PEER EFFECTS AND SMOKING SUSCEPTIBILITY AMONG SECONDARY SCHOOL STUDENTS IN CAMEROON

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ABSTRACT

This study seeks to determine the effect of peer influences on susceptibility to smoke among secondary school students in Cameroon based on the 2014 Cameroonian Global Youth Tobacco Survey. The survey collected information on the smoking behaviour of 2922 students in forms 1 to 4 nested in 25 randomly selected secondary schools. Considering the multi-stage survey sampling design, we control for endogeneity in school selection and unobserved school-level characteristics through the use of school fixed-effects. We appeal to the use of instrumental variable estimators to control for simultaneity in peer effect and susceptibility to smoke in student behaviours. Estimation results are subjected to a robustness check by jointly estimating the structural smoking susceptibility function and the reduced form equation of the potential endogenous variable with the help of conditional mixed process estimation. We find consistent evidence that student smoking susceptibility is responsive to peer influences across all the estimation methods. We establish that a 1% point increase in peer smoking increases the probability of student smoking susceptibility by 5.70% points on average. This finding implies that any policy intervention to reduce student smoking susceptibility must consider the social multiplier effect of peer pressures on currently non-smoking students.

Keywords: Peer pressures, smoking susceptibility, secondary schools, 2014 Cameroonian Global Youth Tobacco Survey

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INTRODUCTION

Cigarette smoking is one of the greatest public health problems facing developing countries. It is a risk factor associated with lung cancer and other smoking related diseases that do not only drain resources of the health care system both for curative and for preventive purposes, but also leads to premature deaths each year (Silles, 2015; WHO, 2015). Evidence from WHO (2015) Report estimates that over 5 million premature deaths occur every year due to smoking related diseases. The Report further warns that the death toll may rise to 8 million per year by 2030 if urgent policy measures are not adopted.

To tackle the tobacco consumption epidemic, policy should be designed to help reduce future smoking-related deaths. One approach is to tackle the root cause of the problem by focusing on youth smoking behaviour. From the literature there is evidence that the school environment is a primary factor that has an influence at the early stage of a child's development (Reid et al. 1995). There is further evidence that children who start smoking at an early age have higher chances of smoking as adults (Chassin et al. 1990). Therefore targeting the youth and their potential smoking behaviour is of policy relevance to design preventive programs against future cigarette smoking. There is much research identifying the factors at individual level that influence adolescent smoking (Koueta et al, 2009; Reda et al, 2012; Ngahane et al. 2015) but studies that capture the influence of school environment on student smoking decision making are scarce in Cameroon.

Second motivation is based on the fact that the effects of peer influences on smoking susceptibility and behaviour are still debatable and inconclusive in the literature. While a study such as McVicar & Polanski (2014) has evidence of a positive and significant peer effects, Soetevent & Kooreman (2007) found an insignificant peer effect on youth smoking behaviour.

Analysing the effect of peer influence on youth smoking behaviour can be quite challenging. This is probable because peer influences are likely to both interact with and are compounded by several factors, which may even have reverse effects. We may therefore attribute the conflicting empirical findings to some methodological lapses in addressing the confounding aspects of peer effects. Most tobacco smoking studies are survey-based conducted in communities; clinics or in schools using multi-stage sampling designs (Steenbergen et al., 2002). In the analysis, however, some of the studies neglect the clustering effect and obtain inconsistent estimates (Chassin et al. 1990; Ngahane et al. 2015). Those that take into account the hierarchical nature of the survey and adopt multilevel modelling approaches fail to control for potential endogeneity of the main factors explaining smoking behaviour (Guindon et al., 2012; Aslam et al., 2014). This may be due to difficulty of finding exclusion variables for smoking behaviour. We attempt to address these econometric issues by identifying instruments and using the instrumental variables approach to account for potential endogeneity sources that are likely to contaminate regression estimates.

In Cameroon, the prevalence of smoking as reported by the Cameroonian Global Youth Tobacco Surveys among secondary school students aged 13 – 15 years stood at 5.7 percent in 2008, and increased to 7.4 percent in 2014 (Awono and Sibetcheu 2008; Awono, 2015). This increase in cigarette smoking predicts a heavy burden of tobacco-related diseases and risky behaviour among the youth. There is further evidence that smoking initiation by age cohort in Cameroon is highest at the ages of 8 – 11 years (Awono, 2015). This early uptake of smoking suggests the likelihood of peer influences. This study argues that action must be taken to prevent scarce resources being used in future to address tobacco-related diseases that could otherwise have been prevented. Cameroon is still in the process of designing efficient tobacco control legislation, and

hopefully findings from this study will be informative, at least, as concerns school-based anti-smoking programs.

The rest of the paper is organized as follows: Section 2 reviews the theoretical and empirical literature. Section 3 discusses the data and variable construction. Section 4 discusses the empirical methodology. Section 5 present results and discuss the findings; while Section 6 concludes.

LITERATURE REVIEW

Here we present the theoretical models, and an empirical review of the existing literature.

Theoretical Framework

This proposal is anchored on the theory of planned behaviour and the social learning theory. These theories explain individuals' intentions, attitudes and behaviours that provide unique pathways to understand smoking tendencies in relation to peer effects.

The theory of planned behaviour predicts that the primary factor that influences human behaviour is the intention. Intention portrays the individual's willingness to perform that behaviour. It thus captures the motivational covariates that influence a particular behaviour. According to Ajzen (2005, 2015) the intention is composed of three constructs: attitudes, subjective norms and perceived behavioural control. Attitude is a reasoned action path that reflects a conscious decision-making process that is conducive toward risk. It captures factors at the individual level that affect smoking decisions such as age, sex, and education. Subjective norm refers to the perceived social influence to engage or not a particular behaviour. It reflects the social pathway which is often unintentional and is a response to the social situations that may lead to a risky behaviour (Ajzen, 2009). Subjective norms reflect contextual and environmental factors. Perceived behavioural control reflects the

perception of the presence of factors that facilitate or hinder the realization of the behaviour (Ajzen, 2015). According to this theory the smoking decision of an adolescent will depend on their exposure to norms, values and behavioural attitudes of their peers with whom they interact. The theory of social learning predicts that imitation and observation of peers is the main channel through which behaviours are being learned (Simpson, 2000). The theory therefore postulates that the adolescent will likely observe and imitate the smoking behaviour of their social contacts. The motivational factors that quickly come to mind here are family and peer influences, media and advertisements. These theories predict that peer effect on smoking susceptibility is positive.

Empirical Review

slam et al., (2014) use cross sectional data obtained from Global Youth Tobacco Survey of Pakistan to estimate prevalence of susceptibility to smoke among adolescents, and identify its correlates. Multivariate logistic regression analyses were performed to establish the associations between smoking susceptibility and co-variates. Their findings revealed that about 12 percent of never-smoking students were susceptible to smoking. Guindon et al., (2012) fit a multi-level logistic regression model to the Global Youth Tobacco Surveys of South East Asian countries (Cambodia, Laos, and Vietnam) to identify correlates at school, class and individual levels that influence susceptibility to smoking among young non-smokers. It is showed that 4.5 percent and 4.2 percent of the variation in smoking susceptibility is associated with school and class differences, respectively. These two studies do not control for endogeneity.

We could trace in the literature some papers that control for the potential endogeneity of peer effects. Lundborg (2006) analyses data from Sweden using a school fixed-effects framework to estimate the influence of peer groups on students' smoking status. Findings

indicate that a positive association with a 10 percent increase in peer smoking leading to 4.7 percent in student smoking. Pertold (2009) carries out a similar study using data from the Czech Republic. The results indicate that a 10 percent increase in daily smoking peers has no significant effect on female students, but leads to a 2.8 percent in smoking among the boys. Another paper by McVicar (2011) estimates classmates peer effects on students smoking status in 26 European countries. Due to data limitations, the analyses exclude school context factors and actually generate estimates for 15 out of the 26 countries. Findings show wide variation in peer effect estimates across the countries. Mukong (2017) analyses the effects of peer networks on both smoking participation and smoking intensity using the South African National Income Dynamic Study panel data. The findings reveal significant positive peer effects. Another recent paper by Nikaj (2017) investigates peer smoking influences on smoking status among youths in 10 countries based on the European Global Youth Tobacco Survey. Instrumental variables are used to control for endogeneity in school selection and unobserved school-level characteristics. Results show significant positive association. Notably, an increase in peer effects by 10 percent leads to a 3 to 6.9 percentage points increase.

Our proposal contributes to the discussion of peer effects on smoking behaviour in the following ways. First, based on Cameroonian data, we use smoking susceptibility as the explained covariate unlike the studies above which focus on smoking status and/or smoking intensity. By proceeding this way better smoking prevention programs can be designed. Second, we capture both student-level and school-level fixed effects by utilising multi-level regression frameworks and further investigate whether or not peer effects vary across both the individuals and schools. Third, we control for the potential endogenous nature of peer effects due to simultaneity, unobserved heterogeneity

and possible sample selection bias using the control function procedure.

DATA AND VARIABLES

Data Description and Source

he data we use for this study come from the 2014 Cameroonian Global Youth Tobacco Survey (GYTS). The GYTS is standardised school-based survey tool jointly developed by the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) that countries adapt to their specificities to collect information on student smoking behaviour. The Cameroonian 2014 GYTS was designed to collect data, across the entire country, on the smoking behaviour of secondary school students in forms 1 to 4 and aged 11 – 17 years. A two-stage sample design was used to collect the data. First, 25 schools were randomly selected from 1500 identified secondary schools (consisting of both public and private). The second stage consisted of selecting in a random manner classes from the selected schools from a list of classes provided by the principals. A total of 49 classes were selected from the participating schools. Every student formally registered in a class was eligible for the survey. A total of 2922 students actually responded to the questionnaire giving a response rate of 88.3 percent. The Cameroonian 2014 GYTS data are available at the National Institute of Statistics and also at the CDC website.

Measurement of Variables

The dependent variable. The dependent variable in this proposal is smoking susceptibility. To measure this variable we draw from the Pierce et al. (1996) procedure which consists of recoding the responses from the following two questions asked in the Cameroonian 2014 GYTS:

a) If one of your friends were to offer you a cigarette, would you smoke it?
b) Do you think you will smoke a cigarette during the next twelve months?
The following response options are given for the two questions:
1) Definitely no; 2) Probably no; 3) Probably yes; 4) Definitely yes
Pierce et al., (1996) advise we label currently non-smoking students who checked response (1) to both questions as *non-susceptible to smoking*, and the rest of the students are coded as *susceptible to smoking*. Thus smoking susceptibility is binary dependent variable with 1 indicating susceptible to smoking, and 0 otherwise.

Peer effects (potential endogenous explanatory variable). To operationalise peer effect we follow Bertrand et al. (2000) to construct peer effects as the share (proportion) of students within class and school who smoke cigarettes, excluding the individual student in question. This is a non-self-class proportion of smoking students. Mathematically, we measure peer effect variable as:

$$P_{ijk} = \frac{1}{n_{jk}-1}\sum_{j\neq i} S_{ijk} \quad (1)$$

where $n_{jk}$is the number of students in the class, $S_{ijk}$is the binary smoking variable.

Control variables. The control variables we include in the study are informed by studies in the literature (see Nikaj, 2017; Aslam et al., 2014; Guindon et al., 2012 and Fletcher, 2010). We therefore include a vector of individual characteristics such as age, gender, and pocket money to spend in school. Information on parents' or relatives smoking behaviour is considered. School level variables that all students are exposed to such as, smoking bans on campus, access to anti-smoking media, and exposure to tobacco smoking advertisements are be included.

METHODS OF DATA ANALYSIS

Empirical model specifications and estimations techniques

The dependent variable in in this study is whether the individual student (the unit of analysis) is susceptibility to smoke or not. Given the nested nature of the data, where students are clustered into classrooms and the classrooms in turn are clustered into schools, we specify the following latent continuous regression model:

$$SS^*_{ijk} = \alpha_0 + \alpha_1 PE_{ijk} + \varphi X_{ijk} + \varepsilon_{ijk} \quad (2)$$

where SS^*_{ijk} is expected value of smoking susceptibility variable. PE_{ijk} is peer effect which is the potential endogenous variable and is continuous in nature; X_{ijk} is set of controls (containing both individual, class and school level covariates); and ε_{ijk} is the error term.

SS^*_{ijk} is not observed, but we do observe the discrete choice made by the individual student according to the following decision rule:

$$SS_{ijk} = \begin{cases} 0 \; if \; SS^*_{ijk} < 0 \text{ (student } i \text{ within class } j \text{ in school } k \text{ is not susceptible to smoke)} \\ 1 \; if \; SS^*_{ijk} \geq 0 \text{ (student } i \text{ within class } j \text{ in schhol } k \text{ is susceptible to smoke)} \end{cases}$$

If ε_{ijk} is assumed to be normally distributed, then Eq 1, which is the structural equation, can be expressed in a probability format as the Probit model as follows:

$$P(SS_{ijk} = 1|X_{ijk}) = \Phi(\alpha_0 + \alpha_1 PE_{ijk} + \varphi X_{ijk}) \quad (3)|$$

where P and Φ refer to probability and cumulative normal density function, respectively. Estimating Eq 3 in its present form by simple Probit model would yield bias and inconsistent estimates because of the potential endogenous nature of peer effects. There are two reasons for this. First, there is possibility of unobserved heterogeneity arising from omitted

unobserved factors such as individual inherited circumstances, cultural values and norms that may correlate non-linearly with peer effects and mediate their impact on smoking susceptibility. Such non-linear interactions will cause the effects of peer influences to vary among the student population. To address such correlated effects of school selection and unobserved school-level characteristics we follow the current literature and control for school fixed-effects in our estimations (see Nikaj, 2017; McVicar & Polanski, 2014; and Fletcher, 2010). Second, it is probable that peer effect is potentially endogenous due to reverse causality with smoking susceptibility. For instance peer pressure affects the smoking decision of an individual student, but at the same time the smoking behaviour of the student also influences the behaviour of his peer group (Gaviria & Raphael, 2001; Mukong, 2017). Indeed, peer smoking and smoking susceptibility are jointly determined within a group; it is difficult to say whether it is the group that affects the individual or vice versa. This endogeneity due to simultaneity in behaviours will generate bias in OLS estimates of α_1 in Eq 1. We employ an instrumental variables (IV) methodology to address the simultaneity issue which is much likely to produce consistent estimates. In line with IV methodology in the literature, in the first stage, we project an equation for the potential endogenous covariate (the reduced form equation) as follows (Wooldridge, 2010; Diagne & Diene, 2011; Baye & Epo, 2015):

$$PE_{ijk} = \beta_0 + \varphi X_{ijk} + \sigma Z_{ijk} + \mu_{ijk} \quad (4)$$

where Z_{ijk} is a vector of instruments that correlates with peer effect but has no direct relationship with smoking susceptibility, the rest of the variables are as defined earlier. Endogeneity is reflected in the potential correlation of PE_{ijk} and the error term of the structural equation (ε_{ijk}). We attempt to address endogeneity issue by identifying instruments and using the

instrumental variables Probit (IV-Probit) approach to overcome the contaminating regression estimates, given the binary nature of the dependent variable.

Having specified the baseline models, we proceed to make a series of estimations. First, we perform a simple Probit estimation on the structural equation (Eq 3) assuming that there is no endogeneity. Then we employ IV-Probit estimation to address endogeneity of the peer measure on students' smoking susceptibility behaviour. As a robustness check we jointly estimate the structural smoking susceptibility model and the reduced form equation of the potential endogenous variable with the help of conditional mixed process estimation- (CMP)[1]. CMP is a method that fits a host of multi-equations which accommodates various types of dependent variables in each specified equation (Roodman, 2011). The dependent variable in this study is binary while the potential endogenous variable is continuous; thus the cmp approach is appropriate to jointly estimate the equations. Given the multi-level (hierarchical) nature of the data structure, we cluster the standard errors at the school level to allow for errors to be correlated within the school.

Identification strategy and assumptions

To properly identify the reduced form equation, we need to find appropriate instruments. The instruments must respect two theoretical assumptions (Wooldridge 2010). First, the instruments must be valid in the sense that they correlate with peer effects and are uncorrelated with smoking susceptibility. Second, the instruments must be exogenous; that is, the exclusion restriction criterion must be respected. This means that the instruments can affect susceptibility to smoking only indirectly through the effect they exert on the peer effects variable.

[1] Conditional mixed process estimation (cmp) is a Stata friendly user programme developed by Roodman (2011). CMP

We follow previous studies in the literature to construct instruments for our study (Ali & Dwyer, 2010; Fletcher, 2010; Bifulco et al., 2011; and Gaviria & Raphael, 2001). First, Ali & Dwyer (2009) and Nikaj (2017) have established that parental smoking as well as the frequency with which an individual sees non-family members smoke in their home increases the likelihood of an individual to smoke. Based on this we construct a non-self-home exposure to smoking variable which captures the proportion of classmates, excluding the individual student, whose parents and relatives smoke at home to instrument for peer smoking effects. In line with Gaviria & Raphael (2001) it is difficult for any individual student to have perfect information about their peers' household and background characteristics. Therefore, the proportion of the individual's classmates whose parents smoke should not correlate with that individual's smoking susceptibility. The transmission pathway is indirect through increased smoking of the classmates, which will in turn affect the smoking behaviour of the student. Second, Bifulco et al., (2011) and Nikaj (2017) have proposed instruments that account for random variation in the age and sex composition of a student's classmates to instrument for peer effect behaviour. In a classroom setting, variation in age and sex of the students is mostly random. In this wise, some students may find themselves, by chance, in a class where there are more boys than girls and /or there are older students. We lean on this to construct two additional instruments: non-self-class mean age and a non-self-male proportion of classmates. We expect a direct correlation between the age and sex composition and the peer effects variable because students in such a class will be exposed to a higher share of older and male classmates who are more likely smoke. But the peer age/sex composition is uncorrelated with individual smoking susceptibility, except through an indirect path of a higher proportion of smoking class peers. In this study therefore we shall use the three variables to instrument for peer effects and conduct

statistical tests to verify whether the instruments are appropriate.

ESTIMATION RESULTS AND DISCUSSION

In this section we present the results of the study, robustness check analyses and discuss the findings. We begin with the presentation of descriptive statistics.

Descriptive Statistics

Table I shows the weighted descriptive statistics for the variables used in the study.

Table 1: Weighted descriptive statistics for variables

Variable	Obs	Weight	Mean/ prop	Std Dev	Min	Max
Dependent variable						
Smoking Susceptibility	2,922	955605	.187542	.390413	0	1
Potential endogenous variable						
Peer smoking	2,810	919459.197	.032231	.020669	.002902	.082728
Exogenous variables						
Age (years)	2,920	955022.072	14.3387	1.610392	11	17
Sex (Male =1, 0 female)	2,920	954888.717	.555479	.4969976	0	1
Pocket allowance (CFA F)	2,913	952971.139	1237.89	2297.659	0	15000
Ever smoked (1=yes)	2,811	919769.642	.176444	.3812661	0	1
Exposure to smoking on campus (1=yes)	2,891	946065.822	.251816	.434131	0	1
Exposure to anti-smoking media messages (1=yes)	2,893	946931.394	.673349	.4690693	0	1
Exposure to tobacco advertising (1=yes)	2,922	955605	.253593	.435142	0	1
Instruments						
Non-self-home exposure to smoking	2,921	955294.555	.289969	.043404	.228136	.340365
Non-self-class mean age	2,919	954711.627	14.3388	.936436	13.2103	15.5452
Non-self-male proportion of classmates	2,810	919459.197	.031089	.019926	.002812	.080168

Source: Computed by authors

Observe on table 1 that out of a total of 2922 students, 18.75% were susceptible to smoke. The average age of students in the survey was 14.34 years.

Out of 2920 students, 55.54% were males while 45.46 were females. On average 25.18%, 67.33%, and 25.35% of the students were exposed to smoking on campus, anti-smoking media messages and tobacco advertisements respectively. Out of 2811 students, 17.64% have ever experimented smoking by taking one or two puffs of cigarettes.

Indicative tests for instruments

Before we present the results of our estimations, we briefly review the reliability and the validity of the instrumental variables used in the study. Given that exact tests of the non-linear structural model (the IV-Probit) is not straightforward to calculate, we present and discuss indicative tests obtained from a standard IV/2SLS model, under the assumption that if these tests validate the instruments we can expect the same validity or invalidity in our specified non-linear model (see Obi et al., 2020; Regmi & Paudel, 2017). More precisely, we assume a Linear Probability Model (LPM) and run the *ivreg2* command in Stata to obtain test statistics for the instruments. Table 2 shows the results of the indicative IV tests based on standard IV/2SLS method.

From Table 2, we reject the hypotheses underlying the under-identification tests, and therefore our instruments are not under-identified. The Hansen-J statistic suggests that we fail to reject the null hypothesis meaning that the instrumental variables are valid as instruments in which case they can be rightfully excluded from the structural equation. Furthermore, Cragg-Donald Wald F statistic of weak identification dictates that we reject the hypothesis of weak instruments. The final test in Table 2 indicates that peer effect should not be considered as exogenous. Conclusively, we are comfortable to say that the use of IV technique is appropriate, and that the proposed instruments are valid and reliable.

Table 2: Indicative instrumental variable tests

Instrumental variables [a]	
Under-identification test (F test of excluded instruments) H_0: instruments are jointly irrelevant in first stage	15.76 Prob>F=0.0000
Under-identification test (KleibergenPaap rk LM Statistic)) H_0: model is under-identified, instruments are not good	36.598 p-val = 0.0000
Over-identification test (Hansen J statistic) H_0: exclusion restrictions of instruments are valid	0.476 p-val=0.639
Weak identification test (Cragg-Donald Wald F statistic) Stock-Yogo weak ID test critical values: 5% maximal IV relative bias 10% maximal IV relative bias 10% maximal IV size 15% maximal IV size H_0:weakly identified system	46.804 16.38 8.96 20.66 14.93
Endogeneity test of endogenous regressor H_0: variable can be considered as exogenous	9.161 p-val = 0.0025

Note: (a) The other explanatory variables are the exogenous variables as in Table 1
Source: Computed by authors

Structural equation estimates

Table 3 shows estimates of the structural susceptibility to smoke model (Eq.4) under various assumptions. Estimates of the simple Probit model are presented in Column one. Column two harbours estimates of the IV-Probit model; while column 3 displays the marginal estimates for the conditional mixed process regression. Both columns two and three correct for potential endogeneity of peer effects. We report the average marginal effects to facilitate interpretation of the results.

Table 3: Structural equation estimates: Marginal effects

Variables	***Simple Probit*** (col.1)	***IV- Probit*** (col.2)	***CMP reg.*** (col.3)
Peer effect	1.424713*	5.699888**	5.71735**
	(.728867)	(2.812543)	(2.815157)
Age-square (years)	.0046399	.0182576	.0169641
	(.002879)	(.0118068)	(.0119473)
Sex (Male =1, 0 female)	.0419952**	.1770718**	.1737843**
	(.020135)	(.0823189)	(.0836823)
Pocket allowance (CFA F)	.0166197***	.0644136***	.0698678***
	(.006336)	(.0264509)	(.0272921)
Exposure at home to smoking (1=yes, 0 otherwise)	.0830984***	.3241433***	.3059541***
	(.0220787)	(.082407)	(.0826079)
Exposure to anti-smoking media messages (1=yes, 0 otherwise)	-.0597913***	-.233885***	-.2326388***
	(.0242853)	(.095538)	(.09569)
Exposure to tobacco advertising (1=yes, 0 otherwise)	.0586695***	.2322715***	.2334237***
	(.0239445)	(.0945309)	(.0946245)
Obs	2774	2774	2774
Wald chi2	44.61	44.53	3312365.24
Prob>chi	0.0000	0.0000	0.0000
Pseudo R-sq	0.0415	-	-
Log pseudo-likelihood	-1258.6721	16889.093	16880.919
Wald test of exogeneity (corr = 0): chi2	-	7.18	-
Prob > chi2		0.0074	-

Figures in parentheses represent robust standard errors clustered at school level.
**** p < 0.01; ** p < 0.05; * p < 0.10*
Source: Authors

We report the First-stage (reduced form equation) coefficients of the regression models on Table 1A in the Appendix. The First-stage results show that the instrumental variables we use perform reasonably well as they are consistently statistically significant at the 1% level for both models. In addition to the indicative tests for instruments' reliability and validity on Table 2, we test for exogeneity of the potential endogenous variable using the estimate of *athanhrho* that is part of the CMP output generated by CMP command in Stata. It is linked to the correlation between the residual terms of the structural and reduced form equations. The null hypothesis is that this correlation is zero which signifies that the peer effect variable is exogenous to the error term in the susceptibility to smoke equation. Observe on Table 1A that we do have evidence against exogeneity (i.e. *athanrho* is statistically significant at the 1% level), thus the use of IV and cmp approaches are justified. In addition, the Wald test of exogeneity (corr=0) results is reported on Table 1A and suggest that we reject the null hypothesis of no endogeneity at the 1% level of significance and conclude that there is evidence of endogeneity and consequently the IV approach is in fact needed.

Peer effect is the key variable of interest in this study and as intimated earlier, the simple probit estimates (Table 3, Col. 1) are likely to be biased due to potential endogeneity attributable to reverse causality. IV-Probit and CMP marginal effect estimates on Table 3 columns two and three respectively correct for the endogeneity issue and hence we do not interpret the results on Column 1. A key regularity of estimates in Table 3 is that peer smoking effect has an increasing effect on individual student susceptibility to smoke behaviour. More specifically, a 1% point increase in peer smoking is linked to 1.42% points increase in susceptibility to smoke when when endogeneity is not corrected (see Table 3 Col. 1). When endogeneity is addressed using

the IV-Probit method, a 1% point increase in peer smoking increases the probability of individual student susceptibility to smoke by 5.69% points, and by 5.71% points using the cmp estimation approach. These results indicate that if we fail to address the endogeneity problem, the influence of peer smoking on individual student susceptibility to smoke will be severely under-estimated. The effect of peers on susceptibility to smoking is of particular interest because students spend a large proportion of their time in contact with their peers in and outside of school (Barnes et al., 2007). Students in secondary school are within the age bracket of adolescents and this transition in their life can be quite challenging. This is the time they experiment and come under pressure to try things they know are not right. For instance, the new environment and new faces in school can be overwhelming and intimidating. Indeed, peer pressure makes adolescents feel as if they are being pulled in opposite directions. They may not want to do what they are being pressured to do, but they consent to do so because they are afraid of losing their friends. It is of great concern to adolescents to be in their peers' good books and they really want to avoid feeling like outsiders among their peers (Mulvihill, 2014). Thus, in line with the theories of planned behaviour and social learning adolescents may engage in smoking with their peers with the intention of identifying with them and being accepted in the group (see Simpson, 2000; Ajzen, 2015; Foo et al., 2015; and Hall et. al., 2016). By seeking for acceptance adolescents strive to join with peers, which in turn, may influence them to participate in undesirable activities such as smoking.

As expected, smoking susceptibility is associated significantly with the smoking behaviour of parents and relatives at home. This is evident on Table 3 col. 2 where a 1% point increase in a student's exposure to smoking at home increases the likelihood of smoking susceptibility by 0.324% points, and this association is significant at the 1% level. Consistent

with socialisation theory, it is within the family that the first process of socialisation occurs, and therefore this finding is not a surprise.

Exposure to anti-smoking media messages has a protective effect, as it significantly reduces at the 1% level, the likelihood of susceptibility to smoking by 0.233% points given a 1% point increase in peer smoking effect. We observe further that a 1% point increase in students' exposure to billboard tobacco advertising increases significantly their likelihood of susceptibility to smoking by 0.233% points. These results are consistent with previous findings in the literature such as Guindon et al., (2012); Nikaj (2017) and Mukong (2017).

Male students are found to be significantly more likely to be susceptible to smoking than girls while age is positively and insignificantly associated with smoking susceptibility. Similar findings have been recorded in the literature by Pertold, 2009; Aslam et al., 2014 and Awono, 2015. Students who have pocket money are more likely to be susceptible than students who have little or no access to pocket income. This finding is in line with studies by Rozi & Akhtar (2004) and Polanska et al., (2022). This indicates that pocket money is a risk factor for smoking susceptibility, and therefore parents need to pay particular attention to how their children use pocket money in school. Furthermore, the role of pocket money in susceptibility to smoking needs to be considered together with students' easy access to tobacco products in the school milieu.

CONCLUSION AND POLICY IMPLICATIONS

The goal of this study was to determine the effect of peer pressures on susceptibility to smoke among secondary school students in Cameroon based on the 2014 Cameroonian Global Youth Tobacco Survey. We address several challenges in estimating peer influences on student susceptibility to smoke behaviour at the school level. To remove the variation

that arises in group behaviour because of sorting into schools and unobserved school characteristics, we use school fixed-effects. By clustering the errors at the school level, we use variation in behaviours between classes within schools to identify the effect of peer smoking on individual susceptibility to smoke behaviour. We use instrumental variable estimators to control for simultaneity in peer effect and susceptibility to smoke in student behaviours. We establish robustness of results by jointly estimating the structural smoking susceptibility function and the reduced form equation of the potential endogenous variable with the help of conditional mixed process estimation.

The results in this study provide evidence of the importance of peer influences for student smoking susceptibility behaviours. We find consistent evidence that student smoking susceptibility is responsive to peers influences across all the estimation methods. We establish that a 1% point increase in peer smoking increases the probability of student smoking susceptibility by 5.70% points on average. This finding clearly indicates that having friends who smoke is the most important predictor for teenage smoking uptake. This finding implies that any policy intervention to reduce student smoking susceptibility must consider the social multiplier effect of peer pressures. This is because policies affecting some individuals in the peer group are most likely to spill-over to others through the peer effect. The education of secondary school children with respect to the detrimental effects of smoking and influence of the school environment is one way of addressing the health of the future generation. Public health campaigns against tobacco consumption should target not only the individual students by intensifying anti-tobacco campaigns but also the households of adolescents attending school.

The study provides adequate information on covariates associated with susceptibility to smoking among secondary school students in Cameroon, and acts as a pointer to the design of effective strategies within

the framework of future programs aimed at stemming out the smoking scourge among students in the country. The findings suggest that proactive action should be implemented to reduce the risk of smoking among students in the future, by reducing all the factors connected with the susceptibility to smoking. It would be policy effective to implement anti-smoking programs with more emphasis on: (i) male rather than female students because findings indicated that males are more likely to smoke than females; and (ii) students with friends/parents or relatives who smoke. This suggests that we need interventions that focus on educating students and household members as well. Proper implementation of anti-tobacco strategies must include students, parents, school authorities and enforcement authorities to reduce smoking initiation among secondary school students in the country.

While we have been able to address some important issues in estimating peer effects on susceptibility to smoke, some limitations remain. Firstly, all the estimates in our regression models were based on self-reports by the students which may be affected by reporting bias. Secondly, due to data limitations, we are unable to control for a rich set of individual characteristics such as parental education, household income, and home environment. Since these characteristics are strong correlates of susceptibility to smoke variable, our regression estimates may reflect the peer effect with some degree of bias. Thirdly, the assumption that all sorting takes place at the school level with no additional sorting into classes may be restrictive. Sorting into classes is possible if parents are able to choose the class into which their child is placed. This can be done if parents are able to choose particular teachers or characteristics of the peer group for their children. However, this is very unlikely in the Cameroonian educational system. Finally, our analysis is conducted for secondary school students and should be interpreted only as reporting peer effects at the school level. This is because the GYTS is a school-

based survey and cannot capture teens that are no longer in school. Therefore, care should be taken not to generalise the findings to youths outside of the secondary educational system of Cameroon. Despite the limitations stated above, this study provides an important insight into the correlates of susceptibility to smoking in secondary schools in Cameroon.

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APPENDIX

Tabe 1A: Estimates of the Peer effect model

Variable	*IV-Probit first-stage estimates (col. 1)*	*CMP Peer effect estimates (Col. 2)*
Age-square (years)	1.00e-06	1.13e-06
	(2.72e-06)	(2.68e-06)
Sex (Male =1, 0 female)	.0001701***	.0001708***
	(.0000172)	(.0000174)
Pocket allowance (CFA F)	-.0000118*	-.0000128*
	(6.83e-06)	(6.84e-06)
Exposure at home to smoking	-.0000601**	-.0000601**
	(.0000213)	(.0000213)
Exposure to anti-smoking media messages	-.0000214	-.000029
	(.0000203)	(.0000223)
Exposure to tobacco advertising	-.0000214	-.0000214
	(.0000203)	(.0000203)
Non-self-home exposure to smoking	-.0050773***	-.0050773***
	(.0009889)	(.0009889)
Non-self-class mean age	-.0000552***	-.0000552***
	(.0000194)	(.0000194)
Non-self-male proportion of classmates	1.038238***	1.038238***
	(.0015523)	(.0015523)
Constant	.0021958***	.0021958***
	(.0003838)	(.0003838)
Obs	2774	2774
athrho2_1	-.1066617***	-
	(.039814)	
lnsigma2	-7.958171***	-
	(.0579745)	
Wald chi2	44.53	3446256.83
Prob>chi	0.0000	0.0000
Log pseudo-likelihood	16889.093	16880.919
Wald test of exogeneity (corr = 0): chi2	7.18	-
Prob > chi2	0.0074	-
lnsig_2	-	-7.958171***
		(.0579745)
atanhrho_12	-	-.1066619***
		(.039814)
sig_2	-	.0003498
		(0000203)
rho_12	-	-.1062592
		(.0393645)

Figures in parentheses represent robust standard errors clustered at school level.

**** p < 0.01; ** p < 0.05; * p < 0.10*

Source: Authors