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Implementation and evaluation of a school-based anti-tobacco program in Mauritius: a pilot study to assess the usefulness and reliability of a tobacco use prevention education instrument

By

Shariah Hussenbocus

A Thesis
Submitted to the Faculty of
Mississippi State University
in Partial Fulfillment of the Requirements
for the Degree of Master of Science
in Food Science, Nutrition, and Health Promotion
in the Department of Food Science, Nutrition, and Health Promotion

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Shariah Hussenbocus

2018

Implementation and evaluation of a school-based anti-tobacco program in Mauritius: a pilot study to assess the usefulness and reliability of a tobacco use prevention education instrument

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Tobacco use among Mauritian adolescents has increased steadily since 2008. Currently, Mauritius has not implemented any school-based anti-tobacco program and there is no instrument to assess the effectiveness of existing anti-tobacco school policies. Since the first cigarette can rapidly lead to nicotine dependence, targeted interventions must be assessed before established patterns of smoking appear. This study evaluated a tobacco use prevention education instrument to determine the effectiveness of a school-based anti-tobacco program. 26 male students completed a survey before and after receiving anti-tobacco lessons. Smoking initiation age could not predict likelihood of tobacco addiction ($r(12)=0.320$, $p=0.311$). However, after receiving the anti-tobacco lessons, participants were less likely to believe that youth who smoke have more friends ($p<0.001$) and were more knowledgeable about tobacco's dangers ($t(25)=3.94$, $p=0.001$). This indicated that, with a few changes, the instrument can be used to assess the implementation of a school-based anti-tobacco program in Mauritius.

DEDICATION

This thesis is wholeheartedly dedicated to the finest life-coaches and friends anyone could hope for, Rehana Tegally and Ihsan Hussenbocus, my parents. Your impressive commitment to helping vulnerable populations has inspired me to believe in, and work for, a healthier Mauritius. I cannot thank you enough for your continued encouragement and for enthusiastically supporting me, over the years, in my determination to find and realize my potential, especially when I doubted myself.

I also dedicate this work to my sister, brothers, and brother-in-law for their unconditional support and suggestions that have helped me fine-tune this anti-tobacco program. To Kareem, my elder brother, who was always keen to know what I was doing and how the thesis was proceeding.

To my undergraduate lecturers at IIUM for their patience with my relentless need to dig deeper and target the roots of health issues.

This thesis is also dedicated to Dr. Brittney D. Oliver. Without your priceless guidance, this program would never have existed. On behalf of the 26 children involved in this study and all those who will receive the anti-tobacco program, thank you for your time and commitment to making this world a better place.

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I thank God Almighty for granting me the knowledge, ability, and opportunity to complete this research study. Without His endless blessings, this achievement would not have been possible.

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To the school board, the school principal, the teacher who taught the five lessons, the study's participants, and the students' parents, thank you for having made this research possible.

Finally, I would like to thank the two guest-speakers who came to my high-school, during my seven years as a high-school student, to try and discourage us from initiating smoking. These two events made me question the effectiveness of the existing anti-tobacco programs for Mauritian teenagers and, 14 years later, helped me implement a program which, I hope, will bring change to the Mauritian anti-tobacco education system for adolescents.

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CHAPTER I

INTRODUCTION

The sustained drive to reduce tobacco consumption in Mauritius has led local health authorities to organize regular anti-tobacco campaigns throughout the island. Despite these efforts, 41% of Mauritian adults were still using tobacco in 2015 (World Health Organization, 2017a) while the prevalence of tobacco use among Mauritian teenagers increased from 15.1% in 2011 to 17.7% in 2017 (Global School-based Student Health Survey, 2017). Unfortunately, the Mauritian anti-tobacco campaigns are not tailored to youth and, therefore, unlikely to generate teenagers' interest or to be effective in dissuading them from initiating smoking or encouraging them to quit (Flay, 2009; Hamilton, O'Connell, & Cross, 2004).

Effects of initiating smoking during adolescence

Russell (1971) was a pioneer in recognizing the impact of the first cigarette smoked during teenage years. He reported that it takes no more than three or four casual cigarettes in this sensitive period to ensure evolution to regular dependent smoking within a few years (Russell, 1971). However, this concept ran against the 1970s conventional wisdom about nicotine addiction (DiFranza, 2008). Back then, scientists believed that (i) nicotine addiction took years to develop, (ii) dependence only occurred after extensive use of tobacco, and (iii) someone who smoked less than five cigarettes per day was not addicted (DiFranza, 2008). Decades later, many scientists began questioning the dogma

about nicotine addiction in teenagers; this led to the publication of various studies which indicated that teenagers could become addicted to nicotine before the onset of daily smoking (DiFranza et al., 2000). However, when Dr. Joseph DiFranza presented his findings in February 2000, and reported that teenagers could experience symptoms of addiction after smoking just one or two cigarettes, he ‘‘was widely regarded as the professor who had not read his textbook correctly’’ (DiFranza, 2008; DiFranza et al., 2000). As teams of researchers began replicating these findings, new research overturned the dogma regarding cigarette addiction during adolescence (DiFranza, 2008). Findings from these studies also raised questions of how nicotine addiction could occur so rapidly in this age group and why teenagers reported increased addiction over time despite enjoying smoking less (DiFranza, 2008). The definitions of tobacco addiction and withdrawal symptoms in teenagers were later revised (DiFranza, 2008).

Anti-tobacco policy efforts in Mauritius

Mauritius has made progress in implementing anti-tobacco legislation and awareness programs. For instance, since 2005 in Mauritius, smoking is prohibited in various public places as well as in public transports, and advertising of tobacco products is banned (Green et al., 2014). Moreover, in 2009, Mauritius successfully implemented pictorial health warnings, and in 2011, the government launched a national anti-tobacco mass media campaign (Azagba et al., 2015; Green et al., 2014). Cigarette tax has been increased several times since 2008 in an attempt to deter Mauritians from smoking (Azagba et al., 2015; The Ministry of Finance and Economic Development, 2016). According to the 2010 International Tobacco Control (ITC) Mauritius Report, in an

attempt to prevent minors from smoking, the government banned the sale of tobacco to teenagers and by teenagers in 1999 and 2009, respectively. This report also states that tobacco retailers must display signs which clearly indicate that cigarettes will not be sold to adolescents. The 2012 ITC Mauritius Report states that the sale of single or 'loose' cigarettes has also been banned on the island, and cigarette retailers can legally sell only packs that contain 20 cigarettes. Furthermore, this report also states that it is illegal, in Mauritius, to sell toys, sweets, and any other products that resemble cigarettes. To facilitate smoking cessation among teenagers, the Mauritian health authorities are working on increasing anti-tobacco policies in schools. For instance, no smoking policies will be more strictly enforced in schools and medical doctors employed by the Ministry of Health will conduct annual routine health check-ups in Mauritian schools. During the check-ups, the doctors will inform the students about the health hazards of smoking (The Ministry of Health and Quality of Life, 2012).

Rationale of this research project

While the anti-tobacco efforts of the Mauritian authorities are to be applauded, smoking prevalence among Mauritian adolescents has increased from 13.7% in 2008 to 15.1% in 2011 (World Health Organization, 2013). Moreover, in 2008, 62.3% of current adolescent smokers in Mauritius wanted to stop smoking (Global School-based Student Health Survey, 2013; World Health Organization, 2013) and 58.5% had unsuccessfully tried to quit smoking (Global School-based Student Health Survey, 2013). These statistics indicate that anti-tobacco control measures and awareness programs implemented in Mauritius are not effective in discouraging adolescents from initiating

smoking and are relatively unhelpful when it comes to helping them quit smoking. It is likely that these anti-tobacco efforts are unsuccessful among teenagers since they target adults and research indicates that adolescents are not attracted to adult-oriented cessation techniques (Hamilton et al., 2004). Moreover, 77% of teachers in Mauritius believe that teachers need specific training to help students avoid tobacco use and only 7.2% of teachers in Mauritius have access to adult-oriented teaching materials on tobacco use (Global Youth Tobacco Survey, 2008). Currently, students are only taught about the adverse health effects of smoking during annual, routine health checkups or one-hour anti-tobacco talks organized by the Ministry of Health in schools. During these health checkups, the doctor would simply ask the students if they smoke and would briefly explain why smoking is a health hazard (Global Youth Tobacco Survey, 2008). The anti-tobacco talks only involve a guest-speaker talking about the dangers of smoking. As such, this method is unlikely to either generate teenagers' interest or to be effective since various reviews and meta-analyses indicate that purely informational and affective programs have no impact on behavior change (Flay, 2009). Furthermore, this anti-tobacco awareness program is conducted by one-time guests (such as social workers or doctors); this type of program has also been found to be ineffective, especially with regard to lasting effects (Flay, 2009). The Public Health Act of 2008 which bans the sale of single cigarettes is hardly applied in Mauritius and tobacco suppliers still sell cigarettes to minors (Framework Convention on Tobacco Control, 2010). The poorly implemented anti-tobacco regulations do not greatly impede teenagers' ability to buy cigarettes.

Since the first cigarette triggers the start of a process that leads quickly to established smoking and nicotine dependence, there is a need for targeted intervention aimed at adolescents before established patterns of smoking appear (Dierker, Swendsen, Rose, He, & Merikangas, 2012). These interventions could help prompt earlier and more successful smoking cessation and prevention efforts (Doubeni, Reed, & DiFranza, 2010; Zhan, Dierker, Rose, Selya, & Mermelstein, 2012). However, to our knowledge, no tobacco use prevention education instrument has been used in Mauritian schools and no evidence-based, adolescent-oriented anti-tobacco program has been implemented in the high schools of Mauritius. Besides teaching students about the dangers of smoking, no smoking prevention program has been implemented in Mauritius (Global School-based Student Health Survey, 2013). As such, this pilot study aimed to evaluate the usefulness and reliability of a tobacco use prevention education instrument after replacing existing school based anti-tobacco education programs with a validated curriculum designed for teenagers.

Purpose of this research project

The proposed research aims to evaluate the use of a tobacco use prevention education instrument to assess the effectiveness of implementing an anti-tobacco school-based curriculum in one high-school of Mauritius. The curriculum is designed to impart anti-tobacco skills and knowledge to Mauritian adolescents to help prevent smoking initiation or assist current smokers in cessation. Research indicates that school-based smoking prevention programs can have significant long-term effects (Flay, 2009) and could even deter adolescents from starting to smoke in the short-term (Thomas,

McLellan, & Perera, 2015). Moreover, anti-tobacco school-based interventions have been found to improve smoking-related knowledge and change attitudes towards smoking (Chen et al., 2014). Based on current evidence, a tobacco use prevention education instrument should help determine if an anti-tobacco program designed for Mauritian adolescents can promote a difference in attitude, belief, and knowledge before and after the curriculum delivery.

Research questions

The proposed research focuses on Grade 7 boys (aged 11 to 12 years, the equivalent of grade 6 in the U.S.) from one Mauritian high school. It is structured as studies 1 and 2, as described below:

i. Study 1 was descriptive. The aim was to assess if the instrument could reliably assess the prevalence of grade 7 boys who (a) smoked tobacco or use e-cigarettes (including hookah pens); (b) have tried to quit smoking; (c) have quit smoking successfully; and (d) have lost their autonomy over tobacco. This study also assessed the adolescents' attitudes, beliefs, and knowledge towards smoking tobacco based on their self-reported responses in the survey.
ii. Study 2 focused on the program. This study aimed to find out if the instrument could determine whether the evidence-based '*Hands Off Tobacco*! An Anti-Tobacco Program for Deaf Youth' program could help create a greater perceived exposure to tobacco prevention and control programming. It also aimed to determine whether the instrument could assess improvements in (a) anti-tobacco attitudes, (b) tobacco-related knowledge, and (c) tobacco-related beliefs among youth without hearing

impairments. The original versions of the instrument and the program were culturally adapted to make it easier for our population to relate to the contents.

Hypothesis

Due to the nature of study 1 which is descriptive, this study's hypotheses are based on study 2 only. The study evaluated the usefulness of a tobacco use prevention education instrument in assessing the implementation of a school-based anti-tobacco program in Mauritius and hypothesized that the instrument could help assess:

i. Whether the age of smoking initiation can increase the likelihood of tobacco addiction.
ii. If an adolescent-oriented anti-tobacco program could positively change the belief that smoking helps one fit in or have more friends.
iii. If an adolescent-oriented anti-tobacco program could help improve teenagers' attitudes, beliefs, and knowledge towards tobacco use.

CHAPTER II

LITERATURE REVIEW

The prevalence of tobacco use among Mauritian adolescents has been increasing steadily from 13.7% in 2008 to 15.1% in 2011 (World Health Organization, 2013) and to 17.7% in 2015 (World Health Organization, 2017a). Alarmingly, 58.5% of those who tried quitting smoking were unsuccessful (Global School-based Student Health Survey, 2013). This chapter reviews (i) how tobacco adversely affects adolescents and can lead to addiction much faster than in adult populations, (ii) the reasons why teenagers start smoking, (iii) the use of e-cigarettes among adolescents, (iv) a comparison of the different anti-tobacco programs for teenagers, and (v) anti-tobacco policy efforts in Mauritius and their effects on teenage smoking.

Tobacco dependence in adolescent smokers

Over the last decade, smoking in the adolescent population has been quite extensively studied. Unlike previously believed, cigarette addiction may not take years or regular smoking to develop (DiFranza, 2008). In fact, current research indicates that nicotine dependence is often rapid, especially among teenagers who can get hooked from their very first cigarette (Dierker et al., 2012; DiFranza, Savageau, Fletcher, Pbert, et al., 2007; Scragg, Wellman, Laugesen, & DiFranza, 2008).

Autonomy over tobacco is an index used to assess addiction; when quitting becomes difficult or unpleasant, the smoker is said to have lost full autonomy over

smoking (Scragg et al., 2008). Measuring loss of autonomy over tobacco in adolescent populations is important since it can help detect the earliest onset of tobacco dependence (DiFranza, Savageau, Fletcher, O'Loughlin, et al., 2007). This measure should help anti-tobacco counselors curb adolescent smoking by targeting addiction in its early stages. Moreover, loss of autonomy also predicts failed cessation and the progression of tobacco use (DiFranza, et al., 2007).

The Development and Assessment of Nicotine Dependence in Youth (DANDY-1) study was the first to show that adolescent smokers can lose autonomy rapidly with non-daily (intermittent) use. Using the Hooked On Nicotine Checklist (HONC), the DANDY-1 study indicated that adolescents experienced each of the ten symptoms of decreased autonomy within a few weeks following their first cigarette (DiFranza et al., 2000). This rapid loss of autonomy was confirmed by other studies (Scragg et al., 2008) including a 4-year longitudinal study involving sixth-grade students which showed that teenagers may experience symptoms of nicotine withdrawal long before they start smoking daily (DiFranza, Savageau, Fletcher, Pbert, et al., 2007). In fact, 50% of teenagers are likely to lose their autonomy by the time they smoke 7 or 8 cigarettes per month and 50% of teenagers who meet the *International Statistical Classification of Diseases, 10th Revision* (ICD-10) criteria for tobacco dependence usually do so by the time they are smoking one or two cigarettes per day and (DiFranza, Savageau, Fletcher, Pbert, et al., 2007). Research suggests that the most susceptible adolescents (those who feel relaxed after their first nicotine dose) will lose their autonomy within a day or two after the first puff from a cigarette (DiFranza, Savageau, Fletcher, Pbert, et al., 2007).

Effects of nicotine on the adolescent brain

The considerable neurodevelopment which occurs during adolescence along with the intrinsic plasticity of the developing brain explains why teenagers are more vulnerable to nicotine addiction compared to adults (Dwyer, McQuown, & Leslie, 2009). This could explain why the younger the age of smoking initiation, the higher the risks of developing nicotine dependence, and the more vulnerable adolescents become to chronic smoking (Dierker et al., 2012). Moreover, research indicates that, besides structural changes, nicotine exerts unique neurochemical effects on the limbic system of the adolescent brain. For instance, adolescent rats show greater nicotine-induced c-fos mRNA activation in the nucleus accumbens, the extended amygdala, and the prefrontal cortex – these are the brain regions associated with reward (Shram, Funk, Li, & Lê, 2007). Changeux (2010) also suggests that the number of nicotinic receptors in the brain of adolescent rats increases from the second dose of nicotine. These permanent changes can speed up the development of nicotine dependence since, the greater the number of nicotinic receptors, the more they will trigger the release of neurotransmitters such as dopamine, glutamate, and GABA which have been found to play a fundamental role in nicotine dependence (Benowitz, 2010).

Adverse effects of tobacco on young smokers

While it is often believed that chronic diseases induced by smoking usually start later in life, research indicates that adolescents who smoke may be more vulnerable to various smoking-related complications within a few years of smoking initiation (Park, 2011). For instance, teenagers who have been smoking for less than two years are at greater risks for

cardiovascular diseases since smoking reduces cardioprotective high-density lipoprotein cholesterol and increases vascular resistance that can promote atherosclerosis (Park, 2011). Moreover, Park (2011) explains that, besides damaging the airways, smoking can also cause bronchial inflammation and affect respiratory immunity thereby increasing the risks of both bacterial and viral infections in the respiratory system of teenagers. Smoking also alters the balance of cytokines, signaling molecules which regulate immunity and inflammation (Harel-Meir, Sherer, & Shoenfeld, 2007). As such, smoking can adversely influence the immune system thereby resulting in the formation of anti-DNA antibodies. These antibodies increase the risks of developing rheumatic diseases, namely systemic lupus erythematosus and rheumatoid arthritis (Harel-Meir et al., 2007) as well as Crohn's disease (U.S. Department of Health and Human Services, 2014).

Smoking during adolescence could further predispose adolescents to an elevated risk of chronic diseases by promoting abdominal obesity. Smoking at least ten cigarettes per day during teenage years could increase the risk of abdominal obesity in both men and women and overall overweight among women (Saarni, Pietiläinen, Kantonen, Rissanen, & Kaprio, 2009). It is likely that smoking affects the glucocorticoid mechanism which controls inflammation while also increasing psychosocial stress, two factors that could promote accumulation of abdominal obesity (Saarni et al., 2009). Moreover, new research suggests that early-onset obesity could explain the worldwide increase in autoimmune diseases such as rheumatoid arthritis, type 1 diabetes, multiple sclerosis, psoriasis, and Hashimoto's thyroiditis (Gremese, Tolusso, Gigante, & Ferraccioli, 2014; Versini, Jeandel, Rosenthal, & Shoenfeld, 2014).

Besides increasing the risk of chronic diseases, smoking also exerts adverse effects on cognitive function. Research shows that smoking during teenage years not only disturbs working memory and attention but also reduces the activity of the prefrontal cortex (Jacobsen, Mencl, Constable, Westerveld, & Pugh, 2007). The prefrontal cortex, the brain area which is responsible for attention, performance, and executive functions such as decision making, is still developing structurally and functionally during adolescence (Galván, Poldrack, Baker, McGlennen, & London, 2011; Jacobsen et al., 2007). As such, reduced activity of the prefrontal cortex could lead to deterioration in accuracy of task performance, acute impairment of verbal memory and higher risks of cognitive decline (Galván et al., 2011). Furthermore, smoking causes adverse neurological effects in teenagers; this can influence the ability of adolescents to make rational choices regarding their well-being, including the decision to quit smoking (Galván et al., 2011).

Finally, by interfering with the brain's limbic circuitry, smoking during adolescence also increases mood disorders and impulsivity that can persist into adulthood (Dwyer et al., 2009). Regarding impulsivity, Krishnan-Sarin et al. (2007) suggest that the more impulsive adolescents are, the less likely they are to abstain from smoking. Teenagers who smoke are also more likely to engage in high-risk sexual behavior, attempt suicide, get involved in fights, carry weapons, and use alcohol and other drugs (Karpinski, Timpe, & Lubsch, 2010).

Risk factors and protective factors for adolescent smoking

The Ecological Systems Theory suggests that the environment in which a person evolves influences lifestyle choices (O'Loughlin, Karp, Koulis, Paradis, & Difranza, 2009). For instance, teenagers are more likely to start smoking and to become regular smokers if their peers smoke (Dahlui et al., 2015; O'Loughlin, Karp, Koulis, Paradis, & DiFranza, 2009; Park, Yoon, Yi, Cui, & Nam, 2011; Wellman et al., 2016). Exposure to pro-tobacco messages in advertising (O'Loughlin et al., 2009) or movies (Wellman et al., 2016) can also increase smoking initiation among adolescents. Teenagers of parents who smoke are also more likely to initiate smoking (Wellman et al., 2016), especially if the mother smokes (Selya, Dierker, Rose, Hedeker, & Mermelstein, 2012). Using alcohol, cannabis or other tobacco products during teenage years also predisposes adolescents to cigarette smoking (O'Loughlin et al., 2009; Park et al., 2011). Risks of smoking onset also increased among adolescents with lower socioeconomic status, poor academic status, family members who smoke, sensation seeking or rebelliousness as well as intentions to smoke in the future (O'Loughlin et al., 2009; Park et al., 2011; Wellman et al., 2016). By contrast, teenagers with higher self-esteem and strong parental supervision or monitoring are less likely to start smoking (Wellman et al., 2016).

Adolescents' perceptions of smoking risks and benefits

Research suggests that most teens in the U.S. consider heavy smoking as a very harmful practice (Amrock & Weitzman, 2015; Roditis & Halpern-Felsher, 2015). However, misconceptions about the safety of light and intermittent smoking are widespread among U.S. adolescents (Amrock & Weitzman, 2015), and nearly 80% of

youth (12 to 17 years of age) engage in intermittent or non-daily (light) smoking (U.S. Department of Health and Human Services, 2014). In one study, only 64.3% and 33.3% of adolescents reported that light and intermittent smoking, respectively, are very harmful (Amrock & Weitzman, 2015). Research also suggests that male teenagers and youth who have a family member who uses tobacco are more likely to view light and intermittent smoking as safe (Amrock & Weitzman, 2015). It also appears that, as adolescents age, they are more apt to recognize the harmful effects of light and intermittent smoking compared to their younger peers although they still consider heavy smoking as being even more harmful (Amrock & Weitzman, 2015). As such, there is a need to bridge the age-related knowledge gap that exists in adolescents' perceptions of light and intermittent smoking since this type of tobacco use carries a similar risk for cardiovascular disease as daily smoking (Schane, Ling, & Glantz, 2010). Moreover, intermittent smokers may be just as vulnerable to nicotine dependence as daily smokers (Schane et al., 2010).

Besides underestimating the addictive properties of nicotine and the difficulties in quitting smoking, many adolescents believe that they would enjoy smoking and that smoking would help them relax and deal with problems and stress (Aryal & Bhatta, 2015; Roditis & Halpern-Felsher, 2015). Nepalese teenagers also believe that smoking would help them 'look cool,' 'become popular,' and appear 'more mature' (Aryal & Bhatta, 2015). However, American teenagers do not share this opinion and reported that smoking cigarettes would be viewed as laughable due to its adverse health effects (Roditis & Halpern-Felsher, 2015). This difference in opinion could indicate that public health campaigns in the U.S. have been effective in increasing awareness of adolescents

regarding the adverse health effects of tobacco as well as changing social norms around conventional cigarette use (Roditis & Halpern-Felsher, 2015).

Use and perception of e-cigarettes among adolescents

Electronic cigarettes (more commonly known as e-cigarettes, hookah pens or shisha pens) are battery-operated devices designed to vaporize a liquid solution of propylene glycol or vegetable glycerine (Giovacchini, Pacek, McClernon, & Que, 2017; Roditis & Halpern-Felsher, 2015). These e-cigarettes may also contain flavorings and nicotine, in doses similar to doses found in conventional cigarettes, to simulate the smoking experience. Since regulations regarding the sale of e-cigarettes are scarce (Wagoner et al., 2016), these devices are heavily marketed on the internet and via electronic communications as safer alternatives to smoking (Dutra & Glantz, 2014).

According to the National Youth Tobacco Survey (NYTS), the prevalence of high-school students in the U.S. who self-reported using e-cigarettes increased from 1.5% in 2011 to 13.4% in 2015 and then dropped to 11.3% in 2016 (Jamal et al., 2017). The aggressive marketing strategies used to promote e-cigarettes, their ease of access, and their perceived safety among teenagers could explain why the use of e-cigarettes among adolescents is high (Dutra & Glantz, 2014; Giovacchini et al., 2017). In one study, 4.6% of middle school students and 37.2% of high school students reported ever-use of e-cigarettes (Giovacchini et al., 2017).

Many teenagers consider e-cigarettes as a means to quit smoking (Lee, Grana, & Glantz, 2014; Wagoner et al., 2016) or as a bridge until they can smoke (Wagoner et al., 2016). Besides being readily available to teenagers, this age group also perceives e-

cigarettes as being classier and less harmful than regular cigarettes (Ambrose et al., 2014; Giovacchini et al., 2017; Roditis & Halpern-Felsher, 2015; Wagoner et al., 2016). Teenagers are also more likely to use e-cigarettes if their peers do so (Giovacchini et al., 2017). These younger populations also like that they can use e-cigarettes in places where smoking is prohibited (Primack et al., 2015) and that the devices are portable, relatively low-cost, and discreet (Wagoner et al., 2016).

Moreover, these e-cigarettes come in different flavors such as chocolate, strawberry, and licorice; flavorings have been banned in regular cigarettes since they appeal to youth (Dutra & Glantz, 2014; Primack et al., 2015). In an earlier draft of proposed regulations in 2014, the FDA intended to extend the flavor ban to e-cigarettes. However, this provision was annulled in 2016 (Pepper, Ribisl, & Brewer, 2016) for fear that the ban would result in the growth of an illicit market which could make flavored e-cigarettes more available and more attractive to teenagers (U.S. Department of Health & Human Services & Administration, 2016). Moreover, the ban could also result in consumers mixing their e-liquids, thereby increasing risks of accidental poisoning and the possibility of overdoses (U.S. Department of Health & Human Services & Administration, 2016).

Use of electronic cigarettes and progression to traditional cigarette smoking

Toxin levels in the vapors produced by e-cigarettes are 9 to 450 lower than levels in conventional cigarette smoke (Maciej Lukasz Goniewicz et al., 2014). However, most e-cigarettes contain between 0.5 to 15.4mg of nicotine (M. L. Goniewicz, Kuma, Gawron, Knysak, & Kosmider, 2013) and can, therefore, also cause nicotine dependence

in teenagers. In fact, research indicates that adolescents who initiate nicotine use through e-cigarettes are more likely to become conventional cigarette smokers within a year of using e-cigarettes despite not intending to smoke cigarettes in the future (Primack et al., 2015).

Types of effective anti-tobacco programs for adolescents

Multicomponent programs that (i) consider the various predisposing factors that can trigger smoking initiation and the development of nicotine dependence and (ii) help adolescents with their social skills have been found to be effective in preventing adolescent smoking (Andersen, Krølner, Bast, Thygesen, & Due, 2015; Wellman et al., 2016). School-based smoking cessation programs may also prove to be more cost effective than tobacco use cessation programs for adults (Minary et al., 2009). The various types of smoking cessation programs for adolescents include (i) pharmacologic and cognitive-behavioral strategies; (ii) theory-based programs; (iii) internet-based smoking cessation programs; and (iv) peer-led interventions.

Pharmacologic and cognitive-behavioral strategies, such as the 'TABagisme chez les ADOlescents' (TABADO) study, consist of a general informational lecture on tobacco addiction followed by an individual consultation with a tobacco addiction specialist and four group sessions of follow-up and cognitive-behavioral therapy for smokers (Minary et al., 2009). Implementation of the TABADO program among French youth was found to have a higher smoking cessation rate at 12 months follow-up in the intervention group in which 10.6% of the participants had become abstinent compared to 7.4% in the control group (Minary et al., 2013).

The American Lung Association's Not On Tobacco (N-O-T) program, Project Ex, and the '*Hands Off Tobacco*! An Anti-Tobacco Program for Deaf Youth' are examples of theory-based programs. These programs consist of various sessions that incorporate motivational issues, smoking history, nicotine addiction, and the physical, psychological, and social consequences of smoking. Anti-tobacco theory-based programs also prepare adolescents to quit tobacco use and promote healthy lifestyle behaviors and volunteerism. In these programs, youth are also taught how to deal with urges and cravings, how to manage stress, and how to handle family/peer pressure (Berman, Guthmann, Crespi, & Liu, 2011; Dino, Horn, Abdulkadri, Kalsekar, & Branstetter, 2008; Sussman, Dent, & Lichtman, 2001). Evaluation of the N-O-T program showed increased smoking cessation in the intervention group during the program, but there was no difference regarding smoking cessation between the intervention and control groups at 6 and 12 months follow-up (Kohler, 2008). Project Ex appears to be an effective program with quit rates ranging from 17 to 30% among U.S. teenagers (Sussman et al., 2001) and 14.28% among Spanish adolescents (Espada et al., 2015) in the intervention group at six months follow-up. Implementation of the '*Hands Off Tobacco*!' curriculum in two schools resulted in a significant reduction in smoking at one of the intervention schools (22.7% baseline to 7.9% follow- up) (King, Pomeranz, & Merten, 2016). Current smokeless tobacco use declined at the other school (7.5% baseline to 2.5% follow-up) (King et al., 2016).

Internet-based smoking cessation programs utilize video content and stories to promote interaction and engagement between participants while educating them about the dangers of tobacco (E. Park & Drake, 2015). These programs have demonstrated higher, but different rates of quitting in the intervention group ranging from (i) 4.9% (Buller et

al., 2008) at post-intervention; 1% (Patten et al., 2006) and 42.8% (An et al., 2008) at two months follow-up. At three months follow-up, quitting rates ranged from 3% (Patten et al., 2006), to 31.3% (Abroms, Windsor, & Simons-Morton, 2008) and 33.0% (Evers et al., 2012). Researchers reported 6% (Patten et al., 2006) and 20.0% (Abroms et al., 2008) quitting rates at six months and 40.5% at 30 weeks (An et al., 2008). The quitting rate at nine months was 6% (Patten et al., 2006) and 28.7% at 14 months (Evers et al., 2012).

Peer-led interventions like the 'A Stop Smoking In Schools Trial' (ASSIST) program involve training influential students, selected by other students, to encourage their peers to abstain from smoking (Campbell et al., 2008; Starkey, Moore, Campbell, Sidaway, & Bloor, 2005). In the intervention schools, the ASSIST intervention achieved a 22% decrease in the odds of being a regular smoker compared with control schools (Starkey, Audrey, Holliday, Moore, & Campbell, 2009).

Comparison of different types of anti-tobacco interventions for adolescents

The four main types of anti-tobacco programs for teenagers have proven to be effective in helping teenagers quit smoking. However, based on the school's criteria for program approval, a theory-based program was deemed more appropriate for our population. The school board requested (i) a program that could be easily included in the school's curriculum and would not require a big budget, (ii) several lessons which could be implemented all year long and (iii) an easy to implement curriculum which would not require any teacher or student training in case students apply for a transfer to another high school or the Ministry of Education decides to relocate teachers to other high schools.

Although pharmacologic and cognitive-behavioral strategies such as TABADO may lead to high smoking cessation rates, they require the participation of a tobacco addiction specialist and cognitive-behavioral therapists for smokers (Minary et al., 2009). To our knowledge, in Mauritius, there are no cognitive-behavioral therapists specifically for smokers and the few tobacco addiction specialists practicing in Mauritius work in private practice and do not offer their services in schools. Peer-led interventions such as ASSIST require training of students by health promotion trainers for two days (Campbell et al., 2008; Starkey et al., 2005). The school does not have the budget to hire tobacco addiction specialists, cognitive-behavioral therapists, or health promotion trainers. Moreover, the school principal reported that parents, especially those of the upper grade students, may be unwilling to have their wards go for training during or after school hours since most Mauritian grade 9 to 13 students attend private tuitions after school hours and during the week-end (Foondun, 1992, 2002). Although internet-based smoking programs also have a high quit rate and might appeal to the youth (E. Park & Drake, 2015), they do not satisfy the program criteria set by the school board. Allowing the students to use the school computer laboratory was not an option since there are just enough computers for students studying computer science. Moreover, the school principal reported that (i) not all students may have access to a computer and/or an internet connection at home and (ii) many Mauritian parents do not like the idea of online lessons for young children. Out of the various theory-based programs, we selected '*Hands Off Tobacco*! An Anti-Tobacco Program for Deaf Youth' since, unlike the N-O-T or Project-Ex programs, '*Hands Off Tobacco*! An Anti-Tobacco Program for Deaf

Youth' does not require any type of training or financial investment since the lessons and survey are provided online free of charge (Berman & Guthmann, 2007).

Demographics of Mauritius

Mauritius, officially the Republic of Mauritius, is a tropical island in the south west Indian Ocean, about 2,000km off the east coast of Africa (Government of Mauritius, 2017b). In 2015, the Mauritian population was estimated at 1,262,862, down from 1,283,415 in 2010 – young people aged 10 to 19 years old comprised 15.4% of the total population (Statistics Mauritius, 2016). Mauritius has a multi-cultural population composed mostly of Mauritians of Indian and African descent (68% and 25% of the total population, respectively) (Central Intelligence Agency, 2017). The remaining population is of Chinese or European ancestry (Central Intelligence Agency, 2017).

Anti-tobacco efforts in Mauritius

The government of Mauritius has shown a strong commitment to decreasing the prevalence of tobacco use through the implementation of a wide range of tobacco control measures. For instance, in 2009, Mauritius became the first country in the WHO's African region to implement a set of eight rotating pictorial health warnings on all cigarette packs, irrespective of the brand (Green et al., 2014). The pictures replaced a text-only warning that read 'GOVERNMENT WARNING: Smoking causes cancer, heart disease, and bronchitis (Green et al., 2014). Moreover, in Mauritius, smoking is banned in indoor public places, including sport, health, and educational facilities, as well as in public transports (Green et al., 2014). Sponsorship, promotion, and advertising of tobacco products are also illegal (Green et al., 2014).

The year 2009 also marked the beginning of government-organized media campaigns which aimed to increase the population's awareness of smoke-free days and the adverse effects of secondhand smoke (Green et al., 2014). Later, in May 2011, with technical and financial support from the World Lung Foundation, the Mauritian Ministry of Health and Quality of Life launched a national anti-tobacco mass media campaign named 'Sponge' (Azagba et al., 2015; Green et al., 2014). Created in Australia, this campaign aimed to graphically illustrate the deleterious effects of tobacco on the lungs (Cotter, Hung, Perez, Dunlop, & Bishop, 2011; Green et al., 2014). Smokers aged 18 to 24 were more likely to consider this ad believable while those aged 25 to 39 found that the campaign was 'attention grabbing' and made them 'want to stop smoking now or think about quitting in the future' (Cotter et al., 2011).

Regarding cigarette tax structure in Mauritius, the excise duty per 1,000 cigarette sticks increased five times, from MUR 2,370 to MUR 3,540 (USD 67.12 to USD 100.25; a 49% increase) from 2007 to 2012 (Azagba et al., 2015). In 2016, the excise duty on cigarettes increased again from MUR 3,717 to MUR 4,646 (USD 105.27 to USD 131.58; a 25% increase) (The Ministry of Finance and Economic Development, 2016). Research indicates that young adolescents are price sensitive and that cigarette taxes can be an effective way to reduce smoking among teenagers (Hawkins, Bach, & Baum, 2016).

Prevalence of smoking among adolescents in Mauritius

While Mauritius has made noteworthy progress in implementing anti-tobacco legislations and awareness programs, smoking prevalence among teenagers has increased from 13.7% in 2008 to 15.1% in 2011 (World Health Organization, 2013). Moreover, in

2007, 70.7% of adolescents had started smoking before the age of 14 compared to 74.5% in 2011 (Global School-based Student Health Survey, 2013). Although it is encouraging that 70.8% of Mauritian adolescents who smoke had tried to quit smoking, it is alarming to note that 58.5% were unsuccessful (Global School-based Student Health Survey, 2013). The overall prevalence of smokeless tobacco use in Mauritius is unknown (The Tobacco Atlas, 2015). However, based on data from the 2016 Global Youth Tobacco Survey, 2.3% of Mauritian youth aged 13 to 15 used smokeless tobacco (World Health Organization, 2017).

The increasing incidence of smoking tobacco among Mauritian teenagers can be due to the illegal sales of cigarettes to minors, limited information about e-cigarettes; and lack of effective tobacco prevention cessation programs. For instance, although sales of cigarettes to minors is illegal in Mauritius, key informants (such as high school students from other schools, the teacher who taught the curriculum, and the school principal) reported that teenagers could easily buy cigarettes (packs or individual cigarettes) even if they are wearing the school uniform. In fact, according to the 2011 Global School-based Student Health Survey for Mauritius, out of the 2168 participants, only 32.8% reported that someone refused to sell them cigarettes because of their age (Global School-based Student Health Survey, 2013). Easy access to cigarettes is another predictor of smoking onset among teenagers (Park et al., 2011; Wellman et al., 2016). Moreover, to our knowledge, there is no data regarding the use of e-cigarettes among Mauritian students. However, based on information from the same key informants, e-cigarettes, especially hookah pens, are very popular among Mauritian teenagers who can easily buy these devices from resellers on social media platforms or from online shops. This is troubling

because studies indicate that adolescents who are exposed to nicotine via e-cigarettes are at greater risks of trying conventional cigarettes within a year (Primack et al., 2015). Finally, to our knowledge, no evidence-based adolescent-oriented anti-tobacco program has ever been implemented in Mauritius. Existing programs are simply educational or affective as per the requirements of the Ministry of Health regarding anti-tobacco education in schools (Global Youth Tobacco Survey, 2008). Once a year, a guest speaker such as a social worker, a doctor, or a healthcare professional, is invited to deliver a one-hour talk on the health complications caused by smoking (Global Youth Tobacco Survey, 2008). Unfortunately, simply informing adolescents about the risks of smoking or using graphic images to elicit fear is unlikely to lead to behavior change (Flay, 2009).

The Education System in Mauritius

In Mauritius, primary and secondary education is free and compulsory for all until the age of 16 (The Ministry of Education Culture & Human Resources, 2008). Until 2016, the Mauritian Education System consisted of three stages namely (i) pre-primary schooling for three to five-year-old children; (ii) primary education for five to 10-year-olds; and (iii) secondary schooling for a minimum of five years (The Ministry of Education Culture & Human Resources, 2008). The nine-year schooling was introduced in January 2017 to eliminate the Certificate of Primary Education (CPE), an intensive national end-of-year examination for the 10-year-olds (The Ministry of Education, Culture & Human Resources, 2017). The new Mauritian education system now consists of four stages as illustrated in table 1 below (The Ministry of Education Culture & Human Resources, 2017).

At the end of the sixth year of primary school, students now take part in the Primary School Achievement Certificate (PSAC) to be admitted to grade 7 in a secondary school in one of the Four Education Zones of the island (The Ministry of Education Culture & Human Resources, 2017). Once students complete their fifth year of secondary education (previously 'Form V,' now Grade 11), they sit for the Cambridge School Certificate (SC) examinations (The Ministry of Education Culture & Human Resources, 2008, 2017). After the SC exams, students are allowed to either move to grade 12 (previously 'Lower VI) or drop out of school (The Ministry of Education Culture & Human Resources, 2008, 2017). Although many students choose to complete their secondary schooling in the same school they moved to after the primary level; many prefer moving to other schools especially if they were ranked at the national level for the Cambridge School Certificate examinations. Finally, to graduate from the secondary level of education, grade 13 (formerly 'Upper VI') students have to take part in the Cambridge Higher School Certificate (HSC) examinations (The Ministry of Education Culture & Human Resources, 2008).

Table 1 The Mauritian Education System

Age (years)	Before 2017	As of 2017	U.S. Equivalent
3 to 5	Pre-primary schooling	Pre-primary schooling	Pre-school
5 to 10	Primary schooling	Basic education (Primary)	
5-6	Standard 1	Grade 1	Kindergarten
7-10	Standards 2 to 5 and	Grades 2 to 5	Grade 1 to 4
10-11	Certificate for Primary Education	Grade 6 (PSAC)	Middle school grade 5
11 to 13	Secondary school Forms 1 to 3	Basic education (Lower Secondary) Grades 7 to 9	Middle school grades 6 to 8
14 to 18	Secondary school	Upper secondary	High School
14-15	Form 4	Grade 10	Freshman (grade 9)
15-16	Form 5 (SC)	Grade 11	Sophomore (grade 10)
16-17	Lower 6	Grade 12	
17-18	Upper 6 (HSC)	Grade 13	Junior (grade 11) Senior (grade 12)

Although the school system is largely based on the British system and English is the official language, French, and a French-based Mauritian Creole are the most popular spoken languages spoken on the island (Government of Mauritius, 2017a).

Rationale of this study

Considering the strength of accumulated evidence and the lack of adolescent-oriented anti-tobacco programs in Mauritius, there is a need to implement an evidence-based, anti-tobacco curriculum in Mauritius' schools to help Mauritian adolescents either never initiate tobacco use or stop using tobacco. If the curriculum proves effective, it will be a new tool in the efforts against smoking in adolescent populations that have not been adequately targeted until now.

Purpose of this study

It is expected that the curriculum will help prevent nicotine dependence amongst teenagers or prompt earlier and more successful cessation efforts by:

(i) Helping them recognize that experimentation with even one cigarette may initiate addiction (Scragg, Wellman, Laugesen, & DiFranza, 2008);

(ii) Making them aware of nicotine dependence symptoms since youth do not recognize strong cravings and withdrawal as symptoms of addiction (Doubeni, Reed, & DiFranza, 2010);

(iii) Providing them with the necessary skills to resist peer-pressure and social influence.

CHAPTER III

METHOD

Participants

This study involved one randomly selected grade 7 (the equivalent of grade 6 in the U.S.) of the main branch of one Mauritian secondary school. Participation in this study was on a voluntary basis with parental or legal guardian permission. Out of the 29 students enrolled in that grade, only 26 students were included in this study. The remaining three students did not receive parental permission to participate in the study. No compensation was given for participation. The participants' mean age was 11.4 years (SD = 0.571) at baseline. All the students received the anti-tobacco lessons over five weeks and completed both the pre-test and the post-test.

School selection

The school was selected as a convenience sample and because the school board had already planned to implement other non-curricular subjects, including tobacco and drug use, at the secondary level. Grade 7 students were selected since the academic curriculum is less extensive than in later grades.

Participant selection

At the end of the sixth year of primary school, Mauritian students take part in the Primary School Achievement Certificate (PSAC) exams to be admitted to grade 7 in a secondary school in one of the Four Education Zones of the island (The Ministry of

Education Culture & Human Resources, 2017). As such, in January 2018, a total of 123 boys were enrolled in grade 7 at the selected school. These students were assigned to Grade 7 A (29 students), Grade 7 B (25 students), Grade 7 C (23 students), Grade 7 D (23 students), and Grade 7 E (23 students) based on their PSAC results. In 2018, students admitted in grade 7 of the selected school had similar PSAC results (4 units) except for Grade 7 E students who performed less well (8 to 9 units). The names of the different grades have been changed in this document to ensure that no one, except those involved in the study, can identify the selected school and the participants.

Only one grade 7 was randomly selected for this study due to limited human resources. The school was able to allocate only one teacher for this subject, and since this teacher was also teaching several other grades, it was not possible for him to teach more than one grade 7. The random selection process was carried out using an online program known as 'Wheel Decide' ("Wheel Decide," n.d.). The school principal was asked to 'spin' the wheel – he did have any prior knowledge of what 'A', 'B', 'C', 'D', and 'E' stood for. The random option on which the wheel landed first was selected.

Materials

Justification for selection of curriculum

After a second meeting to present the objectives of this research to the school board, the school reported being willing to participate. The only requests were to provide a curriculum that is (i) age-appropriate, (ii) emphasizes the adverse influence of peers and how to resist peer pressure, (iii) can be offered as from grade 7 through grade 13 during

the entire school year to all students, (iv) does not require any training for the teacher or students, and (v) does not necessitate a budget that goes beyond regular printing costs.

The '*Hands Off Tobacco*! An Anti-Tobacco Program for Deaf Youth' curriculum was selected for this research project since it addresses core domains and themes, appropriately, at all grade levels and developmental stages (Berman & Guthmann, 2007). Berman, Guthmann, & Sternfeld (2007) report that anti-tobacco programs need to be implemented by middle school and that, starting in high school is too late. The curriculum follows a modular approach that allows for the use of content at various grade levels, as educators see fit. The '*Hands Off Tobacco*!' curriculum is available for U.S. grades 5 to 11, the equivalent of grades 6 to 12 in Mauritius. Moreover, the '*Hands Off Tobacco*!' is available free of charge online and does not require considerable funding, human resources, and training unlike other theory-based anti-tobacco curricula for adolescents. As described in the adaptations section below, the lessons were modified to make them more culturally appropriate for the study population.

Theoretical framework used in the curriculum

The program is theory based, drawing on a Social Influence and Resistance Model approach (Berman & Guthmann, 2007). This model grew out of a multi-study program of research investigating the complexity of tobacco use by young people and focused mostly on identifying, managing, and resisting the social influences that encourage tobacco use (Berman & Guthmann, 2007). Besides emphasizing the role of the immediate environment (peers and friends, siblings and parents), the Social Influence and Resistance Model also highlights the impact of the wider community and culture, including mass

media and marketing by the tobacco industry (Berman & Guthmann, 2007). This model assumes that helping individuals resist social pressures which favor use would help prevent use (Dijkstra, Mesters, De Vries, van Breukelen, & Parcel, 1999). When applied to smoking, this model speculates that resistance to persuasion to use tobacco will be greater if one has enough knowledge and skills to counteract pressures to smoke, whether these come from the immediate environment or wider community (Dijkstra et al., 1999). This model uses elements such as skill training techniques, commitment, or peer teaching (Dijkstra et al., 1999). Research indicates that the most effective interventions targeted both social competence and social skills development (social influences) whereas those that were purely informative or targeted only social influences did not show significant results (Harvey & Chadi, 2016).

Overview of the lessons covered in the curriculum

The organization of the lessons in the curriculum is outlined in table 2 below (Berman et al., 2007). As shown in table 2, the curriculum includes a a lesson titled "Friends and peers", provides content directly focused on tobacco use and prevention, but also emphasizes making healthy choices – universal themes of importance for young people (Berman & Guthmann, 2007; King et al., 2016).

Although the 'Hands Off Tobacco!' curriculum was developed specifically for deaf youth, it features several topics that are of value for diverse populations of hearing youth. For instance, it addresses the importance and influence of friends and peers; decision making; media, industry marketing and youth manipulation (Berman & Guthmann, 2007; King et al., 2016). This is in line with best practices in tobacco control which recommend

increasing awareness of dilution and confusion strategies by tobacco interests (Klein, 2007; Towns, DiFranza, Jayasuriya, Marshall, & Shah, 2017).

As per best practices for tobacco use prevention among adolescents (Kleinjan et al., 2012; Latimer et al., 2012), the curriculum also provides strategies for resisting influences and explains both short-term and long-term physiological and pathological impacts of tobacco use on health as well as the addictive properties of tobacco (Berman & Guthmann, 2007; King et al., 2016). Anti-tobacco efforts and social action to modify smoking norms and patterns are also discussed in the curriculum (Berman & Guthmann, 2007; King et al., 2016). Working on changing social norms regarding smoking is also listed as a recommended practice in tobacco education (NACCHO, 2015).

Program is tailored to teenagers

The program emphasizes simplicity and repetition, visual elements, graphic design, hands-on activities, student involvement through role-playing and art and art therapy techniques (King et al., 2016). Best practices for tobacco control among adolescents emphasize the need for programs that are kept interesting and fun through dramatization, games, and other interactive activities (Gabble, Babayan, DiSante, & Schwartz, 2015).

The selected students received the curriculum for U.S. grade 5 (lesson 5 topics 5-1 to 5-5). The rational is that, although the ‘Hands Off Tobacco!’ curriculum addresses the basic themes at each grade level, topics covered in later grades draw on the materials from previous lessons.

Table 2 Organization of the lessons

Topic	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12
Self-esteem and self- concept	5-1		7-1	8-1	9-1	10-1	11-1	12-1
Friends and peers	5-2	6-1 6-2	7-2	8-2	9-2			
Decision making	5-3 5-4		7-3 7-4	8-3		10-3	11-2	12-2
Media and other influences to use tobacco	5-3 5-4		7-6 7-7	8-5	9-3	10-2		12-5
Resisting influences to Use Tobacco	5-5			8-4	9-7		11-7	12-6
Health effects of tobacco use		6-3 6-4	7-5	8-6	9-4	10-4	11-3	12-3
Addiction				8-7	9-5	10-5	11-4	12-4
Anti-tobacco efforts and social action					9-6	10-6 10-7	11-5 11-6	12-7

Instruments

Survey development

The Social Influence and Resistance Model approach theory was used in the development of the '*Hands Off Tobacco*!' curriculum and the original questionnaire used to assess the curriculum (Berman & Guthmann, 2007). This theory provides a validated structure for the examination of health behaviors (Berman & Guthmann, 2007).

The original questionnaire used to assess '*Hands Off Tobacco*!' was developed from the California Student Tobacco Survey (King et al., 2016). It was utilized, with permission from the authors via email and modified to increase clarity, make the questions relevant to, and culturally appropriate for, the study population. The instrument adaptation section below explains the modifications.

The 'Hooked on Nicotine Checklist'(HONC) was also added to the questionnaire, with permission from Dr. Joseph DiFranza obtained via email, since it can act as a wake-up call for teenagers who do not think they are addicted (Towns et al., 2017). No changes were made to the HONC.

The original questionnaire along with the proposed modifications was sent electronically to a statistician who responded with several suggested edits. The modified questionnaire used in this study (Appendix A) consisted of 88 questions and the 10-item HONC described below. It contained no personal identifiers to ensure confidentiality and anonymity.

Measures, reliability and validity

The questionnaire included demographic questions to address age and area of residence (town or village). The outcome variables were like those used to assess the

implementation of the '*Hands Off* Tobacco! An anti-tobacco education for deaf youth' in a deaf population and included anti-tobacco attitude, exposure to tobacco prevention and control programming, tobacco-related knowledge, current and ever cigarette smoking constructs (Berman et al., 2011). These variables were based on self-report since they were measured using the participants' responses to the survey questions. Other outcome variables included current and ever use of e-cigarettes and e-hookah pens as well as autonomy over tobacco. The independent variable was the autonomy over tobacco as measured by the HONC.

Anti-tobacco attitude construct

Anti-tobacco attitude was assessed based on responses to the following five survey questions:

1) Question 48: "Young people who smoke cigarettes have more friends."
2) Question 49: "Smoking cigarettes makes young people look cool or fit in."
3) Question 50: "Young people risk hurting their health if they smoke from 1 to 5 cigarettes per day."
4) Question 51: "It is safe to smoke for only a year or two, as long as you quit after that."
5) Question 52: "I will lose non-smoking friends if I smoke cigarettes."

The Cronbach's alpha scores for the anti-tobacco attitude scores at pre-test and post-test were 0.474 and 0.478, respectively, after reverse coding the variables for questions 50 and 52 for directional consistency. Hence, we can assume that the study sample is too small for the set of questions to be internally consistent.

Tobacco education exposure construct

Exposure to tobacco prevention and control programing scores were measured using the same score utilized during the evaluation of the '*Hands Off* Tobacco! Anti-tobacco education for deaf youth' (Berman et al., 2011). The scores are described below.

The tobacco education exposure score depends on exposure to tobacco prevention and control programming and was based on responses to the following four survey questions:

1) Question 37: "In the past year did anyone at the school teach you how to say NO to tobacco?" (Yes = +1, No = −1, Not sure = 0)
2) Question 38: "In the past year, what kind of tobacco education did you receive at school? [CIRCLE ALL THAT APPLY]: (a) Classroom lessons; (b) A guest speaker; (c) A school assembly or event; (d) A drug abuse prevention education program that talked about cigarettes; (e) None of the above." (+1 point for answers a to d and 0 for answer e)
3) Question 39: "In the past year, at school did you learn about: [CIRCLE ALL THAT APPLY] (a) Why people your age smoke; (b) How many people your age smoke; (c) The effects of cigarette smoking on your body; (d) The effects of secondhand smoke; (e) How to feel good about yourself; (f) How to make good decisions about behaviors such as smoking; (g) None of the above" (+1 point for answers a to f and 0 for answer g)
4) Question 40: "In the past year did you learn anything in school that would help you say "no" to friends who offer you cigarettes?" (Yes = +1, No = −1, Not sure = 0, In the past year, I did not learn anything in school about smoking = −1);

Raw scores, which ranged from −2 to 12, were converted to a scale of 0–100 using the transformation 100×(raw score − lower bound)/range. Higher scores indicated greater perceived exposure to tobacco prevention and control programming (Berman et al., 2011).

Tobacco-related knowledge construct

The Cronbach's alpha scores for the tobacco-related knowledge scores at pre-test and post-test were 0.567 and 0.716, respectively, after reverse coding questions 56, 57, 58, 60, and 61 for directional consistency. This was considered acceptable due to the small sample size. The composite score for anti-tobacco attitude score was based on responses to the following fourteen survey questions:

1) Question 53: "Smoking cigarettes makes teeth yellow."
2) Question 54: "Smoking cigarettes makes people smell bad."
3) Question 55: "Non-smokers live longer than smokers."
4) Question 56: "Smoking cigarettes makes young people more relaxed."
5) Question 57: "Young people who smoke cigarettes look more grown up."
6) Question 58: "Teenagers are too young to get addicted to cigarettes."
7) Question 59: "Smoking cigarettes can make asthma worse."
8) Question 60: "Nicotine is the only harmful substance in tobacco."
9) Question 61: "Young people can keep from getting addicted to cigarettes by not inhaling when they smoke."
10) Question 62: "The smoke from other people's cigarettes is harmful to you."

11) Question 63: “People can get addicted to using tobacco just like they can get addicted to using other drugs such as cocaine or heroin.”
12) Question 64: “A pregnant woman can harm her unborn baby if she smokes cigarettes.”
13) Question 66: “Breathing smoke from someone else’s cigarettes – secondhand smoke – can cause lung cancer.”
14) Question 67: “Smoking cigarettes can hurt your health even if you do not inhale.” Many individuals believe that cigarettes are harmful only if they inhale the smoke and that keeping the smoke in the mouth is safe.

Items 1 to 3, 7, and 10 to 12, and 14, and 15 were scored as Yes = +1, No = −1, Not sure = 0 whereas items 4 to 6, 8, and 9 were scored as Yes = −1, No = +1, Not sure = 0. Raw scores, which ranged from −14 to 14, were converted to a scale of 0 – 100 using the transformation described earlier. Higher scores indicated higher knowledge (Berman et al., 2011).

Tobacco, smokeless tobacco, e-cigarette, and e-hookah use

Any cigarette smoking in the month preceding this study was used to assess current cigarette smoking. Any use of e-cigarettes or e-hookah was used to assess current use of other forms of tobacco.

Autonomy over tobacco

The Hooked-on-nicotine checklist (HONC), shown below with an explanation of each item, is a 10-item instrument which was included at the end of the questionnaire to assess the onset and strength of tobacco dependence in the study population (DiFranza et

al., 2015). Moreover, the HONC can act as a wake-up call for teenagers who do not think they are addicted (Towns et al., 2017). Since each of the 10 symptoms measured by the HONC has face validity as an indicator of decreased autonomy, a smoker has lost full autonomy if any symptom is endorsed (DiFranza et al., 2015).

"Yes" was scored as "+1" and "No" as "0". Each student's HONC score falls between 0 and 10, with zero indicating no loss of autonomy over tobacco. The higher the HONC score, the more addicted to nicotine the student is deemed to be.

Question 1 "Have you tried to quit but couldn't?" assessed failed cessations and indicated decreased autonomy over tobacco regardless of how hard or how sincerely the person has tried to quit. The key is the desire to quit. If quitting smoking did not necessitate any effort, the person would have successfully stopped smoking (Alberta Health Services, n.d.).

Question 2 "Do you smoke now because it is really hard to quit?" aimed to capture those who do not want to smoke but are still smoking because they are still unsure about quitting smoking, often because they fear they will have a failed cessation. The act of doing something one does not want to indicates diminished autonomy (Alberta Health Services, n.d.).

Question 3 "Have you ever felt like you were addicted to tobacco?" aimed to assess the feeling of addiction which is a sign of decreased autonomy (Alberta Health Services, n.d.). Individuals with full autonomy over their tobacco use do not feel addicted (Alberta Health Services, n.d.).

Question 4 "Do you ever have strong cravings to smoke?" and question 5 "Have you ever felt like you really needed a cigarette?" aimed to assess presence of cravings and

associated feelings which indicate reduced autonomy (Alberta Health Services, n.d.). Having strong cravings or urges to smoke make it harder, or unpleasant, for smokers to quit smoking (Alberta Health Services, n.d.).

Question 6 “Is it hard to keep from smoking in places where you are not supposed to? (like school)” aimed to assess level of autonomy over tobacco since someone who has full autonomy over tobacco will have no difficulty refraining from smoking, especially where forbidden (Alberta Health Services, n.d.).]

Questions 7 to 10, shown below, assessed withdrawal symptoms which indicate reduced autonomy (Alberta Health Services, n.d.).]

“When you tried to stop smoking, or if you hadn’t smoked for a while ...

7. Did you find it hard to concentrate because you couldn’t smoke?

8. Did you feel more irritable because you couldn’t smoke?

9. Did you feel a strong need or urge to smoke?

10. Did you feel nervous, restless, or anxious?”

Adaptation of the curriculum for Mauritian youth

The original curriculum was tested during the entire school year with questionnaires distributed at the beginning and end of the school year (Berman et al., 2011). However, due to time constraints and because the lessons are quite short, the selected grade 7 received five lessons (topics 5-1 to 6-4) over five weeks. Programs with at least five sessions have been found to have higher quit rates, with effects maintained both in the short-term (less than one year) and in the longer term (longer than one year) (Towns et al., 2017). The curriculum was taught by a 26-year old teacher since teenagers prefer

younger models in anti-smoking messages (Latimer et al., 2012). Moreover, this teacher possessed experience in voluntary community drug education among youth. People are convinced by messages when they are conveyed by someone with whom they can relate (Latimer et al., 2012). This teacher also teaches moral values and social etiquette at the selected school.

The curriculum utilized in this study was obtained online from the Tobacco Prevention Program Training of the Minnesota Chemical Dependency Program (Sternfeld et al., 2007). It was adapted to the Mauritian context in three ways. First, since adolescent use of, and experimentation with, electronic cigarettes (e-cigarettes, including e-hookahs, and vape pens) has significantly increased in the last few years (Brandon et al., 2015), the teacher added this information during the lessons' implementation. Second, any references to the United States was changed to Mauritius where possible. Third, since Mauritian students are more comfortable speaking French or Mauritian Creole than English, they were given the choice to interact with each other and the teacher in any of these languages during role playing. The curriculum itself was delivered using a mix of English and French, as the teacher deemed fit.

Adaptation of the survey for Mauritian youth

The survey, attached in Appendix A, was modified to make it more culturally appropriate for this study's population. Details of the changes brought to the survey are described in Appendix B. All changes were reviewed by a statistician.

Procedures

Program Development

An initial meeting was organized with the school principal to better understand which anti-tobacco efforts and policies were already enforced at the school and to get a better picture of smoking prevalence among the students. In short, the school had never conducted any survey to determine how many secondary-school students use cigarettes, e-cigarettes, synthetic drugs, and alcohol since, according to respondents, the school had never had any case of students smoking or using any of the substances above on the school premises. One of the reasons could be that the school has implemented stringent anti-smoking policies for anyone on the school premises since its inception. These policies are described in the students' code of conduct handbook and the employees' handbook as well. Students caught smoking on school premises can either be suspended or expelled depending on the number of times that the same offense has been committed. When asked about factors that increase the risks of initiating smoking among adolescents, the school principal and members of the school board expressed their concern about peer pressure, students' belief that they would be more popular if they smoke and having parents or siblings who smoke. The lack of information regarding students' tobacco use at the school led to the development of Study 1 which is descriptive. Study 1 assessed the prevalence of grade 7 boys who (a) used tobacco products or e-cigarettes (including hookah pens); (b) had tried to quit smoking; (c) had quit smoking successfully; and (d) had lost their autonomy over tobacco. This study also assessed the adolescents' attitudes, beliefs, and knowledge towards using tobacco to address the concerns of the school board regarding tobacco use among teenagers.

Regarding tobacco education at the school, the students are only taught about the dangers of smoking and using other types of drugs during annual talks by guest speakers or annual medical check-ups on the school premises. On an irregular basis, the school principal also talks about the dangers of smoking during morning school assemblies. Various topics such as obedience to parents, respect for elders as well as social ills such as gambling, and drug addiction are covered during school assemblies. Measures to dissuade students from initiating tobacco use and helping them to stop smoking involve informing them about the adverse effects of smoking as well as possible expulsion if they are caught smoking on the school premises more than once. The school also has a general notice board where anti-tobacco and substance use posters received from the local authorities are displayed. Although the implementation of an anti-tobacco curriculum is high on the school's list of priorities, the school board believes that the anti-tobacco education and policies implemented so far have been effective since there have been very few cases of students smoking on the school grounds. However, since the prevalence of smoking among teenagers is increasing in Mauritius (Global School-based Student Health Survey, 2013), it is likely that smoking is also an issue for students from the selected school. These findings led to the development of Study 2 which focused on the program. Study 2 aimed to find out if the evidence-based '*Hands Off Tobacco*! An Anti-Tobacco Program for Deaf Youth' program could help improve attitudes, beliefs, and knowledge towards using tobacco among youth without hearing impairments.

Program implementation

The intervention took place in four stages namely (i) the review of the program's protocol, (ii) informing the students about the program, (iii) distribution and collection of the assent and parental/guardian permission forms, and (iv) implementation of the program. The different stages are described below. Figure 1 shows the timeline used for program implementation.

Review of the program's protocol

The program's protocol was sent to the Institutional Review Board (IRB) of Mississippi States University. Since this program did not have a control group and involved program development, the IRB concluded that this research did not fit the definition of "human subjects and research" and thus, did not require HRPP/IRB review.

Announcement of the program to the students

Grade 7 A was randomly selected by the school principal on the 6th of August 2018 – the random selection process is described in the "Participant selection" section above. On that same day, the school principal informed grade 7 A students about the implementation of an anti-tobacco subject in their syllabus. They were informed that the pilot study involved filling in an ungraded questionnaire once before receiving five anti-tobacco lessons that would be held over five weeks and once again after receiving the lessons.

Distribution and collection of the forms

Assent and parental/guardian permission forms were distributed to the students present and they were requested to return the signed assent and parental/guardian

permission forms the following day. The school principal informed the students that the purpose of the assent form was to indicate their agreement, or refusal, to participate in the study and they were requested to give the parental/guardian permission forms to their parents or guardians who would need to sign the form to indicate whether they agree or refuse that their wards participate in this study. The students were reassured that their participation was voluntary and, should they refuse to participate in the project or fail to receive parental/guardian permission to do so, they would not be penalized in any way. The 'Parental or Legally Authorized Representative Permission' form for participation in research used in this study is included in Appendix C. As per best practices, this form briefly described the study, stating the risks and benefits, and stressing the voluntary nature of participating in the study (Emanuel, Wendler, Killen, & Grady, 2004). The form also provided information about how to contact the research team and Mississippi States University's Research Compliance Office if needed (Emanuel et al., 2004; Nakkash et al., 2014). The assent form can be found in Appendix D.

The school principal also informed the students that those who agreed to participate in the project, and received parental/guardian permission to do so, would be given the questionnaire to fill in to assess their knowledge about tobacco use and would receive the curriculum over five weeks. The students were reassured that their answers would not be graded and that no one affiliated with the school would see their responses at any time since the filled-in questionnaires would be placed by the students themselves in a locked ballot-box which would be collected by us. Students who refused to participate in this project or did not get parental/guardian permission to do so, would be allowed to go to the

school's library while their classmates would be filling in the questionnaire or receiving the curriculum.

Implementation of the program

Of the 29 students enrolled in the selected Grade 7, only 26 students (89.7%) received parental approval to participate in this study. Once all the consent forms were collected on the 7th of August 2018, a pre-appointed teacher distributed hard-copies of the questionnaire to the 26 students involved in the study. The students were asked to complete the questionnaire at the same time and took about 35 minutes to complete it. Some of them experienced difficulties in understanding some of the questions. However, to avoid response bias, the teacher reported instructing the students to answer the questions to the best of their ability.

This pre-test served as baseline to provide data against which to assess its usefulness in the evaluation of the implementation of a school-based anti-tobacco program. The lessons were delivered on Tuesdays starting on the 14th of August 2018. The fifth and final lesson was delivered on the 11th of September 2018. On the 18th of September 2018, the students were given the same questionnaire they answered at the beginning of the study. All the 26 students received the five educational lessons and completed both the pre-test and the post-test. The teacher provided weekly feedback during the entire intervention. Students in the other grades 7 will not receive any part of the program until January 2019 – this is not covered in this pilot study.

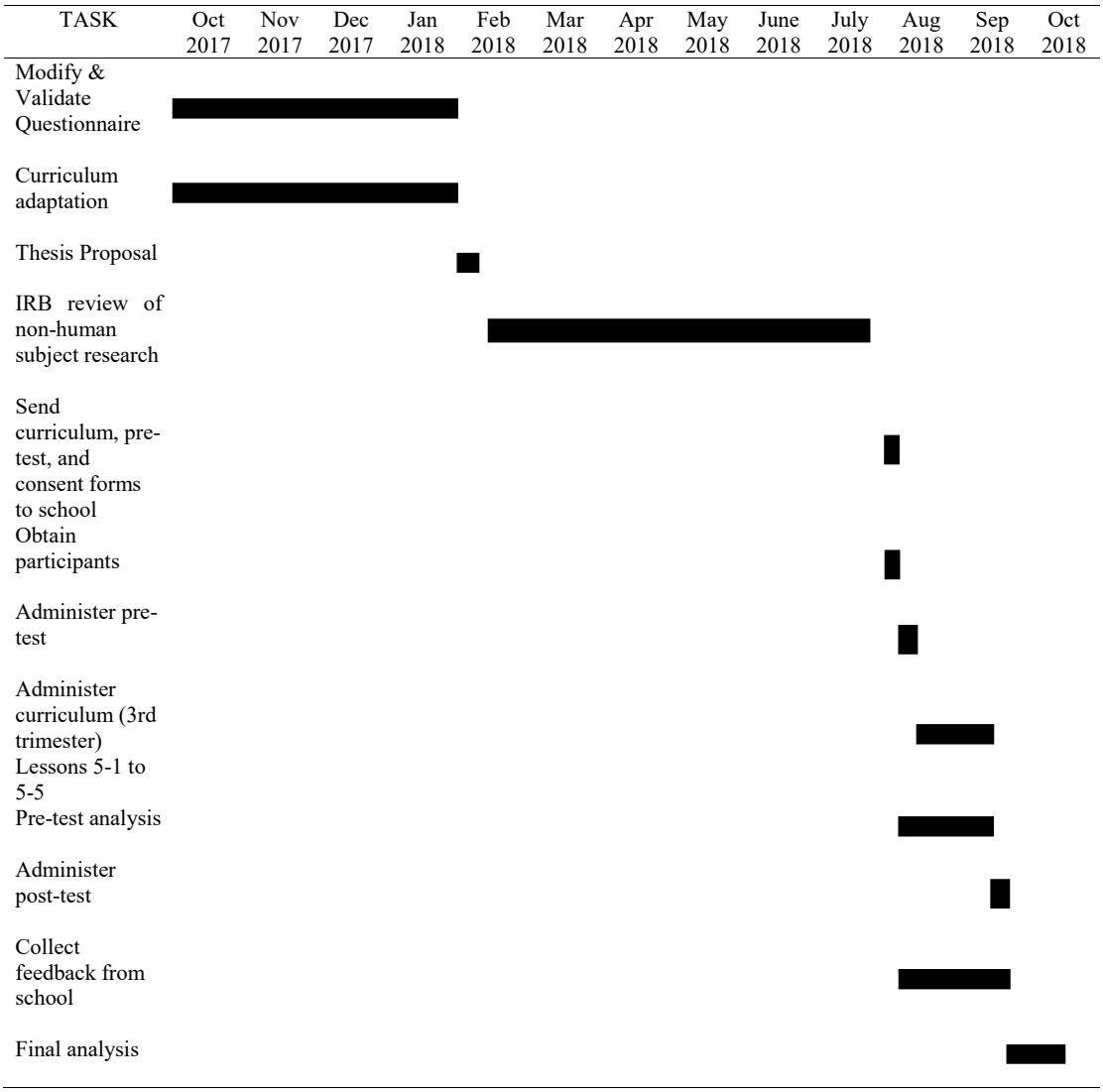

Figure 1 Program Timeline

Note: In Mauritius, the final (3rd) trimester started on the 6th of August 2018 and ended on the 26th of October 2018. Final exams are usually held during the 2nd and 3rd week of October.

Ethics

The curriculum was implemented, and the survey distributed once both were approved by the school's Board of Trustees. Since participants were under the age of 18, they were only allowed to participate in the study if they had received their guardians' approval. Before distribution of the questionnaires, all participants were informed that their responses would be completely anonymous and would not be accessible by any school staff. To further ensure that the school would not have access to the questionnaires, the students were asked to put the filled-in questionnaires in locked ballot box which we collected in person. The students were also notified that they were allowed not to participate in the survey, or to discontinue answering the questions, at any time without penalty or repercussion.

Data Analysis

Students in the randomly selected grade 7 filled in questionnaires before and after the program had been implemented. Data from the questionnaires was keyed in in August 2018 (pre-test data) and September 2018 (post-test data). The teacher provided feedback in person after each lesson.

The data was analyzed using IBM SPSS Statistics Version 24 for Windows. Paired sample t-tests were conducted to determine whether the instrument could assess if the curriculum had any effect on (i) the adolescents' attitudes, beliefs, and knowledge towards smoking tobacco and (ii) their use of tobacco products. Cohen's d was calculated to assess the effect size. Cronbach's alpha was used to assess internal consistency for the anti-tobacco attitude construct, the tobacco-related knowledge construct, and the tobacco

education exposure construct at baseline and follow-up. Continuous outcomes (tobacco education exposure score and tobacco-related knowledge score) were analyzed using paired-sample t-tests. Chi-square tests were used for binary outcomes (current and ever cigarette smoking and current and ever use of e-hookah pens). Wilcoxon sign rank test was used to check for changes in pre-test and post-test attitudes and Pearson's correlations was used to check for associations between age of smoking onset and likelihood of tobacco addiction. The level of significance was set at 0.05 and all P values were two-sided.

CHAPTER IV

RESULTS AND DISCUSSION

Results

Study 1

This study was conducted in the boys' section of the selected secondary school. Grade 7 A students were randomly selected using the 'Wheel-decide' online program as described under *Research Design* in Chapter 3. Out of the 29 students enrolled in the grade 7, three did not receive parental approval to participate in this research. According to the teacher, these three students reported that their parents did not want them to participate in extra-curricular activities during their final grade 7 semester because they felt that these activities would distract their ward from their academic work.

The mean pre-test age was 11.4 years (*SD* = 0.571) with 14 (53.8%) and 11 (42.3%) students aged 11 and 12 years old respectively. Only one student (3.8%) was 10 years old at baseline. The mean post-test age was 11.8 years (*SD* = 0.491) with six 11-year-olds (23.1%), 19 12-year-olds (73.1%), and one 13-year-old (3.8%). 53.8% (*n* = 14) and 46.2% (*n* = 12) of the students lived in villages and towns, respectively.

Prevalence of cigarette smoking

At baseline, 61.5% (*n* = 16) of the participants reported never having smoked a cigarette, not even a puff. Of the 10 students (38.5%) who had smoked in the past, 30% (*n* = 3) reported having their first puff at the age of 10 and 30% (*n* = 3) at 11 years old.

The remaining four students had their first puff at 5, 7, 8, and 9 years old. At follow-up, two additional students reported having tried smoking at the age of 11 in the past year. This is described in more details in the discussion section. Due to the small sample size, these statistics are unlikely to reflect the prevalence of tobacco use among teenagers enrolled at the selected school or in other Mauritian schools.

Age of first whole cigarette

As shown in table 3, of those who smoked, at baseline, 80% (n = 8) reported never having smoked a whole cigarette and 20% (n = 2) smoked their first whole cigarette at the age of 11. During the follow-up survey,75% (n = 9) had never smoked a whole cigarette, 8.3% (n = 1) and 16.7% (n = 2) had smoked their first whole cigarette at the age of 9 and 11 respectively.

Table 3 Age of first whole cigarette

	Never	9 years old	11 years old
	n (%)	*n* (%)	*n* (%)
Baseline	8 (80)	-	2 (20)
Follow-up	9 (75)	1 (8.3)	2 (16.7)

Note: Two additional students reported having tried smoking in the past year during the post-test.

Students' smoking status

Table 4 reflects the students' "smoking status" based on their answers for question 6 "About how many cigarettes have you smoked in your whole life?" and

question 8 “In the past month, on how many days did you smoke at least one puff from a cigarette?” at baseline and follow-up.

Students who chose option “a. None” for question 6 and option “a. 0 days” for question 8 were categorized as “Never” smokers. Selecting option “b. A taste. Tried it once” for question 6 and option “a. 0 days” for question 8 would categorize the student as an “Experimenter”. Those who selected option “c. About half a pack (1 – 10 cigarettes)” for question 6 and option “a. 0 days” for question 8 were categorized as “Former” smokers. Selecting option (c) for question 6 and any of the remaining options for question 8, namely option “b. 1 to 5 days”, option “c. 6 or more days but not every day” or option “d. Every day”, would categorize a student as a “Current” smoker. “Experimenters”, “Former” smokers, and “Current” smokers are considered to be “Ever” smokers.

Table 4 Students’ smoking status

	Never*	Ever*	Experimenter**	Former**	Current**
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Baseline	16 (61.5)	10 (38.5)	7 (26.9)	0 (0)	3 (11.5)
Follow-up	14 (53.8)	12 (46.2)	7 (26.9)	2 (7.7)	3 (11.5)

* Never / Ever: Never smoked even one puff / Smoked at least one puff from a cigarette. (“Ever smokers” include “experimenters”, “former” smokers, and “current” smokers.
**Experimenter /Former / Current: Tried a cigarette once / Did not have even one puff from a cigarette in the past month but tried one cigarette or more in the past / Smoked at least one puff from a cigarette in the past month.

Number of cigarettes smoked in a lifetime

Seven students reported trying smoking only once in their whole life during the pre- and post-tests. The remaining students smoked about half a pack (1 to 10 cigarettes) (n = 1 at baseline and n = 3 at follow-up), about a pack (n = 1 at baseline and follow-up), and more than one pack but less than 5 packs, respectively (n = 1 at baseline and follow-up). None of the participants had ever smoked 5 or more packs. The additional two students who reported having smoked about half a pack at follow-up were the two students who chose not to disclose their smoking status during the pre-test although they reported having smoked their last cigarette "more than a year ago" during the post-test. The data is displayed in table 5 below.

Table 5 Number of cigarettes smoked in a lifetime

	None *n* (%)	A taste *n* (%)	1 to 10 *n* (%)	About 1 pack *n* (%)	More than 1 pack but less than 5 packs, *n* (%)
Baseline	16 (61.5)	7 (26.9)	1 (3.85)	1 (3.85)	1 (3.85)
Follow-up	14 (53.8)	7 (26.9)	3 (11.5)	1 (3.85)	1 (3.85)

Note: Two additional students reported having tried smoking in the past year during the post-test.

Smokeless tobacco use

At baseline, 57.7% (n = 15) of the students did not know what smokeless tobacco was and the remaining 11 students (42.3%) had never used smokeless tobacco in their life. At follow-up, 46.2% (n = 12) of the students did not know what smokeless tobacco was and the remaining 14 students (53.8%) had never used smokeless tobacco in their life.

Use of e-cigarettes and e-hookah pens

Data for e-cigarettes and e-hookah pens is shown in table 6. There was no change in use or knowledge about these products after the curriculum was delivered. The five students who had tried e-cigarettes and e-hookah pens did so at 10 years old (n = 1) and 11 years old (n = 4). None of the students had used these products in the months preceding the pre-test and the post-test. No association was found between smoking cigarettes and using e-cigarettes ($X^2(2) = 0.382$, $p = 0.826$). Again, due to the small sample size used in this study, these statistics cannot be generalized to the entire grade 7 student population in the selected school. Bigger samples would be required to assess whether the instrument can find an association between e-cigarette and tobacco use among Mauritian youth.

Table 6 Prevalence of e-cigarette and e-hookah pen use at baseline and follow-up

	Yes* *n* (%)	No* *n* (%)	Don't know** *n* (%)
Baseline	5 (19.2)	18 (69.2)	3 (11.5)
Follow-up	5 (19.2)	18 (69.2)	3 (11.5)

* Yes / No: Tried / Never tried e-cigarettes or e-hookah pens in the past.
** Don't know: Don't know what e-cigarettes or e-hookah pens are

Intention to stop smoking cigarettes and quitting attempts

Question 12 "Do you want to stop smoking cigarettes?" with answer options "a. Yes", "b. No", "c. I do not smoke now", and "d. Not sure" was used to assess intention to quit smoking.

Of the10 students who had reported trying smoking in the past in the pre-test, two (20%) wanted to stop smoking, seven (70%) did not smoke anymore, and one (10%) was

not sure if he wanted to quit smoking cigarettes having tried quitting on his own more than three times. All the students had tried to quit smoking on their own.

At follow-up, two additional students reported having tried to smoke in the past year. Of the 12 students who reported having tried smoking cigarettes in the past, two students (16.7%) wanted to stop smoking and eight (66.7%) did not smoke anymore. Two participants (16.7%) were not sure if they wanted to quit smoking cigarettes – one had tried quitting by himself more than three times and the other, one of the students who didn't disclose his smoking status at baseline, had tried quitting once or twice.

At baseline, 25 students (96.2%) and one student (3.8%) reported that they definitely and probably would not be smoking cigarettes five years from now, respectively. At follow-up, all the students reported that they "definitely would not be smoking five years from now".

Autonomy over tobacco

The Hooked On Nicotine Checklist (HONC) was included in the survey to assess tobacco addiction – "Yes" was scored as "+1" and "No" as "0". A Cronbach's alpha of 0.950 was calculated as the internal consistency statistic – this was similar to the 0.90 to 0.94 Cronbach's alpha range described in the literature (Scragg et al., 2008). The results are shown in table 7.

An answer of "yes" to any of the questions indicates that addiction has begun. Each student's HONC score falls between 0 and 10, with zero indicating no loss of autonomy over tobacco. The higher the HONC score, the more addicted to nicotine the student is deemed to be.

Table 7 shows the distribution of HONC scores at baseline and follow-up as a function of number of cigarettes smoked. Two students who reported having never smoked in the past had a HONC score of 1 at baseline and 0 at follow-up. The mean HONC for students who reported smoking at baseline and follow-up was 2.00 (*SD* = 3.43) and 2.58 (*SD* = 3.66) respectively. There was no significant difference between baseline and follow-up autonomy over tobacco ($t(25)=-0.945$, $p=0.354$). At baseline, of the 10 students who reported having tried smoking in the past, six students (60%) had a HONC score of 0 – all these students reported having tried smoking only once. The remaining four had a HONC score of 1, 3, 6, and 10 after reporting having smoked only once, more than a pack but less than five packs, about half a pack, and about a pack, respectively.

At follow-up, five students (41.7%) had a HONC score of 0 with four students reporting having tried smoking once. The remaining student, who did not disclose his smoking status at baseline, had smoked about half a pack. One student (8.3%) had a HONC score of 1 after having smoked only once. The remaining six students scored 2 ($n = 2$), 3 ($n = 2$), and 10 ($n = 2$). One of the students who scored 2 had smoked about half a pack (baseline HONC score of 6) and the other had smoked more than one pack but less than five packs (baseline HONC score of 3). One of the two students with a HONC score of 3 reported having smoked only once before while the other, who did not disclose his smoking status at baseline reported having smoked about half a pack. Two students (16.6%) scored 10 with pre-test scores of 0 and 10 after having smoked only once and about a pack, respectively.

Table 7 Difference in HONC Scores as a function of number of cigarettes smoked: pre- and post-test

Score	0		1 – 3		4 – 6		7 – 10	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
A taste	6	4	1	2	0	0	0	1
1 – 10	0	1	0	2	1	0	0	0
A pack	0	0	0	0	0	0	1	1
More than 1 pack but less than 5 packs	0	0	1	1	0	0	0	0

NOTE: 0 = No loss of autonomy
1 – 3 = Mild loss of autonomy
4 – 6 = Moderate loss of autonomy
7 – 10 = High loss of autonomy

Study 2

Exposure to anti-tobacco education

Four survey questions were asked in the pre- and post-tests to assess exposure to tobacco prevention and control programming. Values were assigned to each of the answer options and used to calculate raw scores which were then converted to a scale of 0–100. Results of statistical analyses are provided in table 8. At baseline, the students had mean tobacco education exposure scores of about 9.892 (*SD* =16.0), ranging from 7.1 to 50.0. The students had a significant increase in tobacco education exposure scores from baseline to follow-up, with a mean increase of about 36 points (*SD*=16.8), ($t(25)=10.9$, $p<0.001$). This, along with Cohen's effect size value ($d=2.14$), indicates that the students had a greater perceived exposure to tobacco prevention and control programming after the program was implemented (Berman et al., 2011).

Table 8 Tobacco education exposure scores*

Outcome	Baseline		Follow-up		n	95% CI for Mean Difference	t	df	p
	M	SD	M	SD					
TEES**	9.89	16.0	45.9	17.9	26	29.2, 42.8	10.9	25	<0.001

* Baseline mean is the average score of responses for the pre-test. Follow-up mean is the average score of responses for the post-test. All P values are two-sided. The range of possible scores is 0–100.
**TEES: Tobacco Education Exposure Score

Anti-tobacco attitude

As explained in Chapter III, Wilcoxon sign rank test was used to check for changes in pre-test and post-test attitudes. At baseline, for question 48 "Do you think young people who smoke cigarettes have more friends?", 18 students (69.2%) answered "yes" while the remaining eight students answered, "not sure" (n = 4, 15.4%) and "no" (n = 4, 15.4%). The attitude for this question improved significantly at follow-up ($p <$ 0.001) with 19 students (73.1%) who answered "no" and seven (26.9%) who answered "yes". There were no significant differences in attitude for questions 49 (p = 1.00), 50 (p = 0.276), 51 (p = 0.763), and 52 (p = 0.083).

Tobacco-related knowledge

14 survey questions were asked in the pre- and post-tests to assess tobacco-related knowledge. A Cronbach's alpha of 0.567 was calculated as the reliability statistics for the pre-test set of questions. The alpha for the post-test was 0.716. Values were assigned to each of the answer questions and used to calculate raw scores which were then converted to a scale of 0–100. Results of statistical analyses are provided in table 9. The mean tobacco-related knowledge scores at baseline (M = 75.6, SD = 9.48) differed significantly from the follow-up mean (M = 86.2, SD = 9.91) with a mean increase of about 10.6

points (*SD* = 13.7, 95% CI [5.04, 16.1]), (*t*(25) = 3.94, *p* = 0.001). This indicates that the students were more knowledgeable about the adverse effects of tobacco after the program was implemented (Berman et al., 2011). Further, Cohen's effect size value (*d* = 0.774) suggested a moderate to high practical significance.

Table 9 Tobacco-related knowledge scores

Outcome	Baseline		Follow-up		n	95% CI for Mean Difference	t	df	p
	M	SD	M	SD					
TRKS	75.6	9.48	86.2	9.91	26	5.04, 16.1	3.94	25	0.001

* Baseline mean is the average score of responses for the pre-test. Follow-up mean is the average score of responses for the post-test. All P values are two-sided. For all scores, the range of possible values is 0–100.
**TRKS: Tobacco-Related Knowledge Score

Beliefs related to marketing practices used by the tobacco industry

For question 27 "Would you ever use or wear something that has a tobacco company name or picture on it such as a lighter, T-shirt, cap, or sunglasses?", 24 students (92.3%) said "No" at follow-up compared to 18 (69.2%) at baseline (*p* = 0.027).

Regarding question 29 ". Do you think tobacco companies try to get people addicted to cigarettes?", 20 students (76.9%) said "Yes" at follow-up compared to 15 (57.7%) at baseline (*p* = 0.01).

For question 30 "Do tobacco companies care about your health?" 24 students (92.3%) said "No" at follow-up compared to 18 (69.2%) at baseline (*p* = 0.027).

There was also a significant difference in belief regarding the use of advertisements by tobacco companies to try to get young people to start smoking (question 31): 20 students (76.9%) said "Yes" at follow-up compared to 5 (19.2%) at baseline (*p* < 0.001).

Discussion

Smoking prevalence among Mauritian teenagers has increased from 13.7% in 2008 to 15.1% in 2011 and to 17.7% in 2017 (Global School-based Student Health Survey, 2017). While school-based tobacco education is considered an important tobacco use prevention strategy (Berman et al., 2011), Mauritius lags behind in provision of anti-tobacco educational programs designed specifically for adolescents. As such, the aim of this pilot study was to assess the usefulness of a tobacco use prevention education instrument in evaluating the implementation of an anti-tobacco school-based curriculum in a sample of Grade 7 male students.

Interpretation of findings

Due to the small sample size and the lack of a control group, results of this pilot study cannot be generalized to other grade 7 students in the selected school or in Mauritius. However, this instrument showed that the curriculum was of interest to the students and the teacher from the selected school. The instrument would require a few changes before it can be used on a larger scale in the selected school.

Effects of implementing a school-based anti-tobacco program designed specifically for teenagers

Findings from this study support the hypothesis that the instrument can help assess if an adolescent-oriented anti-tobacco program can help improve teenagers' knowledge towards tobacco use. However, our study sample was too small for internal consistency on the anti-tobacco attitude scale (α = 0.474 and 0.478 at pre-test and post-test, respectively) to find any significant difference in anti-tobacco attitude before and after the curriculum was delivered. We did however find a significant improvement, at

follow-up, regarding the belief that young people who smoke have more friends (p<0.001).

Beliefs related to marketing practices used by the tobacco industry

The instrument indicated that the curriculum helped significantly improve the perception of how the tobacco industry uses marketing to entice young people to start using tobacco.

Smoking prevalence, onset, and addiction

No associations were found between age of smoking onset and likelihood of addiction or the belief that smoking can help one fit in or have more friends and the predictability of current smoking status. Besides having a very small sample size, the teacher reported than many students may have been unwilling to answer the survey truthfully due to the school's strict anti-tobacco policy. Due to the small sample size and short duration of the study, we did not find any change in cigarette smoking prevalence after the program was implemented. However, it is worth noting that two students had already lost autonomy over tobacco after reporting having had smoked cigarettes only once – this is in line with existing research regarding the rapid onset of tobacco addiction in the teenage population (DiFranza et al., 2015).

The student who scored 0 on the HONC scale at baseline and 10 at follow-up probably chose not to disclose his symptoms since, during the post-test, he reported having tried alcohol, synthetic drugs, and illegal drugs the previous year. Research suggests that teenagers who use alcohol, cannabis or other tobacco products are more likely to also smoke cigarettes (O'Loughlin et al., 2009; Park et al., 2011). Moreover,

this student even wrote down, on his post-test questionnaire that he had consumed alcohol two months before the post-test, had used ‘mass’ (Mauritian slang for ‘marijuana’), and synthetic drugs ‘‘last year but stopped’’. It is possible that this student felt more comfortable disclosing this information after interacting with the teacher.

However, it is worth noting that the one student who, at baseline, answered “Yes” to question 70 “If one of your best friends offered you a cigarette, would you smoke it?” answered “No” at follow-up.

Helping students become anti-tobacco advocates with their peers

Although no significant differences were noted, at follow-up (i) three additional students mentioned they had talked with your friends about why tobacco use is dangerous ($p = 0.185$), (ii) three additional students tried to discourage someone they know from using tobacco ($p = 0.103$), and (iii) two additional students reported having tried to help someone they know from using tobacco (one student even wrote down “many, many times” next to question 73 on his post-test questionnaire ($p = 0.664$). Regarding question 78 “If someone was smoking near you, would you ask them to stop?”, two students who had answered “No” at baseline said “Yes” at follow-up ($p = 0.802$). This could show that students may feel more comfortable to discourage others from using tobacco if they have enough knowledge and skills to share anti-tobacco addiction.

Effectiveness of the school’s anti-tobacco policies and awareness programs

None of the students reported smoking on the school grounds at baseline and follow-up. This does not necessarily mean that the school’s anti-tobacco policies are effective since (i) two (7.7%) and six (23.1%) students reported seeing students smoke on the

school premises at baseline and follow-up, respectively and (ii) three (11.5%) and five (19.2%) students reported seeing teachers and other staff smoking on the school grounds at baseline and follow-up, respectively. Three (11.5%) and four (15.4%) students reported seeing others smoke on the school premises at baseline and follow-up, respectively. It is possible that the students were unwilling to disclose that they had been smoking on school premises for fear of being expelled.

During our initial meeting, the school principal mentioned that the school had a general notice board where anti-tobacco and substance use posters received from the local authorities are displayed. However, only four students (15.4%) at baseline and five students (19.2%) at follow-up reported having seen, at the school, a message that tried to get people not to smoke ($p = 0.713$). This shows that the message board may not be effective.

Feedback from the teacher

As part of this research effort, the teacher delivering the curriculum was asked to share his experience and that of the students with us. Overall, the curriculum received praise from the teacher and the students who reported 'loving everything about the curriculum'. The teacher's feedback was recorded and then translated from French to English to prevent loss of meaning.

Program delivery and implementation process

Prior to implementing the curriculum, the teacher expressed his concerns about having to incorporate a new subject in his already hectic teaching schedule and the need to prepare for this subject before delivering it. However, after receiving the curriculum,

he reported that the curriculum was very user-friendly and did not require much preparation since the lessons were well laid-out. The teacher believes that the curriculum can be easily implemented in the school's curriculum. However, like the school principal, the teacher reported that the survey was too long and tedious for many of the participants.

Curriculum review

According to the teacher, each lesson included useful activities that eliminated the need for him to plan how the lesson would unfold. He especially liked that each lesson (i) got the students ready to learn about tobacco use and prevention, (ii) presented new material in a way that is age-appropriate, and (iii) encouraged students to reflect and share opinions. The teacher also found the visual elements and class activities provided with each lesson to be very valuable since (i) they facilitated retention of the lessons' message and (ii) generated discussions and learning about self-love and respect for self and others. Another positive aspect of the curriculum, according to the teacher, is that it can be easily adapted to the students' skill levels without much pre-class preparation.

Teacher's perceptions of students' response to the curriculum

The teacher reported that the students initially believed that this anti-tobacco curriculum would be boring. However, after the first lesson, they kept asking the teacher when they would receive the next one whenever they would meet him in the school hallways. The students even described the curriculum to their friends in the other grades 7 – the latter asked the teacher when they would receive the lessons. The selected students reported finding the five lessons very interesting since these were interactive and

included fun, yet educative activities, that were non-judgmental. They also enjoyed being taught by a young teacher with whom they were able to 'connect'.

Moreover, although not much difference in anti-tobacco attitude was observed at follow-up, the students were significantly more aware of the tactics used by the tobacco industry to increase tobacco's appeal in the younger generations. Furthermore, the one student who, at baseline, answered "Yes" to question 70 "If one of your best friends offered you a cigarette, would you smoke it?" answered "No" at follow-up.

During the follow-up survey, two additional students reported having tried smoking at the age of 11. However, it is unlikely that they started smoking during the intervention since (i) for question 8 "In the past month, on how many days did you smoke at least one puff from a cigarette?", both students selected option "a. 0 days", (ii) for question 9 "In the past month, on the days that you smoked, how many cigarettes did you smoke per day?", both students selected option "a. I did not smoke during the past month.", and (iii) for question 11 "When was the last time you smoked a cigarette – even if this was just one puff?", both students selected option "a. More than a year ago". It is possible that, during the pre-test, these students were unwilling to disclose that they had tried smoking due to the school's strict anti-tobacco policy. The teacher reported that, during the pre-test session, a few students were concerned about who would see their responses since they mentioned that they had tried smoking in the past. Students, during the pre-test, may have been hesitant to disclose engagement in certain behaviors but were more willing to do so at the end of the intervention. It is possible that they established trust with the teacher during the interactive anti-tobacco lessons and were more forthcoming about their smoking status. It is also possible that they realized that none of

their peers had gotten into any kind of trouble after disclosing their smoking status during the pre-test.

Necessary modifications for an effective full-scale implementation

The teacher commented that the curriculum could have an even more significant impact on the students if each student was provided with a set of pictures and worksheets. He believes that this would help the students follow the lesson and stay focused while the teacher is explaining. Due to time constraints, the teacher had to read the books recommended in the curriculum and summarize it for the class.

Limitations

First, due to the existing workload and time constraints, only 35 minutes were allocated to each lesson. The original curriculum was tested during the entire school year with questionnaires distributed at the beginning and end of the school year (Berman et al., 2011). Moreover, for adolescent-oriented anti-tobacco programs to be successful and effective, the period of intervention and evaluation must be longer to enable observation of long-term impact (e.g. one-year follow-up)(Sidhu, Sussman, Tewari, Bassi, & Arora, 2016)

Second, due to limited resources, it was not possible to assess the fidelity with which the teacher implemented the curriculum nor was training the teacher feasible. It is possible that he did not cover certain topics in enough details. For instance, some students still did not know what e-cigarettes (n = 3) or smokeless tobacco (n = 12) were at follow-up. Moreover, at follow-up, six students (23.1%) still believed that teenagers are too young to get addicted to tobacco while eight students (30.8%) remained unsure. Seven

students (26.9%) were unsure whether smoking cigarettes could hurt one's health even if one does not inhale. None of the students answered question 61 "Young people can keep from getting addicted to cigarettes by not inhaling when they smoke" correctly at follow-up: 19 (73.1%) answered "Yes" while the remaining seven students (26.9%) answered "Not sure".

Third, since the anti-smoking policies at the school are very strict, students might have been unwilling to answer questions pertaining to their smoking habits truthfully. As such, results may indicate a lower than expected smoking prevalence and number of cigarettes smoked in a lifetime. Moreover, the teacher reported that the students got bored answering the questions – it is possible that they just selected answers without even reading the question or the answers.

Fourth, since the school was unable to allocate more than one teacher to teach the syllabus, and since that teacher could teach only one grade 7, it was not possible to use the whole grade 7 population of the school. As such, sample error might have occurred, and the results may not be applicable to the whole grade 7 population of school.

Finally, due to the small sample size, there can be greater variability in data and the results may not be applicable to the Mauritian teenage population.

CHAPTER V

CONCLUSION

The instrument indicated that the '*Hands Off Tobacco*! An Anti-Tobacco Program for Deaf Youth' was very well received by both the students and the teacher in charge of delivering the lessons. Moreover, the instrument indicated that the program helped to significantly improve the students' tobacco-related knowledge and perceived tobacco exposure at follow-up. The instrument also showed that the anti-tobacco program helped improve the students' belief that youth who smoke have more friends.

Due to the small sample size, the instrument could not help assess if the age of smoking initiation can increase the likelihood of tobacco addiction. For the same reason, we were unable to find any association between the program delivery and changes in attitude and beliefs towards tobacco.

As such, we believe that, the instrument can help evaluate the implementation of the anti-tobacco program in grade 7 at the selected school provided that some changes are made to the questions. Once the instrument is pilot-tested in the entire grade 7 population of the selected school, it could be further modified before being tested with all the students enrolled at that school. This can help determine how to modify the instrument before suggesting its use at the national level.

Suggestions for future research

Sample size

Initially, the instrument could be used to assess the implementation of the anti-tobacco lessons with all the grade 7 students enrolled in the selected school. Once this is done and changes made to the instrument, a school-wide project which surveys all the students enrolled at the school would help provide a more accurate picture of smoking prevalence among the students as well as their tobacco-related knowledge, attitudes towards smoking, and autonomy over tobacco.

The grade 13 students who have selected computer science as their major could create a computer program that would list out the questions and require the student to fill in all the questions before submitting. The program could also prevent selecting more than one answer except for specific questions which may necessitate several answers. This program could also automatically calculate frequencies and statistics. If this program works, the school could patent the program and rent it with the Ministry of Health – the school could use the funds collected to hire a tobacco addiction specialist, purchase more audio-visual equipment which could be used to make the lessons even more captivating for the students, and organize tobacco-awareness campaigns for the students by the students on the school premises.

Changes to data collection and the survey

It appears that many of the students were not that comfortable answering the questions truthfully. If a similar survey is to be conducted at that school in the future, the students should be allowed to fill in the questionnaires without having a teacher present in the classroom. The teacher would be given a blank questionnaire for him to refer to in

case students have questions and would remain outside the classroom while the students are filling in the questionnaires. If the students need to clarify a question, the class captain could go and meet the teacher outside the classroom. Moreover, the students could be allowed to pick a unique identifier which they would write on their pre-test and post-test questionnaires so that no one, not even the person analyzing their responses, would be able to identify who answered which questionnaire.

Survey questionnaires should be kept short to reduce participant fatigue. Moreover, some of the questions, especially questions 48 to 51 which relate to attitude towards tobacco, need to be reworded since they confused many of the students. For instance, many students believed that question 48 "Smoking cigarettes makes young people look cool or fit in." was asking about why young people smoke.

If the school is to re-use this instrument, they could gather feedback from the participants in this study regarding (i) which questions were unclear and (ii) whether they would be more comfortable answering the questions if these were in French instead of in English. Based on the feedback obtained, the school could reformulate the questions and do a pilot-test with randomly selected students from different grades before distributing the survey to the whole school.

Changes to the program's length and mode of delivery

The curriculum would likely have a greater impact on the students if each lesson was conducted over a period of two to three weeks with refresher sessions at the beginning of the second trimester and the end of the third trimester. Again, due to time constraints, we were only able to allocate one 35-minute session per lesson. This could

explain why no significant difference was observed (i) between baseline and follow-up cigarette smoking among the participants.

Instead of having the teacher read the book(s) for the students, it would be more beneficial for them if they came to the front of the class and read a portion of the book for their peers. Besides helping the students build their public-speaking skills, this class activity would also further improve retention of the lesson's anti-tobacco message. The school could purchase several copies of the book and the students could borrow it for a few days.

Changes to the curriculum

Our findings suggest that not all the students grasped the effect of smoking even one puff on their health and their autonomy over tobacco. This is in line with research which suggests that tobacco addiction is an unanticipated consequence for many young smokers who also believe that it would be very easy for them to quit when they decide to (Wang, Henley, & Donovan, 2004). However, lessons on addiction are only covered in the Grade 8 (equivalent to Mauritian Grade 10) curriculum. As such, these lessons could be introduced earlier in the Grade 5 (equivalent to Mauritian Grade 7) curriculum to highlight the rapid onset of tobacco addiction in the teenage population since young people who believe addiction happens immediately were more likely to commit to never smoke at all (Wang et al., 2004). Conversely, those who thought that addiction cannot happen before one has smoked several cigarettes were more likely to express intentions to experiments (Wang et al., 2004).

Based on our findings, the student's lack of knowledge regarding smokeless tobacco and e-shisha pens did not change after the curriculum was implemented. For instance, 12 out of the 15 students and three out of the three students who did not know what smokeless tobacco or e-cigarettes were, respectively, still did not know what these were at follow-up. Since teenagers often perceive e-cigarettes as being less harmful than regular cigarettes (Ambrose et al., 2014; Giovacchini et al., 2017; Roditis & Halpern-Felsher, 2015; Wagoner et al., 2016), it is important to include data about e-cigarettes and their addictive properties (Primack et al., 2015) in the curriculum. Based on email correspondence with the authors of the curriculum, information about e-cigarettes will be included in the revised version of the curriculum which may be available in 2020. Until the updated version is made available, an additional lesson about e-cigarettes and smokeless tobacco and these products' associated health hazards could be added to the curriculum. The format of the other lessons should be respected to ensure that the content is interesting yet educative and promotes interaction between the students.

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APPENDIX A

QUESTIONNAIRE

TOBACCO SURVEY FOR (SCHOOL NAME) SECONDARY SCHOOL STUDENTS

This is a survey about tobacco use and other health-related behaviors. Whether or not you have ever done any of these things, you can still answer every question.

Completing the survey is VOLUNTARY. You do not have to answer all of the questions in the survey, but we hope that you will. Your assistance will help us learn how the knowledge, attitudes, and behaviors toward tobacco use of young people change as they get older. The answers you give will help us to develop better tobacco education programs for young people like you.

Please answer the questions based on what you really do and know. Your answers will be anonymous. Only you will know how you answered these questions.

Please be sure to ask if you do not understand the question or need to have it explained.

Please circle the letter next to your answer. If the question asks you to "circle all that apply" you can circle as many answers as you wish.

This survey is ANONYMOUS. We will not know your name.

1. How old are you? _____

2. Which of these areas BEST describe the place you live?
   a. Town b. Village

3. Have you ever smoked a cigarette – even a puff?
   a. Yes b. No

IF YOU **NEVER SMOKED EVEN A PUFF**, SKIP TO QUESTION **#16**.

4. How old were you when you had your first puff? _____

5. How old were you when you smoked <u>a whole cigarette</u> for the first time?
   a. I have never smoked a whole cigarette
   b. 8 years old or younger
   c. 9 years old
   d. 10 years old
   e. 11 years old
   f. 12 years old

6. About how many cigarettes have you smoked in your whole life?

a. None
b. A taste. Tried it once
c. About half a pack (1 – 10 cigarettes)
d. About a pack
e. More than 1 pack, but less than 5 packs
f. 100 or more cigarettes (5 or more packs)

7. Did you ever smoke at least one cigarette a day, every day, for one month or more?

a. Yes b. No

8. In the past month, on how many days did you smoke at least one puff from a cigarette?

a. 0 days b. 1 to 5 days c. 6 or more days but not every day d. Every day

9. In the past month, on the days that you smoked, how many cigarettes did you smoke per day?

a. I did not smoke cigarettes during the past month
b. 1 cigarette or less per day
c. 2 to 10 cigarettes per day
d. 11 to 20 cigarettes per day
e. More than 20 cigarettes per day

10. In the past month, did you ever smoke cigarettes at school?

a. Yes b. No

11. When was the last time you smoked a cigarette – even if this was just one puff?

a. More than a year ago
b. In the past year
c. In the past month
d. In the past week
e. Yesterday
f. Today

12. Do you want to stop smoking cigarettes?

a. Yes b. No c. I do not smoke now d. Not sure

13. How many times have you tried to quit smoking?

a. I tried smoking but never continued
b. I smoke cigarettes but never tried to quit
c. 1 or 2 times
d. 3 or more times

14. Did you ever do any of the things on the list below to help you stop smoking cigarettes? [CIRCLE ALL THAT APPLY]

a. I quit on my own
b. I smoke cigarettes but never tried to quit
c. Attend a school program
d. Attend a program but not in school
e. Called a help line or quit line
f. Used nicotine gum or patch
g. Used some other medicine

15. Do you think you could stop smoking cigarettes now if you wanted to?

a. I do not smoke now b. Yes c. No d. I don't know

16. Do you think you will be smoking cigarettes 5 years from now?

a. I DEFINITELY will
b. I PROBABLY will
c. I DEFINITELY will not
d. I PROBABLY will not

17. Have you ever used smokeless tobacco – tobacco that you don't smoke?

a. Yes b. No c. I don't know what this is

18. Have you ever tried e-cigarettes or e-hookah pens (e-shisha pens)?

a. Yes b. No c. I don't know what these are

IF YOU **DON'T KNOW** WHAT SMOKELESS TOBACCO, E-CIGARETTES, OR E-HOOKAH PENS ARE OR HAVE **NEVER USED** THESE DEVICES, SKIP TO QUESTION **20**.

19. How old were you when you used smokeless tobacco?

a. I have never used this
b. 8 years old or younger
c. 9 years old
d. 10 years old
e. 11 years old
f. 12 years old

20. How old were you when you tried e-cigarettes or e-hookah pens (e-shisha pens)?

a. I have never used this
b. 8 years old or younger
c. 9 years old
d. 10 years old
e. 11 years old
f. 12 years old

21. <u>In the past month</u>, on how many days did you use smokeless tobacco?

a. 0 days
b. 5 days or fewer
c. 6 days or more but not every day
d. Every day

22. In the past month, on how many days did you use e-cigarettes or e-hookah pens (e-shisha pens)?
    a. 0 days
    b. 5 days or fewer
    c. 6 days or more but not every day
    d. Every day

23. In the past year, who told you to stop smoking cigarettes, cigars, smokeless tobacco, or using e- cigarettes or e-hookah pens (e-shisha pens) [CIRCLE ALL THAT APPLY]
    a. A doctor, dentist or nurse
    b. A friend
    c. A family member
    d. School staff (teacher, other)
    e. Other
    f. No one, because I do not use tobacco products
    g. None of these people

24. In the past year have any of the following people told you about the dangers of using tobacco products such as cigarettes, cigars, e-cigarettes or e-hookah pens (e-shisha pens)? [CIRCLE ALL THAT APPLY].
    a. A doctor, dentist or nurse
    b. A friend
    c. A family member
    d. School staff (teacher, other)
    e. Other
    f. No one, because I do not use tobacco products
    g. None of these people

25. When you watch TV or go to the movies, how often do you see actors using tobacco such as smoking cigarettes, cigars, or using smokeless tobacco, e-cigarettes or e-hookah (e-shisha) pens?
    a. Most of the time
    b. Some of the time
    c. Hardly ever
    d. Never
    e. I don't watch TV or go to the movies

26. In the past month, where did you see advertisements for cigarettes or other kinds of tobacco? [CIRCLE ALL THAT APPLY]
    a. In stores
    b. Outdoors on signs or buses
    c. On the Internet
    d. At sport or community events
    e. In clubs, bars or restaurants
    f. In magazines or newspapers
    g. I did not see advertisements in any of these places

27. Would you ever use or wear something that has a tobacco company name or picture on it such as a lighter, T-shirt, cap, or sunglasses?
    a. Yes b. No c. I don't know

28. At your school, are students allowed to wear or use something that has a tobacco company name or picture on it?
    a. Yes b. No c. I don't know

29. Do you think tobacco companies try to get people addicted to cigarettes?
    a. Yes b. No c. I don't know

30. Do tobacco companies care about your health?
    a. Yes b. No c. I don't know

31. Do tobacco companies use advertisements to try to get young people to start smoking?
    a. Yes b. No c. I don't know

32. In the past month, where have you seen a message that tried to get people NOT to smoke? [CIRCLE ALL THAT APPLY]
    a. In schools
    b. In stores
    c. Outdoors on signs or buses
    d. In clubs, bars or restaurants
    e. In magazines or newspapers
    f. At sport or community events
    g. On the Internet
    h. In TV stories or advertisements
    i. I have not seen such a message in the past month

33. Does anyone who lives with you smoke cigarettes now?
    a. Yes b. No c. I don't know

34. Think about your close friends. How many of them smoke cigarettes?
    a. None b. Some c. Most of them d. All

35. How many of your close friends use smokeless tobacco?
    a. None b. Some c. Most of them d. All

36. How many of your close friends use e-cigarettes or e-hookah pens (e-shisha pens)?
    a. None b. Some c. Most of them d. All

37. In the past year did anyone at the school teach you how to say NO to tobacco?
    a. Yes b. No c. Not sure

38. In the past year, what kind of tobacco education did you receive at school? [CIRCLE ALL THAT APPLY].
    a. Classroom lessons
    b. A guest speaker
    c. A school assembly or event
    d. A drug abuse prevention education program that talked about cigarettes
    e. None of the above

39. In the past year, at school did you learn about: [CIRCLE ALL THAT APPLY]
    a. Why people your age smoke
    b. How many people your age smoke
    c. The effects of cigarette smoking on your body
    d. The effects of secondhand smoke
    e. How to feel good about yourself
    f. How to make good decisions about behaviors like smoking
    g. None of the above

40. In the past year did you learn anything in school that would help you say "no" to friends who offer you cigarettes?
    a. Yes c. Not sure
    b. No d. In the past year, I did not learn anything in school about smoking

41. Are people allowed to smoke cigarettes on the school premises?
    a. Yes b. No c. I don't know

42. Have you ever seen anyone smoke on school premises? [CIRCLE ALL THAT APPLY]
    a. No c. Saw teachers or other staff smoking
    b. Saw students smoking d. Saw others smoking

43. Do you think there needs to be more programs, **inside** the school, telling people your age not to smoke or use smokeless tobacco or e-hookah pens (e-shisha pens)?
    a. Yes b. No c. I don't know d. Not sure

44. Do you think there needs to be more programs, **outside** of school, telling people your age not to smoke or use smokeless tobacco or e-hookah pens (e-shisha pens)?
    a. Yes b. No c. I don't know d. Not sure

45. What do you think is the BEST way to reach people your age to tell them about the dangers of smoking and other tobacco use? [CIRCLE ONLY ONE ANSWER]

a. In school
b. Outdoor on signs or buses
c. Through the media – TV, newspapers, or magazines
d. On the Internet
e. In clubs or other places for teenagers

46. Who do you think people your age would pay attention to MOST about the dangers of smoking and other tobacco use? [CIRCLE ONLY ONE ANSWER]

a. A doctor or other health professional
b. People your age
c. A friend or family member
d. A teacher or coach
e. A celebrity (movie star, sports figure, etc.)

47. Who do you think people your age would pay more attention to about the dangers of smoking?

a. A teenager who smokes
b. A teenager who used to smoke but quit
c. A teenager who never smoked
d. No difference

DO YOU THINK.....

48. Young people who smoke cigarettes have more friends.

a. Yes b. No c. Not sure

49. Smoking cigarettes makes young people look cool or fit in.

a. Yes b. No c. Not sure

50. Young people risk hurting their health if they smoke from 1 to 5 cigarettes per day.

a. Yes b. No c. Not sure

51. It is safe to smoke for only a year or two, as long as you quit after that.

a. Yes b. No c. Not sure

52. I will lose non-smoking friends if I smoke cigarettes.

a. Yes b. No c. Not sure

53. Smoking cigarettes makes teeth yellow.

a. Yes b. No c. Not sure

54. Smoking cigarettes makes people smell bad.

a. Yes b. No c. Not sure

55. Non-smokers live longer than smokers.
    a. Yes b. No c. Not sure

56. Smoking cigarettes makes young people more relaxed.
    a. Yes b. No c. Not sure

57. Young people who smoke cigarettes look more grown up.
    a. Yes b. No c. Not sure

58. Teenagers are too young to get addicted to cigarettes.
    a. Yes b. No c. Not sure

59. Smoking cigarettes can make asthma worse.
    a. Yes b. No c. Not sure

60. Nicotine is the <u>only</u> harmful substance in tobacco?
    a. Yes b. No c. Not sure

61. Young people can keep from getting addicted to cigarettes by not inhaling when they smoke.
    a. Yes b. No c. Not sure

62. The smoke from other people's cigarettes is harmful to you.
    a. Yes b. No c. Not sure

63. People can get addicted to using tobacco just like they can get addicted to using other drugs such as cocaine or heroin.
    a. Yes b. No c. Not sure

64. A pregnant woman can hurt her unborn baby if she smokes cigarettes.
    a. Yes b. No c. Not sure

65. Most secondary school students smoke cigarettes.
    a. Yes b. No c. Not sure

66. Breathing smoke from someone else's cigarette – secondhand smoke – can cause lung cancer.
    a. Yes b. No c. Not sure

67. Smoking cigarettes can hurt your health even if you do not inhale.
a. Yes b. No c. Not sure

68. Smoking helps keep a young person from getting fat.
a. Yes b. No c. Not sure

69. Are you doing anything to....
a. Lose weight c. Stay the same weight
b. Gain weight d. Not doing anything about your weight

70. If one of your best friends offered you a cigarette, would you smoke it?
a. Yes b. No c. Not sure

71. Have you ever talked with your friends about why tobacco use is dangerous?
a. Yes b. No

72. Have you ever tried to discourage someone you know from using tobacco?
a. Yes b. No c. Not sure

73. Have you ever tried to help someone you know to stop using tobacco?
a. Yes b. No c. Not sure

74. Do you sometimes feel pressure to smoke cigarettes or use tobacco in other ways?
a. Yes b. No c. Not sure

75. Do you think <u>smoking</u> is a problem for persons your age?
a. Yes b. No c. Not sure

76. About how many people your age do you think smoke cigarettes?
a. None b. Some c. About half d. Moste. I don't know

77. Do you think most people your age know that smoking is dangerous?
a. Yes b. No c. Not sure

78. If someone was smoking near you, would you ask them to stop?
a. Yes b. No c. Not sure

79. If you wanted to ask someone near you to stop smoking would it be <u>easier</u> if they were the same age as you, younger or older? [CIRCLE ONLY ONE]
a. Same age b. Younger c. Older d. No difference e. Don't know

80. Do you think alcohol use is a problem among persons your age?
    a. Yes b. No c. Not sure

81. Have you ever drunk alcohol – wine, beer, or liquor – that is, more than a taste?
    a. No b. Yes. In the past month c. Yes. But not in the past month

82. How old were you when you first tried alcohol?
    a. I have never drunk alcohol c. 9 to 10 years old
    b. Younger than 9 years old d. 11 years or older

83. Do you think drug use is a problem among persons your age?
    a. Yes b. No c. Not sure

84. Have you ever used or tried any illegal drugs or other substances, such as marijuana, cocaine, LSD, speed (amphetamines), or ecstasy?
    a. Yes b. No c. Not sure

85. How old were you when you first tried an illegal drug or other substance such as marijuana, cocaine, LSD, speed (amphetamines), or ecstasy?
    a. I have never used such substances c. 9 or 10 years old
    b. Younger than 9 years old d. 11 years or older

86. Have you ever used or tried synthetic drugs?
    a. No b. Yes. In the past month c. Yes. But not in the past month

87. How old were you when you first tried synthetic drugs?
    a. I have never used such substances c. 9 or 10 years old
    b. Younger than 9 years old d. 11 years or older

88. If you had the opportunity to participate in other studies about young people your age, would you be interested?
    a. Yes b. No

CHECKLIST – Please circle your answer for each question.

1	Have you tried to quit but couldn't?	Yes	No
2	Do you smoke now because it is really hard to quit?	Yes	No
3	Have you ever felt like you were addicted to tobacco?	Yes	No
4	Do you ever have strong cravings to smoke?	Yes	No
5	Have you ever felt like you really needed a cigarette?	Yes	No
6	Is it hard to keep from smoking in places where you are not supposed to? (like school)	Yes	No
When you tried to stop smoking, or if you hadn't smoked for a while ...			
7	Did you find it hard to concentrate because you couldn't smoke?	Yes	No
8	Did you feel more irritable because you couldn't smoke?	Yes	No
9	Did you feel a strong need or urge to smoke?	Yes	No
10	Did you feel nervous, restless, or anxious?	Yes	No

YOU ARE DONE. THANK YOU VERY MUCH FOR YOUR HELP!

APPENDIX B

CULTURAL ADAPTATION OF THE QUESTIONNAIRE

Modifications to the original survey questions

The ‘Hands off tobacco! Anti-tobacco education for deaf youth’ survey was culturally adapted for Mauritian youth. The changes brought to the questions are described below.

Since some questions were removed, the question number in the original questionnaire is shown before the corresponding question number in the modified version. For example: ‘question [17] 11’ means that question 17 in the original instrument corresponds to question 11 in the modified version.

Moreover, since no hearing-impaired students were enrolled at the selected school during the study period, the terms ‘hearing’ or ‘deaf/HH’ in questions [26] 23 and [27] 24, [45] 43 to [48] 47, [76] 75 to [81] 79 and [85] 83 were removed and replaced by ‘a friend’ where appropriate. All modifications brought to the questions were reviewed and approved, or suggested, by the statistician.

Modifications to questions 1 to 4

i. For question 1 ‘How old are you?’, no options were given since the participants would be about 11 years old. Instead, they were required to write down their exact age.
ii. Question 2 ‘What is your gender?’ was removed since the study group was composed of males only.
iii. Since students from selected school are mostly from Asian descent, question 3 ‘Which of these groups BEST describes you? a. American Indian or Alaska Native; b. Asian; c. Black or African American; d. Hispanic or Latino [Example: Mexican,

South American, Central American]; e. Native Hawaiian or Other Pacific Islander [Example: Filipino, Samoan]; f. White; g. Other: _____' was replaced with 'Which of these areas BEST describe the place you live? a. Town b. Village' to assess whether living in a town or village had any effect on attitudes, knowledge, and beliefs towards use of tobacco products.

iv. Question 4 'What grade are you in?' was removed since only grade 7 students were selected in this study.

Modifications to questions 5 to 9

Questions 5 to 9, shown below, were removed since they are relevant only to deaf or hard of hearing students – none of the students at the selected school were hearing impaired. As such, question 10 in the original questionnaire becomes question 3 in the modified version.

Question 5: How old were you when you became Deaf or Hard-of-Hearing (Deaf/HH)?

a. Born Deaf/HH b. Less than 2 years old c. 2 to 5 years old

d. 6 years old or older e. Unknown

Question 6: How many of your friends are Deaf/HH?

a. All or almost all b. About half c. Not a lot d. None

Question 7: Is your mother Deaf/HH? a. Yes b. No c. I don't know

Question 8. Is your father Deaf/HH? a. Yes b. No c. I don't know

Question 9. Are any of your brothers or sisters Deaf/HH?

a. Yes b. No c. I don't know d. I don't have any brothers or sisters

Modifications to questions 11, 14, and 17

Questions [11] 5, [14] 8, and [17] 11 were modified as shown in Table 10, 11, and 12 below.

Table 10 Modifications to questions 11

Original question	Modified question	Rational for modification
11. How old were you when you smoked a whole cigarette for the first time? a. I have never smoked a whole cigarette b. 10 years old or younger c. 11 or 12 years old d. 13 or 14 years old e. 15 or 16 years old f. 17 years old	5. How old were you when you smoked a whole cigarette for the first time? a. I have never smoked a whole cigarette b. 8 years old or younger c. 9 years old d. 10 years old e. 11 years old f. 12 years old	Grade 7 students are between 11 and 12 years old. Therefore, the answer options were modified accordingly.

Table 11 Modifications to questions 14

Original question	Modified question	Rational for modification
14. In the past month, on how many days did you smoke cigarettes – even one puff from a cigarette? a. 0 days b. 1 to 5 days c. 6 or more days but not everyday d. Every day	8. In the past month, on how many days did you smoke at least one puff from a cigarette? a. 0 days b. 1 to 5 days c. 6 or more days but not everyday d. Every day	The original question was ambiguous and was modified to make it easier to understand.

Table 12 Modifications to questions 17

Original question	Modified question	Rational for modification
17. When was the last time you smoked a cigarette -- even one puff? [CIRCLE ALL THAT APPLY] a. I never smoked cigarettes – even one cigarette b. More than a year ago c. In the past year d. In the past month e. In the past week	11. When was the last time you smoked a cigarette – even if this was just one puff? a. More than a year ago b. In the past year c. In the past month d. In the past week e. Yesterday f. Today	"[CIRCLE ALL THAT APPLY]" was removed since this question can have only one answer. Option (a) in the original question was removed since after question '[10] 3. Have you ever smoked a cigarette – even a puff?', never-smokers are asked to skip to question 16. Two other options namely (e) 'yesterday' and (f) 'today' were added.

Modifications to questions 19, 20, 40, 43, 44, and 66

i. Options (a) 'I have never smoked cigarettes – even one cigarette' and 'I have never smoked cigarettes' in questions [19] 13 and [20] 14, respectively, were removed since, after question '[10] 3. Have you ever smoked a cigarette – even a puff?', never-smokers are asked to skip to question 16.

ii. Option (e) ‘A DARE program’ in question ‘[40] 38. In the past year, what kind of tobacco education did you have at school? [CIRCLE ALL THAT APPLY].’ will be replaced by ‘a drug abuse prevention education program’ to make the question culturally relevant since there are no DARE programs in Mauritius.

iii. The term ‘campus’ in questions ‘[43] 41. Are people allowed to smoke cigarettes on campus?’ and ‘[44] 42. Have you ever seen anyone smoke on campus?’ was replaced by ‘school premises’ since, in Mauritius, the former is usually used only for universities.

iv. The term ‘high school’ in question ‘[66] 65. Most high school students smoke cigarettes.’ was replaced by the term ‘secondary school’ which is more commonly used in Mauritius.

Questions added to the questionnaire

Cigarette smoking

Question 4 ‘How old were you when you had your first puff?’ was added since it is common practice for teenagers to share one cigarette between them and because teenagers often underestimate the consequences of the first puff. The students will be required to write down the age at which they had their first puff.

Use of e-cigarettes or e-hookah pens

Teenagers often perceive e-cigarettes as inoffensive (Primack et al., 2015). However, research suggests that adolescents who are exposed to nicotine via e-cigarettes are ‘at substantially increased risk for later use of cigarettes, even if they do not intend to smoke cigarettes in the future’ (Primack et al., 2015). According to the National Youth Tobacco

Survey (NYTS), the prevalence of U.S. high-school students who self-reported using e-cigarettes increased from 1.5% in 2011 to 11.3% in 2016 (Jamal et al., 2017). However, there is no data about the use of e-cigarettes or e-hookah pens among Mauritian teenagers.

Questions 18, 20, and 22 were added to determine (i) the prevalence of grade 7 students who use e-cigarettes or e-hookah pens; (ii) the age at which the participants started using e-cigarettes and (iii) how often grade 7 students use these devices. Question 35 was added to help assess the impact of having friends who smoke conventional or e-cigarettes on an adolescent's likelihood to use either or both conventional or e-cigarettes.

i. Question 18 'Have you ever tried e-cigarettes or e-hookah pens (e-shisha pens)?

   a. Yes; b. No; or c. I don't know what these are'.

ii. Question 20 'How old were you when you tried e-cigarettes or e-hookah pens (e-shisha pens)?

   a. I have never used these; b. 8 years old or younger; c. 9 years old; d. 10 years old; e. 11 years old; or f. 12 years old'.

iii. Question 22 'In the past month, on how many days did you use e-cigarettes or e-hookah pens (e-shisha pens)?

   a. 0 days; b. 5 days or fewer; c. 6 days or more but not every day; or d. Every day'.

iv. Question 35. 'How many of your close friends use e-cigarettes or e-hookah pens (e-shisha pens)?

   a. None b. Some c. Most of them d. All

Need for more programs

Question 45, shown below, was separated to an 'inside' of the school item (question 42) and an 'outside' of the school item (question 43). The term 'Deaf/HH' was omitted from the question since none of the students enrolled in the selected school during the study period were hearing impaired. Moreover, two extra options were added, namely 'c. I don't know' and 'd. Not sure' were added as per recommendations from the statistician who reviewed the questionnaire.

Question 45 (original question): Do you think there needs to be more programs – inside or outside of school – telling Deaf/HH people your age not to smoke or use smokeless tobacco? a. Yes or b. No

Question 43 (in the modified questionnaire): Do you think there needs to be more programs, **inside** the school, telling people your age not to smoke or use smokeless tobacco or e-hookah pens (e-shisha pens)? a. Yes b. No c. I don't know d. Not sure.

Question 44 (in the modified questionnaire): Do you think there needs to be more programs, **outside** the school, telling people your age not to smoke or use smokeless tobacco or e-hookah pens (e-shisha pens)? a. Yes b. No c. I don't know d. Not sure.

Use of synthetic drugs

Synthetic drugs such as 'Bat dan latet', 'Murder', 'La poussier tomb', 'Salvia', and 'C'est pas bien' are wreaking havoc in Mauritius and have caused numerous casualties (5-Plus Dimanche, 2017; DefiMedia, 2017; Le Mauricien, 2015). Therefore, questions 84 and 85, shown below, were added to the questionnaire to assess the prevalence of synthetic drug use in this study population.

Question 84. Have you ever used or tried synthetic drugs?

a. No; b. Yes. In the past month; or c. Yes. But not in the past month.

Question 85. How old were you when you first tried synthetic drugs?

a. I have never used such substances; b. Younger than 10 years old; c. 10 or 15 years old; d. 16 years or older.

Modifications to specific answer options

Answer options for Questions [11] 5, [24] 19, [84] 82, and [87] 85 were modified to reflect the age of the participants since only grade 7 students were involved in this study. The changes are summarized in Table 13 below.

Table 13 Modifications to answer options for questions 11, 24, 84, and 87

Question	Original answer options	Modified answer options
11. How old were you when you smoked a whole cigarette for the first time?	a. I have never smoked a whole cigarette b. 10 years old or younger c. 11 or 12 years old d. 13 or 14 years old e. 15 or 16 years old f. 17 years old	a. I have never smoked a whole cigarette b. 8 years old or younger c. 9 years old d. 10 years old e. 11 years old f. 12 years old

Table 13 (continued) Modifications to answer options for questions 11, 24, 84, and 87

Question	Original answer options	Modified answer options
24. How old were you when you used smokeless tobacco?	a. I have never used this b. 10 years old or younger c. 11 or 12 years old d. 13 or 14 years old e. 15 or 16 years old f. 17 years or older	a. I have never used this b. 8 years old or younger c. 9 years old d. 10 years old e. 11 years old f. 12 years old
84. How old were you when you first tried alcohol?	a. I have never drunk alcohol b. Younger than 10 years old c. 10 to 15 years old d. 16 years or older	a. I have never drunk alcohol b. Younger than 9 years old c. 9 to 10 years old d. 11 years or older
87. How old were you when you first tried an illegal drug or other substance such as marijuana, cocaine, LSD, speed, or ecstacy?	a. I have never used such substances b. Younger than 10 years old c. 10 to 15 years old d. 16 years or older	a. I have never used such substances b. Younger than 9 years old c. 9 to 10 years old d. 11 years or older

APPENDIX C

PERMISSION FORM

Mississippi State University

Parental or Legally Authorized Representative Permission Form

for Participation in Research

You are being asked to allow your child to participate in a research project. This form provides you with information about the project. Please read the information below and ask any questions you might have before deciding whether or not to allow your child to participate.

Title of research project: Implementation and evaluation of a school-based anti-tobacco program in Mauritius: a pilot study to assess the usefulness and reliability of a tobacco use prevention education instrument.

Site of research project: [School name not mentioned here to ensure confidentiality]

Name of researcher(s) & University affiliation: Shariah Hussenbocus, Graduate Student at Mississippi State University

The purpose of this research project:

- To increase awareness of health hazards of smoking and the addictive nature of nicotine and to empower students with skills to quit smoking or never initiate smoking.

If you agree to allow your child to participate in this research project, we will ask your child to do the following things:

- Answer an anonymous survey pertaining to smoking behavior and beliefs.
- Participate in smoking awareness classes which will be held on school premises during usual school hours.

The total estimated time to participate in this research project: 4 hours (7 35-minute sessions – 5 sessions to deliver the curriculum and 2 sessions to administer the survey, once before the curriculum's implementation and once after its implementation).

The risks of participation:

- None – the survey is anonymous and only the researcher (no school staff whether teaching or non-teaching) will have access to the data.

The benefits of participation:

- Data from the survey will be used to assess a curriculum that will not only help dissuade teenagers from initiating smoking but will also provide those who smoke with skills to quit smoking. This can help protect the students against smoking-related diseases while also empowering them with skills to resist peer pressure and deal with stress and external stressors in a healthy way.

Compensation: None

Confidentiality and privacy protections:

- All filled-in anonymous questionnaires will be returned to the researcher who will be the only person with access to the data.
- It is important to understand that these records will be held by a state entity and therefore are subject to disclosure if required by law.

Contacts and questions:

- If you have any questions, please ask now. If you should have any questions later or want additional information, please contact Shariah Hussenbocus at (230)58294881. For information regarding your rights as a research subject, please contact the MSU Research Compliance Office at 662-325-3994.

If you do not want your child to participate:

Please understand that your child's participation is **voluntary.** Your refusal to allow your child to participate will involve **no penalty** or loss of benefits to which you or your child is otherwise entitled. You may discontinue your child's participation **at any time** without penalty or loss of benefits. Your child may skip any items that he chooses not to answer. Your refusal will not impact current or future relationships with Mississippi State University or the [school]*. To do so, simply tell the researcher that you wish to stop.

If after reading the information above, you agree to allow your child to participate, please sign below. If you decide later that you wish to withdraw your permission, simply tell the researcher. You may discontinue your child's participation at any time. You will be given a copy of this form for your records.

_____

Child's name (please print)

_____

Parent or *Legally Authorized Representative's Signature

_____

Parent or *Legally Authorized Representative's Signature
(if applicable)

_____

Investigator's Signature

*If a Legally Authorized Representative (rather than a parent), must have documentation to show LAR status.

APPENDIX D

ASSENT FORM

Project Title: Implementation and evaluation of a school-based anti-tobacco program in Mauritius: a pilot study to assess the usefulness and reliability of a tobacco use prevention education instrument.

Investigator: Shariah Hussenbocus

Your parent knows that we are going to ask you to fill out this survey. We want to know about teenagers' attitudes and beliefs regarding smoking. It will take 20 minutes of your time to complete this questionnaire. Your name will not be written anywhere on the questionnaire and no one from the school will have access to the data. No one will know these answers came from you.

If you don't want to participate, you can stop at any time. There will be no bad feelings if you don't want to do this. You can ask questions if you do not understand any part of the questionnaire.

Do you understand? ____ Is this OK? ____

Participant's Name (Please Print): _____

_____

Signature

_____ Date : / / 2018

Investigator's Signature