

The Effect of In-school Health Information on Adolescents' Health Outcomes

Yifei Pei

Under the mentorship of Chris Handy, Ph.D.

Abstract

Objective: The primary objective of this study is to investigate the long-term impact of in-school health information, adolescents' depressive moods, and parental influence on adolescents' health behavior.

Methods: Data were used from the National Longitudinal Study of Adolescent to Adult Health, a nationally representative study of American youth, including information from Wave 1 and Wave 2. Because self-reported health information was potentially endogenous, the random effects estimator was used to evaluate the treatment effect of the program (i.e., information about the smoking).

Results: The study's results did not provide statistically significant support for the effectiveness of in-school health messaging in altering adolescents' smoking behaviors. However, the findings underscored the pivotal roles played by adolescents' mental health and parental behaviors in shaping these outcomes.

Discussion: Policymakers should consider extending health information delivery to parents, and addressing adolescents' mental health needs to create more impactful and enduring interventions.

Keywords: Adolescents' health behaviors, smoking, health education, health belief and attitudes, parental influence

1. Introduction

Healthy lifestyles and health behaviors, such as sufficient exercise and sleep, maintaining a healthy weight, and refraining from smoking and binge drinking, have both short-term and long-term benefits. These behaviors promote health and well-being during adolescence and are associated with higher levels of healthy behaviors during adulthood (Frech, 2012). In contrast, the lack of these behaviors can contribute to the development of chronic diseases, thereby impacting people's overall well-being and their ability to recover from illness (Strine et al., 2007).

It is crucial that adolescents learn about health information, as adolescence is an optimal time to adopt appropriate attitudes, beliefs, and behaviors related to health. When learned early in life, behaviors that promote good health are more likely to be sustained throughout adulthood (Lau et al., 1990). Additionally, it is preferable to prevent health-damaging behaviors at an early age than to modify an already-established habit later (Alexander, 1994). Adolescents are in a critical life transition phase and often initiate decision-making for risky health behaviors, as identified by the Centers for Disease Control and Prevention (CDC, 2022a), which includes sexual behaviors, tobacco use, unintentional injuries, dietary behaviors, physical activity, and substance use (Kratzke et al., 2018). Trends among high school students have shown an increase in the prevalence of high-intensity drinking, electronic cigarette use, and sexually transmitted diseases (Kratzke et al., 2018). Thus, introducing proper interventions that may help develop correct health-related behaviors and prevent risky behaviors related to both physical and mental health is crucial.

Smoking behavior remains a significant concern among adolescents, as indicated by recent data. According to the CDC (2022), in 2022, approximately 14.1% of high school students reported using electronic cigarettes, while roughly 2% reported smoking traditional cigarettes within the past 30 days. These statistics underscore the ongoing prevalence of smoking-related behaviors among adolescents.

Moreover, research conducted by the National Institute of Health (2014) has highlighted the critical period during adolescence when smoking behaviors are predominantly established. Given this insight, it becomes imperative to prioritize the monitoring of adolescents' smoking behaviors and to devise targeted interventions that address the development of such risky behaviors during this crucial stage of development.

Schools offer critical opportunities to provide health education to adolescents. Educators and health professionals have long recognized and documented the positive relationship between health and education (Kolbe, 2019). Studies show that health issues may limit students' motivation and ability to learn, hence hindering academic performance (Basch, 2011). Therefore, it is important to develop positive and healthy school environments that can bring about numerous benefits, including improving health, well-being, and academic achievement (Langford et al., 2014). While there are community programs addressing individual and community health, such as healthy food access for food justice, that have shown potential to influence the adoption of healthier lifestyles among adolescents, they can only reach a limited number of adolescents (Kratzke et al., 2018). Schools, on the other hand, serve as platforms that are able to reach students on a large scale (Rudd & Walsh, 1993). In-school health information about smoking, therefore, may be a potential effective strategy in reducing the prevalence of e-cigarettes and cigarettes usage.

1.1 Literature Gaps

There has been limited research on programs specifically targeting individual health behaviors to promote health, development, and well-being in secondary schools (Curran et al., 2013). Despite the importance of promoting adolescent health in schools, there is still a disconnect between the health and education systems in the United States that has not been fully addressed (Birch & Auld, 2019). Although the CDC (2019) has outlined the characteristics of effective health education programs, many schools in the United States fail to offer adequate health education programs in terms of quality and quantity (Videto & Dake, 2019). Thus, it is crucial to conduct more studies that evaluate existing health curricula in schools and explore ways to better integrate health and education.

While the literature has extensive research on adolescents' health behaviors, few studies have assessed the effect of health-related attitudes on health outcomes, especially on adolescents' smoking behavior. Emerging social cognitive theories suggest the importance of attitude formation in promoting people's intention to carry out behaviors. The current study aims to investigate the influence of learned attitudes on health outcomes. In addition, the understanding about parental influences on their offspring's smoking behavior is mixed. The literature has established that exposure to smokers in social network, including parents, is a strong and consistent predictor of smoking behavior (Distefan et al., 1998). However, one study suggested that parental influences gradually decreased as adolescents transit into adulthood (Mahabee-Gittens et al., 2013).

1.2 Theoretical Background

The study relies on relevant health behavior and social cognitive theories to help understand the determinants of health behavior and guide the selection of relevant variables for the analysis.

Theory of Planned Behavior

The theory of planned behavior (Hill et al., 1977) posits that behaviors are determined by intentions, which are shaped by three factors: attitudes, subjective norms, and perceived behavioral control. This theory suggests the importance for in-school health advocacy program to deliver effective messages that foster positive attitudes toward health-related behaviors. It also proposes that peer's health behavior can have an impact on the individual's behavior (subjective norms). In addition, it is important that the individuals develop the self-efficacy (i.e., develop perceived behavioral control) to perform such behaviors. In the context of school, for instance, physical environments can be re-constructed to facilitate health behaviors, and health professionals can offer a variety of physical education that builds students' confidence in performing health behaviors.

Health Belief Model

The Health Belief Model (Rosenstock, 1974) proposes that people's motivation to undertake health behaviors is influenced by individual perceptions, modifying factors, and the likelihood of action. Individual perceptions include factors that affect people's awareness of health consequences, perception of one's susceptibility to illness, and the importance of health behaviors. Modifying factors include environmental cues that affect people's intention to perform health behaviors. Likelihood of action refers to the extent that people are willing to actually perform the behaviors, which is determined by perceived benefits and costs. The Health Belief Model stresses the importance of outside factors that can encourage people to engage in health behaviors. It indicates the significance of in-school health advocacy programs and their long-term benefits in shaping adolescents' health beliefs and behaviors.

Social Cognitive Theory

According to the Social Cognitive Theory (Bandura, 2002), cultural context plays a crucial role in shaping people's beliefs and intentions. The theory suggests that social interactions and environmental factors impact the acquisition and maintenance of behavioral patterns. When applied to the development of health behaviors, the theory proposes that social environments can foster collective self-efficacy, thereby increasing individual self-efficacy in adopting health-related behaviors. Thus, in-school health programs that incorporate social interactions, such as collective physical education classes, may be beneficial in delivering health information.

In conclusion, the theories of planned behavior, health belief, and social cognitive theory provide a framework for understanding the determinants of health behaviors and can guide the development of effective in-school health advocacy programs. These theories highlight the importance of factors such as attitudes, perceived behavioral control, individual perceptions, and environmental cues in shaping health behaviors. Incorporating these factors into in-school health programs can help foster positive health beliefs and behaviors in adolescents. It is necessary to evaluate the effectiveness of existing programs to identify potential areas of improvement and ensure that they are promoting general health outcomes.

1.3 Study Objective

The present study is designed with the overarching objective of conducting a systematic analysis of the influence of in-school health information regarding smoking on adolescents' smoking behaviors, spanning from adolescence into the transition to adulthood. While in-school health information holds the potential to shape adolescents' attitudes towards smoking, the study acknowledges the multifaceted nature of this influence, recognizing the presence of other external factors.

Depressive moods have been identified as potential determinants in adolescents' decision-making regarding smoking. Longitudinal investigations have unearthed compelling evidence suggesting a bidirectional relationship between smoking and depression (Chaiton et al., 2009). By meticulously controlling for the depressive moods of the participants in close proximity to the survey administration, this study endeavors to enhance our comprehension of the nuanced patterns in adolescents' smoking habits.

Furthermore, this study will offer a comprehensive evaluation of the impact of parental smoking behavior on adolescents. Various avenues exist through which parental conduct and family income levels can shape the health outcomes of adolescents, encompassing factors such as accessibility to medical resources, health insurance coverage, and the influential role of parents' health behaviors as models for their children (Case & Paxson, 2002).

In summary, this study is guided by three primary objectives:

1. To scrutinize the long-term impact of in-school health messaging on adolescents as they transition into adulthood.
2. To probe the influence of adverse mental states, specifically depressive moods, on smoking behaviors.
3. To empirically assess the extent of parental influence on the health-related behaviors of adolescents.

2 Methods

2.1 Data

The study used data from the National Longitudinal Survey of Adolescent Health (Add Health). Add Health is a nationally representative study of the health and well-being of US adolescents in grades 7–12 who were enrolled in school during 1994–1995.

This study focused on data from Wave 1, Wave 2, and Wave 4. Wave 1 data were gathered from an in-school questionnaire administered to a nationally representative sample of students in grades 7 through 12 in 1994–95. Wave 2 data were collected from the follow-up study with a series of in-home interviews of respondents approximately one year in 1996. The Wave 4 interviews were completed in 2008, which consisted of the most recent of four in-home interviews which had followed a nationally representative sample of adolescents since they were in grades 7-12. Adolescents were included in the analytic sample if they had valid information regarding the exposure to in-school health information about smoking.

2.2 Variables

2.2.1 Dependent Variable

Days of Smoking. This study used the number of days smoked as an index to represent the intensity level of the participants' smoking behavior. Participants were asked "During the past 30 days, on how many days did you smoke cigarettes?" A number was self-reported by each participant.

2.2.2 Program Variable

In-school Health Information About Smoking. Among the different components of in-school health information, message about smoking was explored as the program variable. The program variable was based on participant reports of information collected during Wave 1 interviews. In Wave 1, the participants were asked, "Please tell me whether you have learned about each of the following things in a class at school: Smoking." Response options included "Yes" or "No."

2.2.3 Control Variables

Demographics. Demographic variables were collected during Wave 1. Demographic covariates included adolescents' biological sex, age, race, and family income level.

Depressive Level. Participants' general levels of depressive symptoms were measured across waves. The question on the survey listed as "How often was each of the following things true during the past week? You felt depressed." Participants responded in terms of categorical variables that indicate the level of intensity: "Never/Rarely", "Sometimes", "A lot of the time", "Most/all of the time".

Parent's Educational Levels. Parent's educational levels were measured separately. Participants were asked to indicate the highest level of education of their moms and dads.

Parent's Smoking Behavior. The Add Health data did not include detailed descriptions of parent's smoking behavior since the responses were elicited from the adolescent participants. The participants were asked whether their mom/dad ever smoked. The study used this pair of variables as a general indicator of parent's smoking status.

Evidence of Smoking. This variable was collected by the question "Was there any evidence of smoking in the household--for example, ashtrays, people smoking, cigarettes, the smell of cigarettes?" This variable is included to indicate the potential environmental factors that were not captured by parent's smoking behavior.

Family Income. This variable was collected at Wave 4. Due to sample attrition, the available data were limited. Including income variable in the model significantly reduces the degree of freedom and may potentially lead to biased results. However, income level is a significant indicator of the family's socioeconomic status and is a crucial factor to health outcomes. Thus, while the main model excludes income as a control variable, a supplementary model is analyzed including the income level.

2.3 Analysis Methods

Descriptive analyses were first calculated for the dependent variables, independent variable, and control variables in the analytic sample (see **Table 1**). The total observation included in the sample was 15, 262.

The study's model started with the basic statistical specification as follows:

$$Y_{ti} = \beta_1 + \beta_2 X_{ti} + \beta_3 P_i + \delta Z_i + \mu_i + \varepsilon_{ti},$$

where the dependent variable was the number of days smoked. X 's included time-variant variables at the individual level such as feeling of depressive moods. P denoted the time-invariant program variable, which was the exposure to the in-school health message about smoking. Z 's included time-invariant variables such as gender and race. The time-invariant error, μ_i , controlled for different levels of motivation across individuals that were not observed by the researcher. The time-varying error, ε_{it} , included errors in measurement and omitted variables.

Linear Regression Model. OLS with cluster correction was used as a preliminary analysis for the model specified above. While the data sample was random, it was not fully representative (see more details in **Results** section). Thus, sampling weights were used when estimating the OLS regressions. Given the surveys were longitudinal in nature, it should be noted that the weights were adjusted at each wave due to the reason of sample attrition. However, for the purpose of this study, analytic weights from Wave 1 were used to correct for potential biases.

There were several concerns with this method that might bias the results. First, participation in the program (i.e., whether attending to in-school health information) may be endogenous. It is possible that the unobserved motivation affects both the participation decision and the outcome. In addition, the presence of evidence related to smoking (one of the control

variables) might also be endogenous, affecting not only the participants' smoking behaviors but also those of their parents. Second, given the fact that this was a longitudinal data set, multiple observations on individuals might be correlated with each other due to unobservable characteristics. Third, it was likely that regional factors such as the clustering of schools affected participants' health behaviors and outcomes. Thus, other estimation methods need to be used to deal with the multilevel panel models to remove the source of errors and obtain correct standard errors.

Random Effects Estimator. The random effects estimator with cluster was employed in an attempt to correct unobserved heterogeneity. The random effects estimator, however, is only optimal when the treatment variable is exogenous. If the assumption is violated (e.g., the treatment variable is endogenous), the estimator may yield biased results.

In the preliminary model specification, 370 school dummies were included to further control for the possible regional effect on the outcome. However, analyses found that not many school dummies were significant, resulting in no significant differences from the model specification without the school dummies. To maintain brevity, the paper only presented the random effects model without school dummies.

3. Results

3.1 Descriptive Statistics

As displayed in **Table 1**, the full analytic sample was comprised of 15,262 adolescents which included a relatively similar number of men (48%) and women (52%), primarily of White (67%) or African American (24%) race, and an average age of 19 years old. The majority of the parents were high school graduates, as reported by the participants.

Most participants indicated they never/rarely or sometimes felt depressed, and the pattern did not vary much across different waves. Less than half of the participants' parents have ever smoked. Specifically, 44.8 percent of participants indicated that their moms have ever smoked, and 39.7 percent indicated that their dads have ever smoked. Among the adolescents whose mom smoked, 59 percent of the adolescents have ever smoked. Among the participants whose dad smoked, 57 percent of them have ever smoked. In addition, 21 percent of participants indicated that they had found evidence of smoking in the household.

Among all the adolescents, the reported number of days smoking was 5.6. Among the participants who smoked (excluding the ones that indicated that they have never smoked), the average days of smoking was 6.5.

A significant portion of the participants attended to the in-school health information about smoking (92%). While they have reported that they learned about the message about smoking, the survey did not contain sufficient information about the in-school health information, nor did it give the participants opportunities to disclose what they have learned with regards to smoking.

3.2 Multivariate Analyses

Table 2 displays the results of three models evaluating the impact of the program (i.e., in-school health message about smoking) on the dependent variable – days of smoking. The results estimated by OLS were shown by Model 1. Model 2 represented the estimation of the random effects estimator. Model 3 was the supplementary model of OLS regression including family's income.

Furthermore, the study examined time-variant variables at each wave to determine how the effect of those factors on days of smoking changed over time. **Table 3** shows the estimated

coefficients of OLS regressions of each wave in which the controlling variables remain the same as with Model 2 in **Table 2**. The program variable – learning about smoking – was not significant at any wave. Environmental factors from household (i.e., evidence of smoking) were significant across waves, and the coefficient became increasingly large as adolescents turned into adulthood. In addition, parental smoking behaviors were significant at each wave, except that mom’s smoking behavior became insignificant at Wave 4.

The study focused on Model 2, estimation by random effects, with two other models serving as comparisons. In-school health information about smoking was found to have a non-significant treatment effect on adolescents’ smoking behavior. Evidence of smoking in the household seemed to have the biggest impact on adolescents’ smoking behavior. On average, adolescents spent 2.7 more days smoking if there was reported evidence of smoking. Parental smoking behaviors were also significant in increasing the intensity of adolescents’ smoking behavior. If either mom or dad has ever smoked, the participant spent approximately one more day on smoking compared to the participants whose moms or dads did not smoke. In addition, depressive moods were found to be significant factors contributing to the intensity of adolescents’ smoking behaviors. Participants tended to smoke, on average, on 1.5 more days if they feel more depressed.

4. Discussion

The present study embarked upon an examination of the correlation between self-reported exposure to specific health information during adolescence, acquired within the school setting, and subsequent health outcomes. More precisely, this research delved into the impact of a constituent element of the school-based health advocacy program concerning smoking on self-reported instances of smoking. The outcomes derived from the random effects estimator yielded

that the reception of information pertaining to smoking within the school did not statistically significant alter in adolescents' smoking habits. Nonetheless, the findings illuminated the substantial influence exerted by adolescents' mental states as well as parental health on smoking. While the study's results did not provide conclusive support for the significance of in-school health advocacy in shaping adolescents' health outcomes, they underscored the pivotal roles played by depressive moods and parental factors in molding the health behaviors of adolescents. Detailed analyses conducted across different waves demonstrated the enduring impact of depressive moods parental influences as participants transitioned from adolescence to adulthood. Notably, supplementary modeling, even after controlling for income, which encompasses potential access to medical resources and health coverage, continued to highlight the significant impact of parental and environmental factors.

The study's findings present compelling implications that call for potential reform within the existing health advocacy system. First, beyond the dissemination of health-related information to adolescents within the school context, there arises a pressing need to extend the delivery of health messages to parents. As evidenced by the longitudinal analyses conducted across waves, parental health behaviors exhibited an enduring impact on their offspring. This underscores the necessity for parents to receive comprehensive health information and to serve as exemplars of healthy behaviors for their offspring. Commencing this process early in the developmental trajectory is of paramount importance, as it can significantly shape the health outcomes of adolescents. Secondly, it is crucial for health advocacy programs to broaden their focus to encompass adolescents' mental health. In addition to delivering information pertaining to physical health, these programs should prioritize the mental well-being of students. For instance, offering psychological counseling and support services can be instrumental in assisting students

in coping with stress or depression. The absence of such resources may inadvertently foster the development of risky health behaviors among adolescents.

In summary, the study advocates for a holistic approach to health advocacy that not only imparts health-related knowledge but also recognizes the pivotal roles played by parents and the critical importance of addressing adolescents' mental health needs. By implementing these reforms, the health advocacy system can evolve to be more comprehensive and responsive, ultimately leading to improved health outcomes among adolescents.

4.2 Limitations

One limitation of the analyses of the current study was related to the loss of sample size due to attrition as with any longitudinal study. Particularly, only 74% of initial respondents participated in Wave 2 data collection and 60% in Wave 4. While the analyses were weighted to account for attrition, the results might be still be biased given that the weights were only from Wave 1. Due to attrition, it was possible that the representation of the sample varied across waves. While the longitudinal design removed sources of endogeneity and potential clustering effects, its results could still not be considered fully as causal effects given its non-experimental nature.

The study acknowledged the presence of additional factors potentially capable of influencing smoking behaviors, which extend beyond the variables included as control covariates in the final model. Stress, for instance, may be a potential determinant which impacts the intensity of adolescents' smoking habits. Furthermore, the potent influence of social and environmental cues originating from sources other than parents, such as the health behaviors and beliefs of peers, may hold substantial sway over adolescents' health behaviors and outcomes (Manjothi & Othuon, 2022). It is pertinent to note that the data utilized in this study did not encompass the

adolescents' perceptions regarding their peers' health behaviors. This limitation constrained the study's capacity to incorporate these perceptions as independent variables in the analyses, thereby precluding an assessment of the potential impact originating from peers.

The implications drawn from the study's findings for future interventions should be regarded within certain limitations. Firstly, the Add-Health study did not provide a comprehensive account of the in-school health advocacy program, lacking detailed information concerning various critical aspects. Specifically, the study provided only minimal insights into the topics covered within the health content. Moreover, critical details regarding the program's contextual elements remained absent, including the mode of delivery (e.g., posters or class presentations), the duration of the program, and the granular content of each topic. The absence of these specifics may impede the capacity of policy makers to institute targeted changes within the current framework of in-school health promotion.

Secondly, the program variables were reliant on self-reported data collection. This methodology introduced the possibility of recall bias among the participants, potentially engendering systematic errors in the results. While the random effects method was employed to mitigate recall biases to some extent, this concern still merits careful consideration. Additionally, it is plausible that other, unaccounted-for factors may influence whether participants accurately recall having received the health information. Future research endeavors could aim to systematically investigate the efficacy of in-school health messaging through meticulous documentation of students' attendance and soliciting feedback, among other measures.

Furthermore, the summary statistics presented in Table 1 indicate a limited number of participants who did not partake in the program. This is in stark contrast to the overwhelming majority who reported having received health information about smoking at school. The

existence of this limited subset of the control group has the potential to introduce bias into the results. While it may be ethically impractical to assign students to different conditions (e.g., attending the in-school health program or not) to rectify the issue of unequal sample sizes, future researchers may seek to evaluate the program on a larger scale, thereby augmenting the number of participants across both conditions and minimizing potential biasing effects.

5. Conclusion

The study aims to investigate the long-term impact of in-school health information as well as adolescents' depressive moods and parental influence on adolescents' health behavior. While the study findings did not provide statistically significant support for the effectiveness of in-school health messaging in altering adolescents' smoking behaviors, they underscored the pivotal roles played by adolescents' mental health and parental behaviors in shaping these outcomes.

The findings have clear implications for future interventions. Policymakers should consider enhancing the specificity and comprehensiveness of in-school health programs. Expanding the scope of health information delivery to parents and broadening the program's focus to encompass adolescents' mental health needs are important steps towards achieving more holistic and impactful health advocacy efforts.

It is important to note, however, that the study is subject to certain limitations, including the lack of comprehensive program details and the reliance on self-reported data. These limitations impede our ability to draw definitive conclusions regarding the impact of in-school health advocacy. Future research efforts may employ more rigorous data collection methods and collect data at a larger scale, potentially mitigating the biases resulted from recall and unequal sample sizes.

In essence, while this study highlights the complexity of factors influencing adolescent health behaviors, it serves as a catalyst for further inquiry and underscores the importance of comprehensive and nuanced approaches to health advocacy interventions. By addressing the limitations and building upon the insights gleaned from this research, future interventions have the potential to create a more substantial and enduring impact on the health and well-being of adolescents.

Table 1.
Characteristics of the
sample (N=15, 262)

VARIABLES	Mean	Sd
Age	19.46	5.646
Male	0.475	0.499
White	0.673	0.469
African American	0.241	0.428
Asian	0.0391	0.194
Mom's Education	5.749	2.542
Dad's Education	5.930	2.658
Feel_depressed	0.475	0.740
Mom_ever_smoke	0.264	0.441
Dad_ever_smoke	0.449	0.497
Evidence_smoke	0.397	0.489
Days_smoke	0.210	0.408
Learn_smoking	5.570	10.78

Table 2. Multiple Analyses of Days of Smoking on key predictors.

VARIABLES	Model 1	Model 2	Model 3
learn_smoking	0.203 (0.571) (1.818)	0.148 (0.459) (1.677)	0.0143 (0.0416)
feel_depressed	2.150*** (0.227)	1.498*** (0.172)	0.0823*** (0.0176)
age	X	X	0.00147 (0.00784)
mom_educ	X	X	-0.00457 (0.00556)
dad_educ	X	X	0.00713 (0.00628)
male	0.636** (0.304)	0.838*** (0.260)	0.0747*** (0.0242)
white	2.152*** (0.521)	1.812*** (0.417)	0.0987** (0.0472)
af_am	-2.131*** (0.574)	-2.107*** (0.476)	-0.123** (0.0486)
asian	-0.710 (0.685)	-0.778 (0.664)	0.0720 (0.0757)
mom_ever_smoke	1.052*** (0.319)	1.076*** (0.284)	0.0698*** (0.0257)
dad_ever_smoke	1.158*** (0.295)	1.180*** (0.262)	0.0844*** (0.0246)
evidence_smoke	2.576*** (0.529)	2.693*** (0.443)	0.0786** (0.0364)
Constant	-6.806*** (1.209)	-7.767*** (1.707)	0.181 (0.257)
**below are details of each categorical variables			
13.age	1.062 (1.143)	2.645 (1.722)	
14.age	1.783 (1.191)	3.154* (1.638)	
15.age	2.800** (1.137)	4.039** (1.610)	
16.age	3.894*** (1.112)	4.925*** (1.653)	
17.age	5.168*** (1.156)	5.932*** (1.680)	

18.age	6.320*** (1.130)	6.958*** (1.667)
19.age	5.565*** (1.195)	6.968*** (1.683)
20.age	4.836*** (1.640)	6.320*** (1.886)
21.age	3.206 (2.278)	4.894* (2.517)
22.age	2.257* (1.356)	3.557* (1.832)
25.age	-0.681 (1.121)	-14.87*** (2.188)
26.age	7.352*** (1.484)	-5.811*** (1.062)
27.age	9.331*** (1.271)	-4.205*** (1.021)
28.age	8.142*** (1.252)	-4.723*** (0.966)
29.age	7.355*** (1.219)	-5.263*** (0.977)
30.age	7.562*** (1.242)	-5.570*** (0.954)
31.age	8.067*** (1.444)	-4.752*** (1.106)
32.age	3.408* (1.746)	-9.529*** (1.186)
33.age	3.918 (4.192)	-8.007*** (2.325)
34.age	12.26*** (1.356)	
2.mom_educ	0.128 (0.796)	1.076 (0.686)
3.mom_educ	1.027 (2.848)	2.119 (2.201)
4.mom_educ	1.186 (0.765)	1.888*** (0.636)
5.mom_educ	0.845 (1.178)	1.486 (1.007)
6.mom_educ	0.0511 (0.941)	1.293* (0.698)
7.mom_educ	0.668 (0.897)	1.541** (0.728)
8.mom_educ	-0.0583 (0.788)	0.795 (0.631)

9.mom_educ	0.182 (1.022)	1.056 (0.770)	
10.mom_educ	-3.251 (3.995)	-0.0726 (5.195)	
11.mom_educ	0.908 (1.120)	1.508 (1.007)	
12.mom_educ	1.803 (1.918)	2.314 (1.802)	
2.dad_educ	2.552*** (0.679)	1.966*** (0.572)	
3.dad_educ	4.099* (2.202)	2.166 (1.647)	
4.dad_educ	2.763*** (0.696)	2.093*** (0.589)	
5.dad_educ	2.883*** (1.028)	2.397** (0.951)	
6.dad_educ	2.315** (1.101)	1.181 (0.754)	
7.dad_educ	2.100*** (0.789)	1.361** (0.666)	
8.dad_educ	1.721*** (0.637)	1.099** (0.548)	
9.dad_educ	1.380 (0.844)	0.689 (0.678)	
10.dad_educ	6.145 (3.793)	5.045 (4.034)	
11.dad_educ	2.396** (1.147)	1.894** (0.921)	
12.dad_educ	1.720 (1.818)	2.305 (1.677)	
2.income			0.0555 (0.0918)
3.income			-0.0413 (0.0878)
4.income			0.126 (0.110)
5.income			0.0629 (0.0894)
6.income			0.0775 (0.0891)
7.income			0.0363 (0.0859)
8.income			-0.0109 (0.0802)
9.income			-0.0429 (0.0774)

10.income		-0.0769 (0.0778)
11.income		-0.0613 (0.0826)
12.income		-0.165**
	0.125	0.082
R-squared		
Number of AID		4,242

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: 1. Model 1 presents the results of OLS regression without income; 2. Model 2 presents the results of random effects estimator; 3. Model 3 presents the result of OLS regression with income.

Table 3. Effect of Time-variant variables on Days of Smoking.

VARIABLES	Wave 1	Wave 2
Mom ever smoked	.996*** (.343)	.933** (.413)
Dad ever smoked	.846*** (.291)	1.51*** (.421)
Evidence of smoking	2.18*** (.637)	2.03*** (.748)
Depressive moods	1.79*** (.306)	2.18*** (.335)
Learning about smoking	-.220 (.583)	.380 (.683)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

*Note: for **Table 3**, only the coefficients of the time variant variables are presented. The analyses were conducted using the same set of variables as in Model 2.

References

- Alexander, D. (1994). Adolescents and young adults: Overview. *Preventive Medicine, 23*(5), 653–654. <https://doi.org/10.1006/pmed.1994.1108>
- Bandura, A. (2002). Social cognitive theory in cultural context. *Applied Psychology, 51*(2), 269–290. <https://doi.org/10.1111/1464-0597.00092>
- Basch, C. E. (2011). Healthier students are better learners: A missing link in school reforms to close the Achievement Gap. *Journal of School Health, 81*(10), 593–598. <https://doi.org/10.1111/j.1746-1561.2011.00632.x>
- Case, A., & Paxson, C. (2002). Parental behavior and child health. *Health Affairs, 21*(2), 164–178. <https://doi.org/10.1377/hlthaff.21.2.164>
- Centers for Disease Control and Prevention. (2019, May 29). *Characteristics of effective health education curricula - sher*. Centers for Disease Control and Prevention. Retrieved April 22, 2023, from <https://www.cdc.gov/healthyschools/sher/characteristics/>
- Centers for Disease Control and Prevention. (2022, November 10). Tobacco product use among middle and high school students - United States, 2022. Centers for Disease Control and Prevention. <https://www.cdc.gov/mmwr/volumes/71/wr/mm7145a1.htm>
- Centers for Disease Control and Prevention. (2022a, November 22). YRBSS. Centers for Disease Control and Prevention. Retrieved April 22, 2023, from <https://www.cdc.gov/healthyyouth/data/yrbs/index.htm>
- Chaiton, M. O., Cohen, J. E., O’Loughlin, J., & Rehm, J. (2009). A systematic review of longitudinal studies on the association between Depression and smoking in adolescents. *BMC Public Health, 9*(1). <https://doi.org/10.1186/1471-2458-9-356>

- Curran, N., Ned, J., & Winkleby, M. (2013). Engaging students in Community Health. *Health Promotion Practice, 15*(2), 271–280. <https://doi.org/10.1177/1524839913499349>
- Distefan, J. M., Gilpin, E. A., Choi, W. S., & Pierce, J. P. (1998). Parental influences predict adolescent smoking in the United States, 1989–1993. *Journal of Adolescent Health, 22*(6), 466–474. [https://doi.org/10.1016/s1054-139x\(98\)00013-5](https://doi.org/10.1016/s1054-139x(98)00013-5)
- Frech, A. (2012). Healthy behavior trajectories between adolescence and young adulthood. *Advances in Life Course Research, 17*(2), 59–68. <https://doi.org/10.1016/j.alcr.2012.01.003>
- Hill, R. J., Fishbein, M., & Ajzen, I. (1977). Belief, attitude, intention and behavior: An introduction to theory and research. *Contemporary Sociology, 6*(2), 244. <https://doi.org/10.2307/2065853>
- Kolbe, L. J. (2019). School health as a strategy to improve both public health and Education. *Annual Review of Public Health, 40*(1), 443–463. <https://doi.org/10.1146/annurev-publhealth-040218-043727>
- Kratzke, C., Rao, S., & Marquez, R. (2018). Ethnic Differences for Public Health Knowledge, Health Advocacy Skills, and Health Information Seeking Among High School Students: Community Agents of Change. *Journal of Community Health, 43*(5), 874–881. <https://doi.org/10.1007/s10900-018-0496-y>
- Langford, R., Bonell, C. P., Jones, H. E., Poulidou, T., Murphy, S. M., Waters, E., Komro, K. A., Gibbs, L. F., Magnus, D., & Campbell, R. (2014). The WHO Health Promoting School framework for improving the health and well-being of students and their academic achievement. *Cochrane Database of Systematic Reviews*. <https://doi.org/10.1002/14651858.CD008958.pub2>
- Lau, R. R., Quadrel, M. J., & Hartman, K. A. (1990). Development and change of young adults' preventive health beliefs and behavior: Influence from parents and peers. *Journal of Health and Social Behavior, 31*(3), 240. <https://doi.org/10.2307/2136890>

- Le, L. K.-D., Barendregt, J. J., Hay, P., & Mihalopoulos, C. (2017). Prevention of eating disorders: A systematic review and meta-analysis. *Clinical Psychology Review, 53*, 46–58.
<https://doi.org/10.1016/j.cpr.2017.02.001>
- Mahabee-Gittens, E. M., Xiao, Y., Gordon, J. S., & Khoury, J. C. (2013). The dynamic role of parental influences in preventing adolescent smoking initiation. *Addictive Behaviors, 38*(4), 1905–1911. <https://doi.org/10.1016/j.addbeh.2013.01.002>
- Manjothi, N. & Othuon, L. (2022). Influence of Educational Cues and Environmental Modifiers on Smoking Behaviour among Adolescents in the USA. *Contemporary Journal of Education and Human Development. vol. 5* (4)
- Rosenstock, I. M. (1974). The health belief model and Preventive Health Behavior. *Health Education Monographs, 2*(4), 354–386. <https://doi.org/10.1177/109019817400200405>
- Rudd, R. E., & Walsh, D. C. (1993). Schools as healthful environments: Prerequisite to Comprehensive School Health. *Preventive Medicine, 22*(4), 499–506.
<https://doi.org/10.1006/pmed.1993.1042>
- Strine, T. W., Chapman, D. P., Balluz, L. S., Moriarty, D. G., & Mokdad, A. H. (2007). The associations between life satisfaction and health-related quality of life, chronic illness, and health behaviors among U.S. community-dwelling adults. *Journal of Community Health, 33*(1), 40–50.
<https://doi.org/10.1007/s10900-007-9066-4>
- U.S. National Library of Medicine. (2014). The health consequences of smoking-50 years of progress: A report of the surgeon general. National Center for Biotechnology Information.
<https://pubmed.ncbi.nlm.nih.gov/24455788/>

Videto, D. M., & Dake, J. A. (2019). Promoting health literacy through defining and measuring quality school health education. *Health Promotion Practice, 20*, 824-833. doi:10.1177/1524839919870194