work in other cities, such as Taipei City. Moreover, it was found that interactions between parental level of education and death have a significant impact upon drinking behavior. Adolescents with parents who have a lower education level might have a higher risk of experiencing parental death during early life. This can be explained by the protective effects of education on substance use, health knowledge, high-risk behavior, income, and job safety.

Following are some of the strengths of this study. First, it is a longitudinal study based on multiple waves, which recorded the onset of drinking and smoking initiation using time-varying predictors. Second, it compared the effects of different types of family adversity on smoking and drinking initiation. Third, most studies of early life adversity focus on childhood, while our study analyzed the impact of family adversity during adolescence and young adulthood.

However, there were some limitations to this study. First, it relied on self-reported data about sensitive health behaviors. Although other studies have demonstrated the validity of self-reported risky health behavior by adolescents [35], the issues of substance use and exposure to family adversity are sensitive matters in Taiwanese society. The fear of being stigmatized or punished may have lowered participants' self-reporting accuracy. In our study, the self-reported prevalence of smoking among high school students was around 11.6%, while in the United States, the prevalence was 20% (both estimated in 2007) [36]. Although there may be greater under-reporting of substance abuse in the Asian context (where it is more stigmatized), this would not necessarily bias our study results if self-reporting was similar among youth according to exposure status. Second, our assessment of tobacco and alcohol use did not cover the comprehensive aspects of alcohol and tobacco use included in the Global Youth Tobacco Survey or CRAFFT 2.0 for alcohol use assessment. Third, smoking and drinking status and family adversity exposure were presented as dichotomized outcomes in this study. We were unable to test the

dose–response relationship between exposure and outcome. Also, we were not able to distinguish problematic substance use (e.g. binge drinking) from social substance use or experimentation. However, early substance use initiation during adolescence may still have significant clinical implications, since it is associated with the initiation of other risky health behavior [37–39] and a greater likelihood of involvement in problematic substance use and other high risk health behaviors in later life [40–42]. Fourth, the results derived from the study could be biased since participants with parents from lower educational backgrounds had higher risk of loss to follow-up. A previous study also found that level of education was associated with loss of follow-up [43]. When we repeated our analyses stratified by parental education level, we found that parental absence and parental death increased the risk of smoking for both groups, while divorce affected participants with higher parental education level only. For drinking, parental absence was associated with higher risk of alcohol use for both groups. Youth with educated parents were influenced more by parental divorce, while parental death seemed to affect youth with less educated parents. Thus, the selective attrition of participants with lower parental education levels may have underestimated the influence of parental death on drinking, and overestimated the impact of parental divorce. However, the bias was not large enough to change the main conclusions of the study. Fifth, we are unable to examine whether having a higher level of social support could attenuate the link between adversity and substance use. Given that Taiwan is a collectivistic society, investigating the moderating impact of social support may be a promising future research direction. Sixth, the study only had data on the exposure to adversity from early adolescence to early adulthood. We lacked data on experiences of adversity in earlier life stages (childhood). We were thus unable to take into account the influence of early childhood experiences into the analysis. Lastly, limited information about drinking and smoking status and parental exposure to family adversity were available from friends and parents of the participants. This could have introduced bias since these two factors could potentially confound the relationship between family adversity exposure and substance use among the youth.

## Conclusion

In conclusion, we found that exposure to family adversity increases the risk of smoking and drinking initiation among adolescents, and that the association persists and becomes magnified as adolescents transition to early adulthood. Our findings suggest the importance of early psychological intervention for adolescents who are at risk, in order to prevent substance use. Future substance use prevention programs

could place more emphasis on the freshmen population to reduce substance use behavior and cultivate coping skills to build greater emotional resilience.

## Summary

The current study examined the association between the experience of family adversity and timing of drinking and smoking initiation among 5446 Taiwanese adolescents across 9 years of follow-up. The results support the view that exposure to family adversity is associated with a higher risk of drinking and smoking initiation. Furthermore, we found the gaps between adolescents exposed or unexposed to family adversity and the onset of drinking and smoking widens after early adulthood. This result is different from the findings in Western countries where the impact of family adversity is more influential during early- to mid-adolescence.

The policy of a minimum legal drinking/smoking age and family and school supervision might possibly delay drinking and smoking initiation of adolescents in Taiwan. However, this protective effect does not extend into adulthood. The study offers insight into how to identify the population with a greater need for substance use prevention and intervention strategies.

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