The Effect of Urban And Rural Locality on Student's Perception of E-Cigarette Use

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Introduction

Electronic cigarettes, commonly known as e-cigarettes, are devices that simulate smoking tobacco. According to the Centers for Disease Control and Prevention (2021), most e-cigarettes contain nicotine, which is highly addictive and can harm adolescent brain development. The use of e-cigarettes is unsafe for kids, teens, and young adults. This poses a risk as among both middle school and high school students in the US, e-cigarettes were the most commonly used tobacco product (Jamal, A. et al., 2017).

In Canada, there have been multiple regulations to combat the increasing popularity of e-cigarette use. These range from regulating the minimum age to use on a federal level, to advertising and necessary package labeling such as health warnings (Health Canada, 2021).

To truly combat the harm that e-cigarettes can cause the youth, I believe it is important to supplement regulations with a proper understanding of the risks posed to the youth. Targeted education can be a keystone in decreasing e-cigarette use. By utilizing data from this study, purposeful advertisement campaigns or other methods of raising awareness and informing youth can be developed to help prevent e-cigarette use. This paper tackles the question of how a school's location in an urban or rural area affects its students' perception of e-cigarette use in Canada. To answer this question, the Canadian Student Tobacco, Alcohol and Drugs Survey 2018/2019 is used. Measuring risk perception can shed light on future e-cigarette use, as supported by Vogel et al. (2021), according to whom higher risk perceptions are associated with a lower likelihood of e-cigarette use. By taking into account the student's current smoking status, their sex at birth, and their grade, we use regression analysis to explore this dataset.

Background

While the benefits and harms of e-cigarette use remain highly debated, there have been considerable studies that approach the topic of the association between e-cigarette use and user's age, sex, smoking habits, association with marijuana, alcohol and illegal drug use. The control variables used in this study were decided upon reviewing past literature on student attitudes toward e-cigarette smoking and their risk perceptions. According to Vogel et al. (2021), "nicotine vaping is associated with older age" in the age group of 13-20. The sex of the individual and past smoking habits also play a role in the perception. According to Tan & Bigman (2014), current smokers are more likely to view e-cigarette use as less risky. .

While there have been studies linking the Canadian youths' smoking habits with the region their school is in (Plotnikoff et al., 2004), to the best of my knowledge, this is the first study that studies the relationship between regions of students' schools and e-cigarette use risk perception.

Data

The secondary data analysis for this study is based on the Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) 2018/2019. It is sponsored by Health Canada and conducted by Statistics Canada. The respondents are students in Canadian schools, from grades 7 to 12. The total sample for this survey is 62,850 individuals. As outlined later, the students who responded "I do not know" to the perceived risk of e-cigarette use have been excluded. Further, 79 observations were removed due to missing values for whether the school belonged to an urban or rural region, and so the number of samples studied is 55,218.

The main outcome in this study was “perception of e-cigarette use”. This was measured based upon the question, “How much do you think people risk harming themselves when they do each of the following activities? Use an e-cigarette with nicotine once in a while” (Response PH_051). The respondents were provided the following options: “1. No risk”, “2. Slight risk”, “3. Moderate risk”, “4. Great risk”, “5. I do not know”. By eliminating respondents who responded with 5, we can divide the responses into 2 categories, those who think e-cigarette use is risky, and those who do not perceive it as such. Responses 3 and 4 are grouped into the ‘risky’ category, and responses 1 and 2 are grouped into the ‘not risky’ category, and this new variable is treated as a categorical variable.

The main independent variable here is whether their school is classified as belonging to a rural area or an urban area (DVURBAN), asked by the question: “Is the respondent’s school in an urban or rural region?”. The response 1 here represents urban, and 2 represents rural, and as such is treated as a categorical variable.

Covariates were used to try and isolate the effect of the school's region. These are discussed here. The grade the student is in (GRADE) is measured by the question, “What grade are you in?” The responses were from 7 to 12, and this is treated as a continuous variable. The sex at birth of the student (SEX) is also measured with response 1 standing in for female, and 2 for male. To include the effect of cigarette smoking on risk perception for e-cigarette use, the variable for smoking status included in the survey (DVTY1ST) was used. This is derived by Statistics Canada, based on multiple responses in the survey. 1 here represents a current smoker, 2 a former

smoker, and 3 a never smoker. The table given below summarizes the values of the variables based on the names assigned to them in the CSTADS survey.

Variable	Mean	Standard Deviation	Minimum	Maximum
PH_051	0.4608568	0.49847	0	1
DVURBAN	1.230031	0.4208559	1	2
GRADE	9.225962	1.595789	7	12
SEX	1.499539	0.5000043	1	2
DVTY1ST	2.926093	0.3673024	1	3

Table 1 - Summary of Regression Variables

Methodology

To analyze the data, a linear regression was run on R, version 4.1.1. The appendix contains the code used to arrive at the results. The regression is of the form:

$$Y_i = \beta_1 + \beta_2 D_i + \beta_3 X_{1i} + \beta_4 X_{2i} + \beta_5 X_{3i} + \beta_6 X_{4i}$$

Here Y_i is the outcome variable, which is e-cigarette risk perception, and D_i is whether the student's school is in an urban or rural setting. The $X_i's$ are the covariates. The results section goes into more detail about what these covariates are.

For the regression to be causal, several assumptions are required. The first one is the Conditional Independence Assumption (CIA). This here means that for given grade, sex and smoking status of the student, the potential outcome of risk perception of e-cigarette use is independent of whether the student's school is in an urban or rural region. We also assume that the covariates

occur with similar frequency in students in both urban and rural regions. Finally, for the regression model to be robust, there should not be any omitted variables that impact risk perception.

Results

The results of the regression are given as follows in Table 2.

Coefficients (Related Covariate Interpretation)	Estimate	Std. Error	P-value
β_1 (Intercept)	0.601474	0.018174	<2e-16
β_2 (School region is urban or rural)	-0.043475	0.004995	<2e-16
β_3 (Grade of student)	-0.028553	0.001331	<2e-16
β_4 (Whether student is male)	-0.085810	0.004192	<2e-16
β_5 (Whether student is a former smoker)	0.056847	0.026865	0.0343
β_6 (Whether student is a never smoker)	0.182868	0.011822	<2e-16

Table 2 - Summary of Regression Results

For ease of interpretation, positive values mean that the factor contributes to a more risky perception of e-cigarette use. With these results, we can see that in both regressions, students attending school in rural areas tend to perceive occasional e-cigarette smoking as less risky compared to those attending school in urban areas.

Also, perceived risk tends to decrease with students being in higher grades, and thus being older. Male students also tend to associate use of e-cigarette with less risk than female students. Moreover, students who currently smoke associate e-cigarette use as less risky than those who have never smoked, and even those who were former smokers.

Discussion

This study sheds light on the differences between e-cigarette smoking in urban and rural areas. As e-cigarette use becomes more common, it is important to continually assess trends in the population while introducing ways to increase awareness among students.

The findings in this report regarding age, sex and smoking habits playing a role in risk perception line up with other reports. The findings regarding the school's region playing a role in perception are subject to a few limitations. Firstly, CSTADS covers only students from schools, thus these findings cannot be generalized to youths who are being home-schooled or have dropped out of school. The data is also self-reported, and thus the findings can suffer from bias. Also, the wording of questions and responses can have an impact on reported use and perception. Further, the relevance of former smokers perceiving higher risk than current smokers can be considered insignificant at the 0.01 level. Regarding causality, it is quite difficult to completely remove omitted variable bias. This would require the identification and measurement of all factors that contribute to an increased or decreased risk perception of e-cigarette use.

Extension

It would be important to understand why there is a difference in the risk perception between urban student populations and rural student populations. Since e-cigarette use is a result of

multifaceted factors, a comprehensive study tackling the underlying reasons could help decrease use among students. It would also be of interest to include other controls which are often associated with smoking cigarettes. One such would be bullying. A more comprehensive study to assess risk perception of e-cigarette use might include these.

Conclusion

The CSTADS is a large cross-sectional survey and using it, we can decisively say that students studying in rural areas have a higher likelihood of e-cigarette use, associated with their lower risk perceptions. With the increasing popularity of e-cigarettes, it is of utmost importance that public health professionals understand where to best allocate resources to have the biggest impact. As such, this study provides a look at tackling this problem. It should be noted that trends among groups should be tracked closely in order to effectively address the rising popularity of e-cigarette use as new regulations continue to be passed.

By understanding the reasons behind e-cigarette use, hazardous behaviors can be reduced, thus preventing the social burden of disease from growing among young Canadians.

References

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