

First tobacco product tried and current use of cigarettes and electronic cigarettes among adolescents from Guatemala City

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Abstract

Objective. To assess how first experimenting with cigarettes or e-cigarettes is associated with current use in Guatemala, a middle-income country with weak tobacco control and no e-cigarette regulations. **Materials and methods.** We surveyed students from private schools in Guatemala City, limiting analyses to ever users (n=1 026). Multinomial logistic models regressed current product use on first product used, adjusting for sociodemographics and friends and family use. **Results.** The most common first product used was e-cigarettes (56%), followed by flavored cigarettes (24%) and regular cigarettes (20%). At the time of the survey, 4% were exclusive smokers, 37% were exclusive e-cigarette users, 18% dual users, and 40% had ever tried either but were not current users. Compared to those who first tried cigarettes, students who first tried e-cigarettes were less likely to be current smokers (RR=0.19 [CI: 0.11,0.31]) or dual users (RR=0.26 [CI: 0.14,0.49]) and students who first tried flavored cigarettes were more likely to be current smokers (RR=1.66 [CI=1.13,2.42]). **Conclusions.** In our sample, Guatemalan adolescents from private schools more frequently experiment

Resumen

Objetivo. Evaluar la asociación entre primera experimentación con cigarros o cigarros electrónicos (e-cigarro) y el uso actual en Guatemala, un país de medianos ingresos con escaso control de tabaco y sin regulaciones para los e-cigarros. **Material y métodos.** Se encuestó a estudiantes de escuelas privadas en la ciudad de Guatemala, limitando el análisis a los adolescentes que habían probado algún producto (n=1 026). Modelos logísticos multinomiales exploraron la asociación de uso actual y primer producto de uso, ajustando para variables sociodemográficas y uso en la familia y amigos. **Resultados.** El producto de primer uso más común fue el e-cigarro (56%), seguido por cigarros saborizados (24%) y cigarros convencionales (20%). Al momento de la encuesta 4% eran usuarios exclusivos de cigarros, 37% eran usuarios exclusivos de e-cigarros, 18% usuarios duales, y 40% habían probado, pero no eran usuarios actuales. Comparado con aquellos que probaron por primera vez cigarros, los que probaron por primera vez e-cigarros tenían menor probabilidad de ser usuarios actuales de cigarro (RR=0.19 [CI: 0.11,0.31]) o usuarios duales (RR=0.26 [CI: 0.14,0.49]), y los que probaron

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and continue to use e-cigarettes than cigarettes. There is urgent need to implement e-cigarette restrictions in addition to tobacco control policy implementation.

Keywords: adolescent behavior; electronic nicotine delivery system; tobacco use; health policy

primero cigarros saborizados tenían más probabilidad de ser usuarios actuales de cigarro (RR=1.66 [CI=1.13,2.42]).

Conclusiones. Los adolescentes guatemaltecos de escuelas privadas experimentan con mayor frecuencia y continúan usando e-cigarros a comparación de cigarros. Es urgente implementar regulaciones para el e-cigarro además de implementar políticas para el control de tabaco.

Palabras clave: conducta del adolescente; sistemas electrónicos de liberación de nicotina; uso de tabaco; política de salud

Over the last decade, electronic cigarette (e-cigarette) use has rapidly increased among adolescents in high-income countries, causing concerns about their potential public health impacts.¹⁻³ By heating a liquid, these products deliver an aerosol that contains nicotine, flavorings, and other chemicals potentially harmful to the lungs.⁴ New product innovations continue to emerge, including an expanding array of flavors that appeal to youth.⁵⁻⁷ Yet, the evidence around experimentation and progression in using tobacco products is primarily from high-income countries, many of which have strong tobacco control policies and e-cigarette regulations.^{8,9}

On the other hand, cigarettes deliver nicotine to the lungs by burning tobacco (sometimes with flavorings) in a stick. Most experimentation with smoking begins in adolescence, as most adult smokers have begun smoking in their teen years.¹⁰ The tobacco industry has designed its products to make them appeal to adolescents, including adding flavors.^{4,11} For instance, menthol makes it easier for adolescents to experiment by reducing harshness of cigarette smoke and disguising tobacco flavor, which increases its addictive potential.^{12,13} Furthermore, the likelihood of becoming an established smoker is greater for those who initiate experimenting with menthol cigarettes.^{14,15}

Flavor capsule cigarettes, which contain a capsule that the consumer can crush to flavor the smoke, have rapidly gained market share worldwide.¹⁶ In 2018, Guatemala had the second highest market share for these cigarettes (30%) worldwide.^{16,17} Use has been associated with younger age and being female in countries such as Mexico and Chile.¹⁸ Moreover, adolescents perceive them as less harmful and more attractive than conventional cigarettes.^{19,20} Therefore, flavor capsule cigarettes might help recruit new smokers.

E-cigarettes also appeal to adolescents, with 81% of U.S. adolescent users reporting availability of flavors as one of the reasons for use.^{4,14,21} Further-

more, current use of e-cigarettes has increased among adolescents in the U.S., England, Canada, Mexico, and Guatemala.²²⁻²⁵ A considerable proportion of adolescents who use e-cigarettes have never smoked a cigarette, raising concerns about a possible gateway effect in youth who would have not otherwise initiated tobacco use.²⁶ For instance, two studies that assessed first product experimentation found that those who first try e-cigarettes are more likely to later try smoking and be current smokers than never smokers.^{27,28} However, in a cohort of American adolescents, those who first experimented with e-cigarettes were less likely to be ever smokers compared to those who first tried cigarettes.²⁹ In a longitudinal study in Mexico—where e-cigarettes are banned—researchers found that adolescents who had experimented with e-cigarettes at baseline were more likely to have tried and be past 30-day smokers than never tobacco users, although the association was substantially weaker than found in the US.³⁰ Understanding the types of tobacco products with which adolescents first experiment and the behavioral sequelae associated with each is vital in assessing and developing new tobacco control strategies.

In Guatemala, the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC) was signed and ratified in 2005. Since then, only a poorly enforced 2008 smoke-free environments law has been implemented.^{31,32} The only data on e-cigarette use indicates that high school students are much more likely to use e-cigarettes than smoke,²⁴ and e-cigarettes, particularly those with fruit flavors, are more appealing to adolescents than cigarettes or heated tobacco products.³³ In this study, we sought to understand the relationship between the first product used by adolescents and current product use in Guatemala, a middle-income country with weak tobacco control, where novel tobacco products are unregulated.^{31,34}

Materials and methods

Survey design and data

A cross-sectional study was conducted from May to September 2019 among 13 to 17-year-old students, in private schools in Guatemala City. Of the 30 schools invited, 6 declined, 14 did not respond, and 10 agreed to participate. Students in grades 8th-11th were recruited from all schools, with students in grade 12 also included from five schools, upon request from the schools. Students provided their assent to participate with passive consent obtained from their parents. Data was collected using a paper-based, self-administered, Spanish-language survey which was previously used in Mexico and adapted (including pretesting) for Guatemala.³⁵ The survey included questions on tobacco product susceptibility and use, risk factors for use and sociodemographics. From the 10 participating schools, 3 311 students were invited to participate and 2 870 completed the survey. The analytic sample for this study included those who had ever tried smoking or e-cigarettes (n=1 026). To assess ever tobacco use, students were asked if they had ever tried smoking cigarettes or e-cigarettes, even one or two puffs, with each product assessed separately. We excluded those who had never tried cigarettes or any other product (n=1 768) as we were only interested in ever smokers/ e-cigarette users. This protocol was approved by the Institutional Ethics Committee of the Institute of Nutrition of Central America and Panama (INCAP) in Guatemala.

Outcome variable

Current product use was defined as using either product in the past 30 days, with students classified into four mutually exclusive categories: tried but not current smoker or e-cigarette user (non-current), current exclusive smoker, current exclusive e-cigarette user, or current user of both products (*i.e.*, dual user).

Independent variable

The first product used was assessed using the question: "If you have consumed any type of tobacco product, which type did you try the first time?" Response options included: (a) "I have never tried any tobacco product"; (b) "common cigarette without flavorings"; (c) "common cigarette with menthol or another flavor"; (d) "common cigarette with flavor capsule"; (e) "electronic cigarette"; (f) "heated tobacco product such as IQOS"; and (g) "other type of tobacco such as hookah, chewing tobacco, or cigars". Those who answered (c) or (d) were combined

into one category (flavored cigarette including flavor capsules) to increase the sample size. Those who chose HTPs (f), or other type of tobacco (g) were excluded (n=28), because the group was too small to analyze.

Covariates

Students reported on smoking and e-cigarette use among family members and their five closest friends, which we used to derive four dichotomous variables: 1) At least one family member smokes; 2) at least one family member uses e-cigarettes; 3) at least one friend smokes; 4) at least one friend uses e-cigarettes. Sociodemographic variables included sex, age (between 13 and 17 years old), highest educational attainment by either parent, and family affluence using the Family Affluent Scale (FAS). The FAS is a summative measure using four items ("How many cars does your family have?", "Do you have your own bedroom?", "How many times did your family go on vacation last year?", and "How many computers are in your house?"; range 0-9) that have been previously validated among other adolescent populations,³⁶ including Latin American adolescents.³⁷ We treated the FAS as a continuous variable, so the RRs reflect the average decrease in likelihood of the outcomes for each increase in the FAS score.

Statistical analysis

Multinomial logistic models regressed the four-category current product use outcome (reference="not current user") on first product type used, as well as covariates, adjusting for clustering between students in the same school. All statistical analyses were conducted in Stata version 16.*

Results

Of the 1 026 students in this analytic sample, half were male (51%), between 16 and 17 years old (57%), and had at least one parent with a university degree or more (93%) (table I). In terms of tobacco product use, 40% of students had either tried but were not current smokers or e-cigarette users. Exclusive use was lower for cigarette (4%) than for e-cigarette (37%) users. Nearly 1 in 5 (18%) were current dual users. About half of the sample tried e-cigarettes first (56%). Of those who first smoked cigarettes, 20% first tried regular cigarettes and 24% flavored ones.

* StataCorp. 2019. Stata Statistical Software: Release 16. College Station, TX: StataCorp LLC.

Table I
SAMPLE CHARACTERISTICS OF GUATEMALAN
ADOLESCENTS WHO HAD TRIED ANY TOBACCO
PRODUCT. GUATEMALA, 2019 (N=1 026)

	<i>n (%)</i>
Sex	
Female	496 (49)
Age	
13	70 (7)
14	137 (13)
15	233 (23)
16	287 (28)
17	297 (29)
Parental education	
High school or less	49 (5)
University degree or more	951 (93)
Unknown	19 (2)
FAS (mean ± SD)	7.39 ± 1.55
Product Use	
Tried but not current smoker or e-cigarette user	413 (40)
Current exclusive smoker	43 (4)
Current exclusive e-cigarette user	381 (37)
Current dual use	184 (18)
First product use	
Cigarette	208 (20)
Flavored cigarette (including capsules)	248 (24)
E-cigarette	570 (56)
Family member smokes	
No	544 (53)
Yes	479 (47)
Family member vapes	
No	705 (69)
Yes	317 (31)
Friend smokes	
No	275 (27)
Yes	750 (73)
Friend vapes	
No	194 (19)
Yes	831 (81)

FAS: Family affluence scale

Compared to students who first tried a cigarette, students whose first product used was an e-cigarette were less likely to be a current smoker, whether exclusively (RR= 0.19; CI=0.11,0.31) or dual use (RR=0.26; CI=0.14,0.49) (table II). Those whose first product was

a flavored cigarette, were more likely to be a current smoker (RR=1.66; CI=1.13,2.42). Those with a family member who smokes were more likely to be a current exclusive smoker (RR=3.05; CI=1.62,5.74). Likewise, those with a family member who uses e-cigarettes, were more likely to be current exclusive e-cigarette users (RR=2.29; CI=1.85,2.84) or current dual users (RR=2.48; CI=1.47,4.19). Students with a friend who smokes were more likely to be a current smoker (RR=2.39; CI=1.22,4.72). Similarly, those with a friend who uses e-cigarettes were also more likely to be a current exclusive e-cigarette user (RR=4.46; CI=2.94,6.76) or current dual user (RR=3.56; CI=2.12,5.98) than those who did not have a friend who used e-cigarettes.

Those whose parents had a university degree or higher were less likely to be current exclusive smokers (RR=0.21; CI=0.09,0.52), e-cigarette users (RR=0.46; CI=0.28,0.75), or current dual users (RR=0.28; CI=0.13,0.61) compared to those with parents with lower educational attainment. The higher the student's family affluence, the less likely they are to be current exclusive smokers (RR=0.83; CI=0.72,0.95) or e-cigarette users (RR=0.90; CI=0.81,1.00).

Discussion

Our assessment of initial product experimentation among a sample of Guatemalan adolescents who had previously tried tobacco products indicated that those who first tried e-cigarettes were less likely to be current smokers, whether they were exclusively smoking or dual using, compared to those who first experiment with cigarettes. Moreover, those who first experimented with flavored cigarettes were more likely to be current smokers. More adolescents first experiment with e-cigarettes (56%) than with cigarettes (44%). Most of those who had tried these products currently used them (60%), with e-cigarette use being the most popular, whether used exclusively (37%) or along with smoking (dual use, 18%).

Our findings show that a significant proportion of Guatemalan adolescents from private schools who first experiment with e-cigarettes continue to use e-cigarettes (45%) and they are also less likely to report transitioning to either exclusive smoking or dual use when compared to those who first try cigarettes. Similar findings have also been documented in U.S. adolescents. Those who experimented first with e-cigarettes were less likely than those who first try cigarettes to be past 30-day smokers.²⁹ It is unclear whether e-cigarettes substitute for cigarettes in a subset of Guatemalan adolescents who would have otherwise smoked in the absence of e-cigarettes. This could be explained through the "common liability" pathway, which suggests that shared risk factors for sub-

Table II
MULTINOMIAL LOGISTIC REGRESSION MODEL OF TOBACCO USE STATUS. GUATEMALA, 2019 (N=998)

	Noncurrent (base outcome)	Current exclusive smoker		Current exclusive e-cigarette user		Current dual user	
	%	%	RR (95%CI)	%	RR (95%CI)	%	RR (95%CI)
First tobacco use							
Cigarette	40	5	Ref	27	Ref	28	Ref
Flavored cigarette (inc. flavor capsules)	33	11	1.66 (1.13,2.42)*	29	0.91 (0.66,1.26)	27	0.77 (0.37,1.61)
E-cigarette	44	1	0.19 (0.11,0.31)‡	45	1.08 (0.73,1.59)	10	0.26 (0.14,0.49)‡
Sex							
Female	42	4	Ref	38	Ref	16	Ref
Male	39	4	0.95 (0.63,1.45)	37	1.10 (0.84,1.45)	20	1.33 (1.02,1.72)§
Age							
13	60	0	Ref	31	Ref	9	Ref
14	58	2	0.58 (0.21,1.60)	33	0.76 (0.45,1.27)	7	0.29 (0.12,0.69)*
15	40	5	1.29 (0.66,2.52)	40	1.13 (0.61,2.09)	15	0.67 (0.30,1.53)
16	36	4	1.10 (0.51,2.38)	38	1.22 (0.60,2.51)	23	1.20 (0.53,2.73)
17	32	6	1.19 (0.52,2.69)	38	1.40 (0.65,3.02)	23	1.13 (0.43,2.94)
Parental education							
High school or less	43	4	Ref	35	Ref	18	Ref
University degree or more	40	4	0.21 (0.09,0.52)*	38	0.46 (0.28,0.75)*	18	0.28 (0.13,0.61)*
Unknown	53	5	0.27 (0.02,3.55)	37	0.49 (0.15,1.62)	5	0.12 (0.02,0.90)§
FAS			0.83 (0.72,0.95)*		0.90 (0.81,1.00)§		0.93 (0.82,1.04)
Family member smokes							
No	45	2	Ref	40	Ref	13	Ref
Yes	35	7	3.05 (1.62,5.74)*	34	0.80 (0.60,1.06)	23	1.27 (0.83,1.94)
Family member e-cigarette user							
No	46	5	Ref	34	Ref	15	Ref
Yes	27	2	0.41 (0.29,0.59)‡	45	2.29 (1.85,2.84)‡	26	2.48 (1.47,4.19)*
Friend smokes							
No	56	2	Ref	35	Ref	8	Ref
Yes	35	5	2.39 (1.22,4.72)§	38	0.88 (0.60,1.28)	22	1.43 (0.96,2.15)
Friend e-cigarette user							
No	70	8	Ref	16	Ref	6	Ref
Yes	34	3	0.73 (0.54,0.99)§	42	4.46 (2.94,6.76)‡	21	3.56 (2.12,5.98)‡

Note: Ref: reference level; RR: relative risk; CI: confidence interval; FAS: Family affluent scale

* $p < 0.01$; ‡ $p < 0.001$; § $p < 0.05$

stance use explains the use of both products.³⁸ However, our cross-sectional data do not compare smoking rates among those who first try e-cigarettes and those who do not try any product, which is how longitudinal studies that support the alternative “gateway” effect have been conducted.³⁹ Indeed, some evidence suggests that e-cigarettes attract relatively low-risk youth who would not have otherwise become smokers.^{35,40} Nevertheless, overall declines in youth smoking in the US have accelerated as e-cigarette use became more widespread, suggesting that the gateway effect seems offset by substitution effects when examined at the population level.^{40,41} Further longitudinal and population-level data are needed to better understand whether adolescent e-cigarette users become established smokers.

Males were more likely to be dual user than females, which consistent with previous data that shows that males to engage in more risky behaviors.^{35,42,43} Adolescents in our sample were more likely to be current smokers when they first experimented with flavored cigarettes. Adding flavors and menthol to tobacco, a well-known tobacco industry strategy, is now used for capsules in cigarettes.^{13,44,45} Currently, capsule cigarettes are highly advertised at the point-of-sale under no regulations.⁴⁶ Younger consumers perceive capsule cigarettes as less risky, better tasting, and more appealing.¹⁸ Moreover, tobacco industry documents confirm that capsule cigarettes were created to recruit younger populations.⁴⁷ The market share of capsule cigarettes in Guatemala is one of the largest, hence regulating the availability and marketing of these products is important.^{16,17}

In addition, family and peers appear to be an important risk factor for adolescent cigarette and e-cigarette use. In our sample, the use of e-cigarettes by a family member or friend was common (31 and 81%, respectively), and a key predictor of current exclusive e-cigarette use and dual use. Moreover, those with a family member that smokes (47%) are more likely to be current exclusive smokers. Hence, school is an important exposure for product experimentation and use.

Higher FAS and parental education reduced the likelihood of current smoking and current e-cigarette use. This is different from what has been reported in Mexico, where a higher wealth index was associated with use of e-cigarettes.⁴³ However, our sample had an average high level of FAS, thus findings might be different when including other socioeconomic levels.

Our study has some limitations. Our sample is from private medium/high socioeconomic status private schools in Guatemala, where most students have a higher purchasing power than the average Guatemalan adolescent. In 2020, 49% of the population lived below the poverty line.⁴⁸ Hence, e-cigarette use was likely

higher in our study population given that e-cigarettes are relatively expensive compared to cigarettes in Guatemala; nevertheless, cigarettes are inexpensive relative to other countries and so the direction of bias in our smoking estimates is unclear.^{49,50} In general, our findings are unlikely to generalize to lower- and middle-income classes living with less than 3.20 United States dollars per person per day or those living in rural Guatemala, where a higher proportion of the population lives in poverty and school completion is lower. All data are self-reported which might also lead to bias. Nevertheless, our study provides information from a middle-income country where tobacco control is weak and where there are no existing e-cigarette regulations. Moreover, our methodology refers to the first tried product which shed lights to the current situation and the controversy to understand the role of e-cigarettes in tobacco control.

Other Central American countries are moving towards the regulation of e-cigarettes. For example, Panama, Honduras and Costa Rica include them as part of the smoke-free environments law and regulate the marketing, promotion and sponsorship of these products.⁸ Moreover, other novel tobacco products have been introduced into the Guatemalan market under no regulations, including Phillip Morris’s, heated tobacco product IQOS and British American’s Tobacco e-cigarette, Vuse.³⁴

Compared to other countries in Latin America, MPOWER implementation lags behind in Guatemala.⁵¹ Only policies for smokefree environments have been adopted, although implementation and enforcement are weak. The MPOWER strategy of raising tobacco taxes reduces demand, particularly among adolescents, and should be adopted in Guatemala. However, tobacco industry interference hinders the approval of new tobacco regulations, as seen with law proposal 5461 “Law for Tobacco Control and its Products”, which has not been discussed in Congress since August 2019 due to industry interference.⁵² Furthermore, legislation should also consider emerging tobacco products as our findings show their substantial use.

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Author contributions

Sophia Mus: investigation, writing-original draft preparation. Jose Carlos Monzon: investigation, writing – review and editing. Farahnaz Islam: formal analysis, visualization. James F. Thrasher: conceptualization, methodology, writing – review and editing, funding acquisition. Joaquin Barnoya: conceptualization, methodology, writing – review and editing, funding acquisition, supervision. All authors contributed to and have approved the final manuscript.

Declaration of conflict of interests. The authors declare that they have no conflict of interests

References

1. U.S. Department of Health and Human Services. The Health Consequences of Smoking: 50 Years of Progress. A Report of the Surgeon General. Atlanta, 2014 [cited Jul 3, 2020]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK179276/>
2. Breland A, Soule E, Lopez A, El-hellani A, Eissenberg T. Electronic cigarettes: what are they and what do they do? *Ann NY Acad Sci*. 2018;1394(1):5-30. <https://doi.org/10.1111/nyas.12977>
3. National Academies of Sciences Engineering and Medicine. Public Health Consequences of E-Cigarettes. Washington DC: The National Academies Press. 2018 [cited Jul 3, 2020]. Available from: <https://nap.nationalacademies.org/resource/24952/012318ecigaretteConclusionsbyEvidence.pdf>
4. Walley SC, Wilson KM, Winickoff JP, Groner J. A Public health crisis: electronic cigarettes, vape, and JUUL. *Pediatrics*. 2019;143(6):e20182741. <https://doi.org/10.1542/peds.2018-2741>
5. Hsu G, Sun JY, Zhu SH. Evolution of electronic cigarette brands from 2013-2014 to 2016-2017: Analysis of brand websites. *J Med Internet Res*. 2018;20(3):1-10. <https://doi.org/10.2196/jmir.8550>
6. Moodie C, Ford A, Dobbie F, Thrasher JF, McKell J, Purves R. The power of product innovation: Smokers' perceptions of capsule cigarettes. *Nicotine and Tobacco Research*. 2018;20(9):1157-60. <https://doi.org/10.1093/ntn/ntx195>
7. Glantz SA. Heated tobacco products: The example of IQOS. *Tob Control*. 2018;27:s3-6. <https://doi.org/10.1136/tobaccocontrol-2018-054601>
8. Institute for Global Tobacco Control, Johns Hopkins Bloomberg School of Public Health. E- cigarette Policy Scan. Country Laws Regulating E-cigarettes - Country Comparison. Institute for Global Tobacco Control, 2020 [cited Jul 7, 2020]. Available from: <https://www.globaltobaccocontrol.org/e-cigarette/countryregion-comparison>
9. European Commission, The Tobacco Products Directive. Revision of the Tobacco Products Directive. European Commission, 2014 [cited Jul 7, 2020]. Available from: https://ec.europa.eu/health/tobacco/product-regulation/implementing-tobacco-products-directive-directive-201440eu/revision-tobacco-products-directive_en
10. Binns HJ, Forman JA, Karr CJ, Paulson JA, Osterhoudt KC, Roberts JR, et al. Policy statement - Tobacco use: A pediatric disease. *Pediatrics*. 2009;124(5):1474-87. <https://doi.org/10.1542/peds.2009-2114>
11. Jamal A, Gentzke A, Sean Hu S, Cullen KA, Alpelber BJ, Homa DM, et al. Tobacco use among middle and high school students - United States, 2011-2016. *Morb Mortal Wkly Rep*. 2017;66:297-603. <https://doi.org/10.15585/mmwr.mm6623a1>
12. World Health Organization. Case studies for regulatory approaches to tobacco products: Menthol in tobacco products. Geneva:WHO, 2018 [cited Jul 3, 2020]. Available from: <http://apps.who.int/bookorders.%0Ahttp://apps.who.int/iris>
13. Kreslake JM, Yerger VB. Tobacco industry knowledge of the role of menthol in chemosensory perception of tobacco smoke. *Nicotine and Tobacco Research*. 2010;12(Suppl 2):98-101. <https://doi.org/10.1093/ntn/ntq208>
14. Villanti AC, Johnson AL, Ambrose BK, Cummings KM, Stanton CA, Rose SW, et al. Flavored tobacco product use in youth and adults: findings from the first wave of the PATH Study (2013-2014). *Am J Prev Med*. 2017;53(2):139-51. <https://doi.org/10.1016/j.amepre.2017.01.026>
15. Giovino GA, Villanti AC, Mowery PD, Sevilimedu V, Niaura RS, Vallone DM, et al. Differential trends in cigarette smoking in the USA: Is menthol slowing progress? *Tob Control*. 2015;24(1):28-37. <https://doi.org/10.1136/tobaccocontrol-2013-051159>
16. Moodie C, Thrasher JF, Cho YJ, Barnoya J, Chaloupka FJ. Flavour capsule cigarettes continue to experience strong global growth. *Tob Control*. 2019;28(5):595-6. <https://doi.org/10.1136/tobaccocontrol-2018-054711>
17. Paraje G, Araya D, Drope J. The association between flavor capsule cigarette use and sociodemographic variables: Evidence from Chile. *PLoS One*. 2019;14(10). <https://doi.org/10.1371/journal.pone.0224217>
18. Kyriakos CN, Zatoński MZ, Filippidis FT. Flavour capsule cigarette use and perceptions: a systematic review. *Tob Control*. 2021. <https://doi.org/10.1136/tobaccocontrol-2021-056837>
19. Abad-Vivero EN, Thrasher JF, Arillo-Santillán E, Pérez-Hernández R, Barrientos-Gutiérrez I, Kollath-Cattano C, et al. Recall, appeal and willingness to try cigarettes with flavour capsules: Assessing the impact of a tobacco product innovation among early adolescents. *Tob Control*. 2016;25:e13-9.
20. Barrientos-Gutiérrez I, Islam F, Cho YJ, Salloum RG, Louviere J, Arillo-Santillán E, et al. Assessing cigarette packaging and labelling policy effects on early adolescents: results from a discrete choice experiment. *Tob Control*. 2021;30:505-14.
21. Schneller LM, Bansal-Travers M, Goniewicz ML, McIntosh S, Ossip D, O'Connor RJ. Use of flavored E-cigarettes and the type of E-cigarette devices used among adults and youth in the US—results from wave 3 of the population assessment of tobacco and health study (2015-2016). *Int J Environ Res Public Health*. 2019;16(16). <https://doi.org/10.1136/tobaccocontrol-2019-055463>
22. U.S. Department of Health and Human Services. E-cigarette use among youth and young adults. a report of the surgeon general. Atlanta: Department of Health and Human Services, 2016 [cited 2020 Jun 3]. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK538680/>
23. Barrientos-Gutiérrez I, Lozano P, Arillo-Santillán E, Morello P, Mejía R, Thrasher JF. "Technophilia": A new risk factor for electronic cigarette use among early adolescents? *Addictive Behaviors*. 2019;91:193-200. <https://doi.org/10.1016/j.addbeh.2018.09.004>
24. Gottschlich A, Mus S, Monzon JC, Thrasher JF, Barnoya J. Cross-sectional study on the awareness, susceptibility and use of heated tobacco products among adolescents in Guatemala City, Guatemala. *BMJ Open*. 2020;10(12):e039792. <https://doi.org/10.1136/bmjopen-2020-039792>
25. Hammond D, Rynard VL, Reid JL. Changes in prevalence of vaping among youths in the United States, Canada, and England from 2017 to 2019. *JAMA Pediatrics*. 2020;174(8):797-800. <https://doi.org/10.1001/jama-pediatrics.2020.0901>
26. Martinielli T, Candel MJJM, De Vries H, Talhout R, Knape V, Van Schayck CP, et al. Exploring the gateway hypothesis of e-cigarettes and tobacco: A prospective replication study among adolescents in the Netherlands and Flanders. *Tob Control*. 2021. <https://doi.org/10.1136/tobaccocontrol-2021-056528>
27. Lea Watkins S, Glantz SA, Chaffee BW. Association of noncigarette tobacco product use with future cigarette smoking among youth in the population assessment of tobacco and health (PATH) study, 2013-2015. *JAMA Pediatr*. 2018;172(2):181-7. <https://doi.org/10.1001/jamapediatrics.2017.4173>

28. Berry KM, Fetterman JL, Benjamin EJ, Bhatnagar A, Barrington-Trimis JL, Leventhal AM, et al. Association of electronic cigarette use with subsequent initiation of tobacco cigarettes in US youths. *JAMA Netw Open*. 2019;2(2):e187794. <https://doi.org/10.1001/jamanetworkopen.2018.7794>
29. Shahab L, Beard E, Brown J. Association of initial e-cigarette and other tobacco product use with subsequent cigarette smoking in adolescents: a cross-sectional, matched control study. *Tob Control*. 2021;30:212-20. <https://doi.org/10.1136/tobaccocontrol-2019-055283>
30. Lozano P, Barrientos-Gutierrez I, Arillo-Santillan E, Morello P, Mejia R, Sargent JD, et al. A longitudinal study of electronic cigarette use and onset of conventional cigarette smoking and marijuana use among Mexican adolescents. *Drug Alcohol Depend*. 2017;180(180):427-30. <https://doi.org/10.1016/j.drugalcdep.2017.09.001>
31. Barnoya J, Monzon JC, Briz P, Navas-acien A. Compliance to the smoke-free law in Guatemala 5-years after implementation. *BMC Public Health*. 2016(16):1-5. <https://doi.org/10.1186/s12889-016-2960-x>
32. World Bank Group. Guatemala Overview of: Tobacco use, tobacco control legislation and taxation. Washington DC: World Bank, 2019 [cited Oct 5, 2020]. Available from: <https://documents1.worldbank.org/curated/pt/966181561061563530/pdf/Guatemala-Overview-of-Tobacco-Use-Tobacco-Control-Legislation-and-Taxation.pdf>
33. Monzón J, Islam F, Mus S, Thrasher JF, Barnoya J. Effects of tobacco product type and characteristics on appeal and perceived harm: Results from a discrete choice experiment among Guatemalan adolescents. *Prev Med*. 2021;148. <https://doi.org/10.1016/j.ypmed.2021.106590>
34. Barnoya J, Monzon D, Pinetta J, Grilo G, Cohen JE. New tobacco products, old advertising strategies: point-of-sale advertising in Guatemala. *Tob Control*. 2021;30:591-3. <https://doi.org/10.1136/tobaccocontrol-2020-055681>
35. Thrasher JF, Abad-Vivero EN, Barrientos-Gutierrez I, Pérez-Hernández R, Reynales-Shigematsu LM, Mejía R, et al. Prevalence and correlates of e-cigarette perceptions and trial among early adolescents in Mexico. *J Adolesc Health*. 2016;58(3):358-65. <https://doi.org/10.1016/j.jadohealth.2015.11.008>
36. Boyce W, Torsheim T, Currie C, Zambon A. The family affluence scale as a measure of national wealth: Validation of an adolescent self-report measure. *Soc Indic Res*. 2006;78(3):473-87.
37. Pérez A, Thrasher J, Monzón JC, Arillo-Santillán E, Barnoya J, Mejía R. La escala de afluencia familiar en la investigación sobre inequidades sociales en salud en adolescentes latinoamericanos. *Salud Publica Mex*. 2021;63(2):201-10. <https://doi.org/10.21149/11793>
38. Vanyukov MM, Tarter RE, Kirillova GP, Kirisci L, Reynolds MD, Kreek MJ, et al. Common liability to addiction and "gateway hypothesis": Theoretical, empirical and evolutionary perspective. *Drug Alcohol Depend*. 2012;123(Suppl 1):S3-17. <https://doi.org/10.1016/j.drugalcdep.2011.12.018>
39. Soneji S, Barrington-Trimis JL, Wills TA, Leventhal AM, Unger JB, Gibson LA, et al. Association between initial use of e-cigarettes and subsequent cigarette smoking among adolescents and young adults: a systematic review and meta-analysis. *JAMA Pediatr*. 2017;171(8):788-97. <https://doi.org/10.1001/jamapediatrics.2017.1488>
40. Wills TA, Knight R, Williams RJ, Pagano I, Sargent JD. Risk factors for exclusive e-cigarette use and dual e-cigarette use and tobacco use in adolescents. *Pediatrics*. 2015;135(1):e43-51. <https://doi.org/10.1542/peds.2014-0760>
41. Levy DT, Warner KE, Michael-Cummings K, Hammond D, Kuo C, Fong GT, et al. Examining the relationship of vaping to smoking initiation among US youth and young adults: A reality check. *Tob Control*. 2019;28(6):629-35. <https://doi.org/10.1136/tobaccocontrol-2018-054446>
42. Morello P, Perez A, Peña L, Lozano P, Trasher J, Sargent J, et al. Prevalence and predictors of e-cigarette trial among adolescents in Argentina. *Tob Prev Cessat*. 2016;2:1-8. <https://doi.org/10.18332/tpc/66950>
43. Zavala-Arciniega L, Reynales-Shigematsu LM, Lozano P, Rodriguez-Andrade MÁ, Arillo-Santillán E, Thrasher JF. Patterns of awareness and use of electronic cigarettes in Mexico, a middle-income country that bans them: Results from a 2016 national survey. *Prev Med*. 2018;116:211-8. <https://doi.org/10.1016/j.ypmed.2018.09.018>
44. Strombotne K, Buckell J, Sindelar JL. Do JUUL and e-cigarette flavours change risk perceptions of adolescents? Evidence from a national survey. *Tob Control*. 2021;30(2):199-5. <https://doi.org/10.1136/tobaccocontrol-2019-055394>
45. Leventhal AM, Goldenson NI, Cho J, Kirkpatrick MG, McConnell RS, Stone MD, et al. Flavored e-cigarette use and progression of vaping in adolescents. *Pediatrics*. 2019;144(5):e20190789. <https://doi.org/10.1542/peds.2019-0789>
46. Barnoya J, Monzon D, Pinetta J, Grilo GC. Flavor capsule cigarettes, and heat not burn products point of sale advertising in Guatemala. New Orleans: USA, 2020.
47. Yvette van der E, Teo KW, Tan GPP, Chua WM. Tobacco industry strategies for flavour capsule cigarettes: analysis of patents and internal industry documents. *Tob Control*. 2021. <https://doi.org/10.1136/tobaccocontrol-2021-056792>
48. The World Bank. Poverty & Equity Brief: Latin America & the Caribbean. Guatemala, 2020.
49. Chacon V, Arriaza A, Cavazos-Rehg P, Barnoya J. Availability, Price, and Packaging of Electronic Cigarettes and E-Liquids in Guatemala City Retailers. *Nicotine & Tobacco Research*. 2018;20(2):253-7. <https://doi.org/10.1093/ntr/ntx071>
50. de Ojeda A, Barnoya J, Thrasher JF. Availability and costs of single cigarettes in Guatemala. *Nicotine and Tobacco Research*. 2013;15(1):83-7. <https://doi.org/10.1093/ntr/nts087>
51. Pan American Health Organization. Report on Tobacco Control for the Region of the Americas 2022 Country Profiles. 2022.
52. Assunta M. Global Tobacco Industry Interference Index 2019. Bangkok: Global Center for Good Governance in Tobacco Control, 2020 [cited Oct 5, 2020]. Available from: https://exposetobacco.org/wp-content/uploads/GlobalTIIIndex2020_Report.pdf