

## Influence of Educational Cues and Environmental Modifiers on Smoking Behaviour among Adolescents in the USA

Naheed Manjothi<sup>1</sup> & Lucas Othuon<sup>2</sup>

<sup>1</sup>University of South Wales, CF37 1DL, Pontypridd.

<sup>2</sup>Maseno University, Department of Educational Psychology, P. O. Box 333, Maseno, Kenya.

### Abstract

*Smoking is one of the biggest public health concerns in the world, yet factors influencing smoking amongst adolescents has received little research attention. The purpose of this study was to show the influence of educational cues and environmental modifiers on smoking behavior among adolescents as conceptualized by the Health Belief Model. Use was made of a subset of the secondary data from Wave I National Longitudinal Study of Adolescent to Adult Health (Add Health, 1994-2008) in the USA. A saturated sample of 6518 participants were included in the study. Quantitative data were analyzed using descriptive statistics and correlation analysis. Whereas a weak association was found between educational cues and smoking behaviour, findings indicated that there was a strong association between some environmental modifiers and smoking behaviour. In particular, the relationship between learning about smoking in class and smoking behaviour of adolescents was statistically significant ( $\chi^2=5.906$ ; Cramer V=.05,  $p=.01$ ). However, the relationship was weak. Parents smoking behaviour was also significantly related to children's smoking behaviour. In particular, the relationship between mothers' and fathers' smoking behaviour were significantly related to their adolescent children's smoking behaviour ( $\chi^2=1143.9$ ; Cramer V=0.69,  $p=.00$  for mothers and  $\chi^2=16.39$ ; Cramer V=.10,  $p=.00$  for fathers). However, the study revealed a strong relationship between mothers who smoked and their adolescent child's subsequent choice to smoke, with a Cramer V score of 0.69 ( $p=.00$ ) with an odds ratio of 10.85 for adolescents who opted to smoke and had mothers who smoked versus those who did not have mothers who smoked. This was significantly higher when compared to an odds ratio of 1.1 for adolescents who opted to smoke and had fathers who smoked. It is concluded that offering educational cues to adolescents about the risks of smoking, and mothers' smoking behaviour in particular, are important factors in modelling adolescents' smoking behaviour. The study further recommends that health intervention designers should be cognizant of the wider social and environmental effects of cues and modifiers in their design as suggested in the HBM, with some modifiers being particularly powerful in determining behaviour than others; affective and physical proximity of modifiers being relevant considerations.*

**Keywords:** Smoking Behavior, Health Belief Model, Adolescent Health, Health Cues, Health Environmental Modifiers.

---

<sup>1</sup>Corresponding author. Email: [nmanjothi@yahoo.com](mailto:nmanjothi@yahoo.com)

## INTRODUCTION

### 1.1 Background to the Study

Smoking is one of the biggest public health problems in the world. World Health Organization Report on the Global Tobacco Epidemic (2011) reckons that tobacco is responsible for six million deaths annually worldwide. This makes cigarette smoking a major life-threatening aspect with serious health problem. The leading causes of death attributed to tobacco are cancer (lung cancer being the most common), ischemic heart disease, chronic obstructive pulmonary disease (COPD) and stroke (Eriksen, Mackay & Ross, 2012). The majority of smokers begin smoking at an early age. In the US 83% of smokers begin smoking before the age of 18 (Ahmed, Ahmed & Semanya, 2004).

In the US 83% of smokers start smoking before 18 years of age. In middle class American families, children start smoking at the mean age of 8.5 with a range between 6 and 11 years old (Ahmed, Ahmed & Semanya, 2004). In the US, in 2006, 6.8% of students aged 11–14 were smokers (Richardson, Hemsing, & Greaves, 2009). In 2011, among 13–15-year-old boys the smoking prevalence was 7–15.9% (Eriksen, Mackay & Ross, 2012). In 2013, 22.9% of high school students reported the use of one product of smoke, while 12.6% reported the use of two or more products of smoke (Arrazola, Neff & Kennedy, 2014).

Cigarette smoking in childhood and adolescence leads to short and long-term health problems thereby endangering the lives of the youth. First of all, lungs are impaired and respiratory symptoms occur. Lung function and lung growth are reduced. Young people who smoke experience shortness of breath, lower physical endurance and sometimes wheezing. These patients are often mistreated for asthma. Moreover, smoking at a young age increases the risk for lung cancer and other smoking-related cancers such as oropharyngeal, esophageal and bladder's. Consequently, smoking in adulthood is a known risk for heart disease and stroke. Early indications of these diseases, such as arteries' atherosclerosis, have been detected amongst young smokers. (World Health Organization Report on the Global Tobacco Epidemic, 2011).

Many children and adolescents initiate smoking annually making the existing smoking epidemic worse. Starting smoking at a young age bears greater danger. Young people are more susceptible to risks associated with smoking given that growth has not been completed and the harmful components of tobacco impair the process. Further, It has been indicated that the younger the age the stronger the addiction. Moreover, the longer the organs are been exposed to smoke the greater the danger for the appearance of smoking related diseases such as COPD or lung cancer later in life (Centre for Disease Control and Prevention, 1994).

The Health Belief Model (HBM), a Social Cognitive Model (SCM) has been used in understanding of adherence to primary health interventions. The model includes five core cognitive constructs. 'Perceived Severity' coupled with 'Perceived Susceptibility', 'Demographics & Social Economic Modifiers', 'Cues-to-action', 'Perceived Benefits' and 'Perceived Barriers' These five constructs interact to provide a basis for future health behaviour modification (Charles & Paschal, 2005; Jones, Smith, & Llewellyn, 2014).

Such an approach may be considered particularly salient for specific habit-forming behaviours such as smoking, the focus area of this study. However, the model has been criticized for focusing primarily on the cognitive aspects of behaviours and overlooking the behavioural and psycho-social aspects (Modifiers) that can influence behaviour (Munro, Lewin, Swart, & Volmink, 2007).

Proponents of the HBM argue that the 'Cues-to-action' construct adequately captures the behavioural and environmental aspects that may influence behaviour (Sheeran, *et al.*, 2016). It is therefore for this reason that the current study focused on the construct of 'cues-to-action' of the HBM and the 'environmental modifiers' effects to fill this knowledge gap. Specifically, the study focused on school-based educational cues on the hazards of smoking on adolescents to refrain from smoking and effects of peers and parents on the smoking behaviour of the adolescents in USA.

Because of the seriousness of the smoking problem in children and adolescents, many prevention and cessation programs have been initiated within the school system. These efforts focus on interventions in school or in the community. Public education has also been targeted through the mass media. Children have been informed about the harmful habit of smoking in order to prevent them from initiating it. Similarly, studies show that low educational level is associated with a higher risk of smoking initiation in children and adolescents in the US and in North Europe due to lack of access to health care specialists (Cremers, Oenema & Mercken, 2014).

Studies have also asserted that acceptance from friends plays a significant role in smoking initiation in childhood and adolescence. In addition, a parent, brother, close relative or a friend who smokes will affect a child or an adolescent in his smoking initiation. A parent who smokes may affect his child in his smoking initiation, but in later adolescence he will not. As the young person grows he/she will be more affected in initiating smoking by his close friends than his parents' smoking habits (Etcheverry & Agnew, 2008; Bricker, Peterson & Robyn, 2006).

### 1.2 Objectives of the Study

This study was guided by the following objectives:

1. To determine the relationship between educational cues and smoking behaviour of adolescents.
2. To determine the relationship between environmental modifiers and smoking behaviour of adolescents.

### 1.3 Limitations of the Study

The study had the following limitations:

- i. The study draws relationships between health behaviours and a singular contextual cue and four modifiers from the HBM. To that extent, this study overlooks all other HBM potential modifiers that may in part affect adolescent health behaviours.
- ii. Given the use of a subset of the secondary data, reliability of the data from the survey tool could not be ascertained.
- iii. Non-response rate on the items was rather high and the reason for non-response could not be ascertained. This could have a negative impact on the findings of the study.

### 1.4 Theoretical Framework

The HBM focused on two aspects of individuals' representations of health and health behaviour: threat perception and behavioral evaluation. Threat perception was construed as two key beliefs: perceived susceptibility to illness or health problems, and anticipated severity of the consequences of illnesses. Behavioral evaluation also consisted of two distinct sets of beliefs: those concerning the benefits or efficacy of a recommended health behavior, and those concerning the costs of, or barriers to, enacting the behavior. In addition, the model proposed that cues to action can activate health behaviour when appropriate beliefs are held. These 'cues' included a diverse range of

triggers, including individual perceptions of symptoms, social influence, and health education campaigns (Becker, Haefner, & Maiman, 1977b).

Jones *et al.* (2014) in their systemic review observed that HBM studies generally opted to give focus to some constructs within the model and neglected others. In particular, the 'Cues-to-action' construct was observed to be a neglected measure in most existing studies. Having undertaken a review of a sample of HBM studies, this study was able to confirm that the 'Cues-to-action' construct was generally given lesser focus than other constructs. It may be inferred that this may be the case given that there is numerous supporting research to validate the theories of social learning (Social Learning Theory) and social exposure (Exposure Theory); aspects of human behaviour which may be argued to be the basis for the inclusion of this construct. None-the-less, several studies that did explore cues were able to verify the effects of cues on positive health behaviour (Sadeghi, Hashemi, & Khanjani, 2018; McArthur, Riggs, Uribe, & Spaulding, 2018). Jones *et al.* (2015) accessed the mediating effects of each of the four cognitive constructs (Perceived Susceptibility, Severity, Barriers and Benefits) in their interaction with cues. Within the study context of understanding smoking in adolescents, various studies have established significant effect size based on educational cues determined by their approach and duration (Flay, 2009).

Based on the foregoing, it is apparent that there is paucity of research on the relationship between educational cues, environmental modifiers and health behaviour among adolescents in the USA particularly with regard to smoking. It is this gap that the present study has attempted to address.

## METHODOLOGY

### 2.1 Research Design

The quantitative research paradigm was applied in the study. This called for descriptive survey and correlation research designs.

### 2.2 Study Sample

The study made use of secondary data from *Wave I National Longitudinal Study of Adolescent to Adult Health* (Add Health, 1994-2008). All the participants who completed the Wave I Survey were included in the study sample. Their number totalled 6518 participants.

### 2.3 Research Instrument

The study made use of *In-Home Adolescent to Adult Health* (ADD Health) Questionnaire administered in Wave I, 1994-1996 by researchers from the University of South Carolina. The items extracted from the Questionnaire are presented in Appendix 1.

### 2.4 Methods of Data Analysis

Descriptive statistics and correlation analysis were used to analyze data. More specifically, contingency tables with frequencies and percentages were used. Pearson's  $\chi^2$  statistic was also used to determine if the association between educational cues/environmental modifiers and adolescents' smoking behaviour was statistically significant or not. In addition, Cramer V was used to establish the strength of relationship between the variables. In all cases, the 95% confidence interval was applied. The Statistical Package for the Social Sciences SPSS (Version 20) was used for data analysis.

## 2.5 Ethical Considerations

Use was made of secondary data collected by the National Longitudinal Study of Adolescent to Adult Health (Add Health) from 1994 to 2008, in the United States of America. The dataset was determined to be adequate from an ethical perspective given that researchers had taken adequate measures to ensure that the personal identity of participants and access to data was protected.

The primary researchers sought informed consent in line with the APA guidelines. Further, given that participants were minors, initial consent was sought from parents before the interview. Consent was however approached in a passive way which only required signed refusal from parents rather than a signed consent when notified of the survey. If parents did not respond, then it was assumed that they had provided passive consent. This approach whilst easier to execute introduced the potential risk that parents may later not recall having been informed or may legitimately have missed the notification. For many schools this approach was unacceptable and hence required formal signed consent from parents (Carolina Population Centre; Add Health, 2020).

In addition, interview participants were informed that all data was to be captured anonymously for the purpose of research only before seeking signed participant consent. Participants also had the option to opt out of any question that they did not want to specifically answer or to discontinue the interview at any point (Harris & Udry, National Longitudinal Study of to Adult Health (Add Health), 1994-2008 [Public Use] - In-Home Questionnaire, 2018). Researchers were also unable to view the responses as they were provided by the participants on the computer. This approach was taken to avoid any potential priming from the researchers, in line with APA guidelines (American Psychological Association, 2017, p. 13).

Finally, to ensure the confidentiality of personal information in line with the APA guidelines, no personal public unique identifiers were stored of the participants, and instead a single numeric identifier was assigned to each participant. In addition, certain aspects such as family and friends details and neighbourhood details were also restricted for access within the public dataset to reduce deductive disclosure risk (Carolina Population Centre; Add Health, 2020).

## FINDINGS

This section begins with demographic characteristics of respondents. This is followed by the findings for the relationship between Educational Cues and Smoking Behaviour as well as the relationship between Environmental Modifiers and Smoking Behavior of adolescents.

### 3.1 Demographic Characteristics of Respondents

The Wave I survey sample available for public usage was conducted in 1995 and comprised of a total of 6504 respondents. Table 1 highlights key demographic characteristics of the respondents. A total of 6518 adolescents submitted their data in the Wave I Survey ranging between the ages of twelve and twenty-one. However, seventeen respondents did not submit their age information.

Whereas females were more than males, there was near gender parity in the distribution of respondents, with 3147 (48.4%) males and 3354 (51.6%) females. The median age was 17 years.

**Table 1: Demographic Characteristics of Wave I Survey Respondents**

Birth Year	Age (Years)	Gender		Total	%
		Male	Female		
1974	21	12	6	18	0.28
1975	20	28	15	43	0.66
1976	19	202	187	389	5.98
1977	18	551	598	1149	17.67
1978	17	597	572	1169	17.98
1979	16	567	595	1162	17.87

1980	15	509	572	1081	16.63
1981	14	424	479	903	13.89
1982	13	254	325	579	8.91
1983	12	3	5	8	0.12
<b>Total</b>		<b>3147</b>	<b>3354</b>	<b>6501</b>	<b>100.00</b>
<b>%</b>		<b>48.4</b>	<b>51.6</b>	<b>100.0</b>	

### 3.2 Relationship between Educational Cues and Smoking Behaviour

The first objective was to determine whether offering adolescents educational cues was related to their smoking behaviour. Table 2 shows the responses from adolescents across two primary classifications of smokers against non-smokers.

From Table 2, only 2538 of the 6518 respondents submitted a response on whether they had been provided with educational cues on the hazards of smoking. This gave a non-response rate of 61.1%. Of the 2538 respondents, 2352 (92.7%) had been educated in school about the risks of smoking and 186 (7.3%) had not been educated. A total of 840 respondents constituting 33.1% of those who had learnt the risks of smoking in school ended up not smoking. On the other hand, of those who had received education on the risks of smoking, 1512 (59.6%) still ended up as smokers. The Odds Ratio of being a smoker when adolescents learnt the risk of smoking in school compared to being a smoker when adolescent did not learn the risk of smoking was 0.88.

**Table 2: Contingency Table for Educational Cues by Smoking Behaviour**

		Does respondent smoke?			
		No	Yes	Total	
<i>Learnt smoking health risks in school?</i>	<b>No</b>	Count	50	136	<b>186</b>
		% of Total	2.0	5.4	<b>7.3</b>
	<b>Yes</b>	Count	840	1512	<b>2352</b>
		% of Total	33.1	59.6	<b>92.7</b>
<b>Total</b>	<b>Count</b>	<b>890</b>	<b>1648</b>	<b>2538</b>	
	<b>% of Total</b>	<b>35.1</b>	<b>64.9</b>	<b>100.0</b>	

\*Odds Ratio of being a smoker when adolescent learnt the risk of smoking compared to being a smoker when adolescent did not learn the risk of smoking= 0.88

Results for the Pearson chi square ( $\chi^2$ ) test and Cramer's V test for the first objective are presented in Table 3. The null hypothesis for the objective was follows:

H<sub>01</sub>: Educational cues is not related to smoking behaviour of adolescents.

**Table 3: Pearson's Chi-Square and Cramer's V Test for Hypothesis H<sub>01</sub>**

Questionnaire Item	df	$\chi^2$	p-value	$\gamma$
<i>Please tell me whether you have learned about smoking in a class at School</i>	1	5.906	0.01	0.05

From the Table, the relationship between learning about the risks of smoking and adolescents' smoking behaviour was statistically significant ( $\chi^2=5.906$ ,  $p=.01$ ). However, the relationship was weak ( $\gamma=.05$ ). It is therefore important for adolescents to learn about the risks of smoking.

### 3.3 Relationship between Environmental Modifiers and Smoking Behaviour

The second objective was to determine the relationship between environmental modifiers and smoking behaviour of adolescents. To address the objective fully, this section has been divided into

two sub-sections; [i] the relationship between smoking behaviour of close friends and adolescents' smoking behaviour, and [ii] the relationship between parents' smoking behaviour and that of their adolescent children. Further, the relationship between parents' smoking behaviour and that of their adolescent children has been divided into two parts; one for mothers and the other for fathers.

*Close friends and adolescents' smoking behaviour.* One of the components of the second objective on environmental modifiers was the relationship between smoking behaviour of close friends and adolescents' smoking behaviour. Table 4 is a contingency table for Close Friends by Smoking Behaviour.

**Table 4: Contingency Table for Close Friends by Smoking Behaviour**

		<i>Does respondent smoke?</i>		<b>Total</b>
		<b>No</b>	<b>Yes</b>	
<i>Do at least one of your three best friends smoke at least one cigarette a day?</i>	<b>No</b>	Count 420	720	<b>1140</b>
		% of Total 16.8	28.9	<b>45.7</b>
	<b>Yes</b>	Count 459	894	<b>1353</b>
		% of Total 18.4	35.9	<b>54.3</b>
<b>Total</b>	<b>Count</b>	<b>879</b>	<b>1614</b>	<b>2493</b>
	<b>% of Total</b>	<b>35.3</b>	<b>64.7</b>	<b>100.0</b>

\*Odds Ratio of being a smoker when close friends are smokers compared to being a smoker when close friends are non-smokers=1.04

From the Table, only 2493 of the 6518 respondents submitted a response on whether at least one of their three best friends smoked at least one cigarette a day. This resulted into a non-response rate of 61.8%. Of the 2493 who responded, 1353 (54.3%) had at least one close friend who smoked. Thus, there were more adolescents who had at least one close friend who smoked than those who had friends who did not smoke. Of those who had close friends who smoked, 894 (35.9%) were also smokers compared to 459 (18.4%) who did not smoke.

Adolescents who did not have at least one of three best friends who smoked at least one cigarette a day were 1140 (45.7%). A total of 720 (28.9%) adolescents who had no friends who smoked were smokers and only 420 (16.8%) were non-smokers. The odds ratio of being a smoker when close friends are smokers compared to being a smoker when close friends are non-smokers was 1.04.

The null hypothesis for the second objective was as follows:

H<sub>02</sub>: Smoking behavior of close friends is not related to one's smoking behavior.

Pearson's chi-square ( $\chi^2$ ) test and Cramer's V were used to test this hypothesis as presented in Table 5.

**Table 5: Pearson's Chi-Square and Cramer's V Test for Hypothesis H<sub>02</sub>**

<b>Question</b>	<b>df</b>	<b><math>\chi^2</math></b>	<b>p-value</b>	<b><math>\gamma</math></b>
<i>Do at least one of your three best friends smoke at least one cigarette a day?</i>	1	2.307	0.7	0.03

From the Table, H<sub>02</sub> was retained at  $\alpha=.05$ . This means that the smoking behavior of close friends is not related to one's smoking behavior ( $\chi^2=2.307, p=0.7$ ). In addition, Cramer's V test indicated that the relationship between the smoking behavior of close friends and one's smoking behavior was weak ( $\gamma=0.03$ ).

*Mothers' smoking behaviour and their children's smoking behaviour.* The second component of environmental modifiers was on parents' smoking behaviour. This section reports findings for the relationship between mothers' smoking behaviour and their children's smoking behavior. Table 6 is a contingency table for Mothers' Smoking Behaviour by their Children's Smoking Behaviour.

From the Table, only 2406 of the 6518 respondents submitted a response on whether they had a mother who smoked or not. This gave a non-response rate of 63.1%. Of the 2406 who responded, 1797 (74.7%) had a resident mother who smoked and 609 (25.3%) had a mother who did not smoke.

Table 6: Contingency Table for Mothers' Smoking Behaviour by their Children's Smoking Behaviour.

		<i>Does respondent smoke?</i>		
		No	Yes	Total
<i>Does resident mother ever smoke?</i>	No	Count 562	47	609
		% of Total 23.4	2.0	25.3
	Yes	Count 294	1503	1797
		% of Total 12.2	62.5	74.7
<b>Total</b>		Count 856	1550	2406
		% of Total <b>35.6</b>	<b>64.4</b>	<b>100.0</b>

\*Odds Ratio of being a smoker when mother is a smoker as compared to being a smoker when mother is a non-smoker=10.85

This finding indicates that the majority of respondents had mothers who smoked. Of those who had a mother who smoked, 1503 (62.5%) were also smokers compared to only 294 (12.2%) of those who did not smoke and had mothers who were non-smokers as well. This finding shows that the majority of adolescents with mothers who smoked turned out to be smokers as well. The Odds Ratio of being a smoker when mother is a smoker as compared to being a smoker when mother is a non-smoker was 10.85.

The null hypothesis for the third objective was as follows:

H<sub>03</sub>: Mothers' smoking behaviour is not related to their adolescent children's smoking behaviour.

Table 7 shows the results of the  $\chi^2$  test for the relationship between mothers' smoking behavior and their children's smoking behaviour.

Table 7: Pearson's Chi-Square and Cramer's V Test for Hypothesis H<sub>03</sub>

Question	df	$\chi^2$	p-value	$\gamma$
<i>Does the person whom you reside with that fills the mother role in your life ever smoke cigarettes?</i>	1	1143.9	0.00	0.690

Information in Table 7 shows that there was a statistically significant relationship between mothers' smoking behaviour and their adolescent children's smoking behaviour ( $\chi^2=1143.9$ ,  $p=.00$ ). Cramer V showed that the strength of the relationship was strong ( $\gamma =0.69$ ).

*Fathers' smoking behaviour and their children's smoking behaviour.* This section reports findings for the relationship between fathers' smoking behaviour as an environmental modifier and their children's smoking behavior. This was part of the second objective.

Table 8 is a contingency table for Fathers' Smoking Behaviour by their Children's Smoking Behaviour.



**Table 8: Contingency Table for Fathers' Smoking Behaviour by Children's Smoking Behaviour**

		Does respondent smoke?		Total	
		No	Yes		
<b>Resident father ever smoke?</b>	<b>No</b>	Count	94	212	306
		% of Total	5.5	12.4	17.9
	<b>Yes</b>	Count	606	794	1400
		% of Total	35.5	46.5	82.1
<b>Total</b>	Count	700	1006	1706	
	% of Total	41.0	59.0	100.0	

\*Odds Ratio of being a smoker when father is a smoker compared to being a smoker when Father is a non-smoker=1.1

From Table 8, it is evident that 1706 of the 6518 respondents submitted a response on whether they had a father who smoked or not, giving a non-response rate of 73.8%. Of the 1400 children who had a resident father who smoked, 794 (46.5%) smoked and 606 (35.5%) did not smoke. Of the 306 (17.9%) children who had resident fathers who never smoked, 212 (12.4%) smoked and only 94 (5.5%) did not smoke. The Odds Ratio of being a smoker when father is a smoker compared to being a smoker when father is a non-smoker was 1.1.

The null hypothesis for this second objective was as follows:

H<sub>04</sub>: Fathers' smoking behaviour is not related to their children's smoking behaviour

Pearson's chi-square ( $\chi^2$ ) test and Cramer's V were used to test this hypothesis as presented in Table 9.

**Table 9: Pearson's Chi-Square and Cramer's V Test for Hypothesis H<sub>04</sub>**

Question	df	$\chi^2$	p-value	$\gamma$
Does the person whom you reside with that fills the father role in your life ever smoke cigarettes?	1	16.39	0.00	0.10

Information in the Table indicates that fathers' smoking behaviour was related to their children's smoking behaviour ( $\chi^2=16.39$ ,  $p=.00$ ). This implies that fathers made a significant contribution to the smoking behaviour of their adolescent children. However, Cramer V showed that the strength of the relationship was weak ( $\gamma =0.10$ ).

## DISCUSSION

The study set out to determine the influence of educational cues and environmental modifiers on smoking behaviour among adolescents in the USA. It was established that educational cues was related to adolescents' smoking behaviour. However, the relationship was weak. This is consistent with the findings of Nurumal, Zain, Mohamed & Shorey, 2019 and Lisboa *et al.*, 2019 although these studies showed a stronger link between education intervention and the rejection of cigarette smoking. Since these studies were carried out in the recent past as opposed to the current study, the stronger relationships in the more recent studies could be attributed to the increased campaign and usage of audio-visual sensitization against smoking in schools. Graaf, Putte, Zebregs, Lammers and Neijens (2016) agree to this assertion by stating that the use of audio-visual media in schools to warn against cigarette smoking have a higher impact on adolescents than written ones.

The study established a non-significant relationship between smoking behaviour by adolescents and the smoking behaviour of close friends. This finding concurs with that of Mercken, Sleddens, Vries and Steglich (2013) who observed that adolescents' selection of friends can vary across several

factors contingent to parenting styles. Parenting style breeds more autonomy and it supersedes peer influence. Friends who smoke are generally accepted despite one's perception of the habit. However, Xu *et al.* (2016) had a contrary finding. The study observed that friends are likely to be the first point of contact through which adolescents may experiment with cigarettes. This finding could be attributed to the fact that this study focused on friends alone as the possible source of influence and failed to look at other possible influencers. Mercken, Sleddens, Vries and Steglich (2013) opines that adolescents who choose to smoke are just as likely to have smoker friends as they are to have non-smoker friends.

The current study also found a significant relationship between parents' smoking behaviour and adolescents' smoking behaviour. Put differently, a parent who smokes is more likely to influence a child to start smoking. However, mothers who smoked had a stronger influence on children's smoking behaviour than fathers who smoked. This finding concurs with that of Mercken, Sleddens, Vries and Steglich (2013) as well as that of El-Amin, Kinnunen, Ollila, Helminen and Alves (2015) who observed a similar trend in their studies. It appears that the social and cognitive effects of a mother who smokes appears to strongly affect an adolescent's perception of the acceptability of smoking habit more than from a father. However, Schoenaker, Emily, Wakefield and Durkin (2018) argue that social acceptability of smoking is generally shunned across all families today, without any gender-based variance across parents. It is worth noting that these studies were carried out in different environments (England and India) and therefore the different findings could be attributed to cultural differences that may explain such a variance.

From a Health Belief Model (HBM) perspective, this study therefore recommends that cues to action construct of HBM should be enhanced for proper behaviour modification. Specifically, education cues to action should be enhanced at school level as it has shown to influence positive behaviour change. In a similar manner, environmental modifiers play a key role in shaping adolescents' smoking behaviour. This is more particularly so from the mother's influence than the father's. In light of this finding, it is recommended that health intervention designers should put in place positive behaviour modification mechanisms for parents so as to reduce cigarette smoking among the adolescents.

#### ACKNOWLEDGEMENT

This research used part of the data from ADD Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due to Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the ADD Health data files is available on the [Add Health website](#). No direct support was received from grant P01-HD31921 for this analysis.

#### REFERENCES

- Ahmed, N. U., Ahmed, N. S., Semanya, K. A., *et al.* (2004). Prevalence and correlates of initiation of smoking behaviour among preteen black and white children. *Journal of the National Medical Association*, 96, 2-8.
- Anthony, D. (2011). *Statistics for Health, Life and Social Sciences*. Denis Anythony & Ventus Publishing ApS.
- Arrazola, R. A., Neff, L. J., Kennedy, S. M., *et al.* (2014). Tobacco use among middle and high school students--United States. *Morbidity and Mortality Weekly Report*, 63, 1021-1026.

- Becker, M. H., Haefner, D.P. & Maiman, L. A. (1977b). The health belief model in the prediction of dietary compliance: a field experiment. *Journal of Health and Social Behaviour*, 18, 348–66.
- Ben-Arye, R., Bonucci, M., Daher, M., Kebud, R., Saad, B., Breikreuz, T., . . . Elio Rossi, N. G. (2018). Refugees in Conflict: Creating a Bridge Between Traditional and Conventional Health Belief Models. *The Oncologist*, 693-702.
- Bricker, J. B., Peterson, A. V., Andersen, M. R., *et al.* (2006). Close friends', parents', and older siblings' smoking: re-evaluating their influence on children's smoking. *Nicotine and Tobacco Research*, 8, 217-226.
- Carolina Population Centre; Add Health. (2020). *addhealth.cpc.unc.edu*. Retrieved from Add Health: [https://addhealth.cpc.unc.edu/wp-content/uploads/2020/06/research-design\\_3-6-18\\_regular.pdf](https://addhealth.cpc.unc.edu/wp-content/uploads/2020/06/research-design_3-6-18_regular.pdf)
- Centre for Disease Control and Prevention (1994). *Preventing Tobacco Use Among Young People: A Report of the Surgeon General*. Atlanta, GA: U.S. Department of Health and Human Services.
- Charles, A., & Paschal, S. (2005). *Predicting and Changing Health Behaviour, 2nd Edition*. Open University Press.
- Cremers, H. P., Oenema, A., Mercken, L., *et al.* (2014). Explaining socio-economic differences in intention to smoke among primary school children. *BMC Public Health* 1, 14:191
- El-Amin, S. E., Kinnunen, J. M., Ollila, H., Helminen, M., & Alves, J. (2015). Transmission of Smoking across Three Generations in Finland. *International Journal of Environmental Research & Public Health*, 1-15.
- Eriksen M, Mackay J, Ross H (2012). *The tobacco atlas. 4th ed.* Atlanta, GA: American Cancer Society; New York, NY: World Lung Foundation; Available online: <http://www.tobaccoatlas.org>
- Etcheverry, P. E. & Agnew, C. R. (2009). Similarity in cigarette smoking attracts: a prospective study of romantic partner selection by own smoking and smoker prototypes. *Psychological Addiction Behaviour*, 23, 632-43.
- Falla, E., Izauteb, M., & Chakroun-Baggionib, N. (2018). How can the health belief model and self-determination theory predict both influenza vaccination and vaccination intention ? A longitudinal study among university students. *Psychology & Health*, 746-764.
- Farquhar, D. (2014). What Is Case Study Research? In D. Farquhar, *Case Study Research for Business* (pp. 1-18). London: Sage Publications.
- Fau, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 1149-1160.
- Fayanju, O., Drake, B., Goodman, M. S., & Oka, M. (2014). Perceived Barriers to Mammography among Underserved Women in a Breast Health Center Outreach Program. *The American Journal of Surgery*, 425-434.
- Field, A. (2009). *Discovering Statistics using SPSS (and sex and drugs and rock 'n' roll)*. London: Sage Publishers.
- Flay, B. R. (2009). School-based smoking prevention programs with the promise of long-term effects. *Springer Link*, 1-18.
- Graaf, A. d., Putte, B. v., Zebregs, S., Lammers, J., & Neijens, P. (2016). Smoking Education for Low-Educated Adolescents: Comparing Print and Audiovisual Messages. *Health Promotion Practice*, 853–861.

- Harris, K. M., & Udry, J. R. (2018). *National Longitudinal Study of Adolescent to Adult Health (Add Health), 1994-2008 [Public Use]*. Carolina Population Center, University of North Carolina-Chapel Hill [distributor], Inter-university Consortium for Political and Social Research [distributor].
- Harris, K. M., & Udry, J. R. (2018, 08 06). *National Longitudinal Study of Adolescent to Adult Health (Add Health), 1994-2008 [Public Use] - Data Guide*. Retrieved from ICPSR: <https://www.icpsr.umich.edu/web/ICPSR/studies/21600/datadocumentation#>
- Harris, K. M., & Udry, R. J. (2018, 08 06). *National Longitudinal Study of Adolescent to Adult Health (Add Health), 1994-2008 [Public Use] - In-Home Questionnaire*. Retrieved from ICPSR: <https://www.icpsr.umich.edu/web/ICPSR/studies/21600/datadocumentation#>
- Jones, C. J., Smith, H., & Llewellyn, C. (2014). Evaluating the effectiveness of health belief model interventions in improving adherence: a systematic review. *Health Psychology Review*, 253-269.
- Jones, C. L., Weaver, J., Katheryn, C., Brown, N. R., Scherr, C. L., & Jenson, J. D. (2015). The Health Belief Model as an Explanatory Framework in Communication Research: Exploring Parallel, Serial, and Moderated Mediation. *Health Communication*, 566-576.
- Kahsay, Z. H., Hiluf, M. K., Shamie, R., Tadesse, Y., & Bazzano, A. N. (2019). Pregnant Women's Intentions to Deliver at a Health Facility in the Pastoralist Communities of Afar, Ethiopia: An Application of the Health Belief Model. *International Journal of Environmental Research and Public Health*, 1-9.
- Kleijn, M. J., Farmer, M. M., Booth, M., Motala, A., Smith, A., Sherman, S., . . . Shekelle, P. (2015). Systematic review of school-based interventions to prevent smoking for girls. *Systematic Reviews*, 1-13.
- Kothari, C. (2004). *Research Methodology: Methods and Techniques*. Mumbai: New Age International Publishers.
- Lisboa, O. C., Bernardes-Souza, B., Xavier, L. E., Almeida, M. R., Corrêa, P. C., & Brinker, T. J. (2019). A Smoking Prevention Program Delivered by Medical Students to Secondary Schools in Brazil Called "Education Against Tobacco": Randomized Controlled Trial. *Journal of Medical Internet Research*, 1-9.
- McArthur, L. H., Riggs, A., Uribe, F., & Spaulding, T. J. (2018). Health Belief Model Offers Opportunities for Designing Weight Management Interventions for College Students. *Journal of Nutrition Education and Behavior*, 485-494.
- Mercken, L., Sleddens, E., Vries, H. D., & Steglich, C. (2013). Choosing adolescent smokers as friends: The role of parenting and parental smoking. *Journal of Adolescence*, 383-393.
- Mjøset, L. (2008). The Contextualist Approach to Social Science Methodology. In L. Mjøset, *The Sage Handbook of case-based methods* (pp. 39-68). New York: Sage Publications.
- Munro, S., Lewin, S., Swart, T., & Volmink, J. (2007). A review of health behaviour theories: how useful are these for developing interventions to promote long-term medication adherence for TB and HIV/AIDS? *BMC Public Health*, 1-16.
- Nurumal, M. S., Zain, S. H., Mohamed, M. H., & Shorey, S. (2019). Effectiveness of School-Based Smoking Prevention Education Program (SPEP) Among Nonsmoking Adolescents: A Quasi-Experimental Study. *The Journal of School Nursing*, 1-10.
- Orji, R., Vassileva, J., & Mandryk, R. (2012). Towards an Effective Health Interventions Design: An Extension of the Health Belief Model. *Online Journal of Public Health Informatics*, 4-27.
- Pynn, G. (2016). *Contextualism in Epistemology*. London: Oxford University Press.

- Rezapour, B., Mostafavi, F., & Khalkhali, H. (2016). Theory Based Health Education: Application of Health Belief Model for Iranian Obese and Overweight Students about Physical Activity” in Urmia, Iran. *International Journal of Preventive Medicine*, 1-6.
- Richardson L, Hemsing N, Greaves L, et al. (2009). Preventing smoking in young People: a systematic review of the impact of access interventions. *International Journal of Environmental Research and Public Health*, 6, 1485-1514.
- Sadeghi, R., Hashemi, M., & Khanjani, N. (2018). The impact of educational intervention based on the health belief model on observing standard precautions among emergency center nurses in Sirjan, Iran. *Health Education Research*, 327-335.
- Schoenaker, D. A., E. B., Wakefield, M. A., & Durkin, S. J. (2018). Anti-smoking social norms are associated with increased cessation behaviours among lower and higher socioeconomic status smokers: A population-based cohort study. *PLoS One*, 1-17.
- Sheeran, P., Maki, A., Montanaro, E., Avishai-Yitshak, A., Bryan, A., Klein, W. M., . . . Rothman, A. J. (2016). The Impact of Changing Attitudes, Norms, and Self-Efficacy on Health-Related Intentions and Behavior: A Meta-Analysis. *Health Psychology*, 1178-1188.
- Sreedharan, J., Muttappallymyalil, J., & Divakaran, B. (2010). Less demand for tobacco smokers in the marriage market. *Indian Journal of Cancer*, 87-90.
- World Health Organization (2011). *Report on the Global Tobacco Epidemic, 2011*. Geneva: World Health Organization.
- Xu, X., Chen, C., Abdullah, A. S., Liu, L., Sharma, M., Li, Y., & Zhao, Y. (2016). Smoking related attitudes, motives, and behaviors of male secondary school students in an urban setting of China. *SpringerPlus*, 1-9.

## APPENDIX

## Subset of Wave I Adolescent -Adult Health Questionnaire used in this study

	<b>Code</b>	<b>Question</b>	<b>Type of variable</b>	<b>Values</b>
1.	<b>H1TS3 (S4Q3)</b>	Please tell me whether you have learned about smoking in a class at School	<b>Independent</b>	(0) No (1) Yes (6) Refused (8) Don't Know
2.	<b>H1TO9b (S28Q9B)</b>	Do at least one of your three best friends smoke at least one cigarette a day?	<b>Independent</b>	(0) No (1) Yes (6) Refused (8) Don't Know (9) Not Applicable
3.	<b>H1RF14 (S15Q14)</b>	Does the person whom you reside with that fills the father role in your life ever smoke cigarettes?	<b>Independent</b>	(0) No (1) Yes (6) Refused (7) Legitimate Skip (8) Don't Know
4.	<b>H1RM14 (S14Q14)</b>	Does the person whom you reside with that fills the mother role in your life ever smoke cigarettes?	<b>Independent</b>	(0) No (1) Yes (6) Refused (7) Legitimate Skip (8) Don't Know
5.	<b>PA64 (A64)</b>	Do you Smoke?	<b>Dependent</b>	(0) No (1) Yes (6) Refused (7) Legitimate Skip