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Initiation Patterns and Trends of E-Cigarette and Cigarette Use among U.S. Adolescents

Rebecca J. Evans-Polce^{a,*}, Philip Veliz^a, Carol J. Boyd^{a,b,c}, Sean Esteban McCabe^{a,b}

^aCenter for the Study of Drugs, Alcohol, Smoking, and Health, School of Nursing, University of Michigan, 400 N. Ingalls Street, Ann Arbor, MI 48109, USA.

^bInstitute for Research on Women and Gender, University of Michigan, 1136 Lane Hall, 204 S. State Street, Ann Arbor, MI 48109, USA.

^cAddiction Center, Department of Psychiatry, University of Michigan, Ann Arbor, MI 48109, USA.

Abstract

Purpose: The primary objectives were to (1) examine the initiation patterns of e-cigarette and cigarette smoking, (2) compare recent trends in initiation patterns for 2015, 2016, and 2017, (3) examine sociodemographic differences in initiation patterns over time and, (4) examine how initiation patterns are associated with cigarette-related perceptions, behaviors, and intentions.

Methods: Data were collected via self-administered questionnaires from 2015–2017 nationally representative samples of 8th grade (modal ages 13–14) and 10th grade (modal ages 15–16) students (N=36,506) attending U.S. secondary public and private schools.

Results: Among lifetime e-cigarette or cigarette users (n = 9,858), initiating e-cigarettes only was the most common (47.45%). This was followed by cigarette before e-cigarette initiation (18.50%) which decreased in prevalence from 2015 to 2017. E-cigarette before cigarette initiation was the smallest group (6.89%) but increased from 2015 to 2017. E-cigarette before cigarette users were more likely to perceive cigarette use as risky (aOR: 1.40; 95% CI: 1.11,1.77) but also more likely to currently smoke cigarettes (aOR:1.30; 95% CI: 1.03,1.63) compared to those who initiated cigarettes before e-cigarettes. Both cigarette only initiators (aOR: 0.52; 95% CI: 0.33,0.80) and e-cigarette only initiators (aOR: 0.22; 95% CI: 0.07,0.16) were less likely to report future intentions to smoke compared to those who initiated cigarettes before e-cigarettes.

Conclusions: Initiation patterns related to e-cigarette and cigarette use among U.S. youth appears to be changing rapidly. Furthermore, patterns of initiation should be considered in future research as cigarette-related risk among different e-cigarette and cigarette use initiation patterns is heterogeneous.

*Corresponding author: Rebecca Evans-Polce, PhD, 400 N. Ingalls Street, Ann Arbor, MI 48109, USA, bjevans@umich.edu; Phone: (734) 647-1595; Fax: (734) 998-6508.

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Keywords

e-cigarettes; cigarettes; tobacco; nicotine; tobacco initiation

INTRODUCTION

Tobacco use among youth remains a significant public health threat in the U.S. While cigarette use has continued to decline [1,2], e-cigarette use has increased dramatically among youth [3,4]. Growing literature suggests that e-cigarette use among youth may be of particular concern because of associations with later cigarette use and other substance use [5]. Findings are mixed regarding this association. The “gateway effect” offers one explanation, where youth who would not have otherwise initiated cigarette use are more likely to do so after initiation of e-cigarettes [6]. In contrast, a common liability of risk for both cigarette and e-cigarette use, along with use of other substances, including marijuana [7] is also theorized (e.g., Vanyukov et al., 2012[8]). Dual use of both e-cigarette use and cigarettes is especially concerning as it is more heavily associated with binge drinking, marijuana use, other substance use, and poorer academic outcomes [9-11] than e-cigarette use alone.

Much of the literature regarding e-cigarette use risk has focused on subsequent risk for cigarette use initiation among e-cigarette users (e.g., [12-16]). While this subsequent risk is an important public health issue to address in understanding the risk associated with e-cigarette use, the number of youth who exhibit this initiation pattern compared to other initiation patterns is unknown. In addition, it is not well understood if different e-cigarette and cigarette initiation patterns confer similar or varying levels of cigarette-related risk. By initiation patterns we refer to both (1) whether an individual initiated e-cigarettes or cigarettes and (2) if both were initiated, the order of that initiation. To date, very few studies have examined the full spectrum of e-cigarette and cigarette sequence of initiation among adolescents. One study found that among those who had initiated both cigarette and e-cigarette use, most initiated cigarette use prior to e-cigarette use. The same study also showed that the initiation pattern of e-cigarettes/cigarettes differentiates risk of other substance use among 12th graders [17]. Another study found that most e-cigarette users had initiated other substances, including cigarette use, prior to initiation of e-cigarettes [18]. No studies have yet examined trends in initiation patterns of e-cigarette and cigarette use or how youth who exhibit different initiation patterns diverge in their sociodemographic profiles and in their cigarette-related risk.

It is important to understand not only how these initiation patterns differ in their associations with current cigarette use but also how potential precursors to use, including cigarette risk perceptions and future intentions to use cigarettes, differ by initiation pattern. Higher cigarette risk perceptions are negatively associated with cigarette use [19,20] and future intentions are a strong and robust indicator of both future health behaviors generally [21] and for cigarette use specifically [22,23]. Previous research found that e-cigarette use among cigarette-naïve youth was associated with decreased cigarette risk perceptions [24].

With the quickly evolving landscape of tobacco use among youth, initiation patterns of e-cigarettes and cigarettes may also be changing. Changing initiation patterns may signal that profiles of e-cigarette and cigarette users are changing along with the risk perceptions associated with e-cigarette and cigarette initiation. For example, an individual who initiates cigarettes before initiating e-cigarettes may be using e-cigarettes as a cigarette cessation aid; this scenario (i.e. cigarette cessation aid) is unlikely if e-cigarettes are initiated first or only e-cigarettes are initiated. Intervention strategies may also differ depending on whether an individual is a dual initiator (reporting initiation of both e-cigarettes and cigarettes) and whether they initiate e-cigarette or cigarette use first. Understanding the context in which adolescents use nicotine and tobacco products, including the initiation order of such products, is critical for public health interventions. Order of initiation may also be related to motivations to use which informs interventions. Continual surveillance of these patterns among youth will maintain an accurate understanding of this public health issue, along with relevant interventions.

The present study examines e-cigarette and cigarette use initiation patterns in a nationally representative sample of 8th and 10th graders in 2015-2017. We examine (1) the prevalence of initiation patterns, (2) whether these patterns have changed from 2015 to 2017, (3) sociodemographic differences in initiation patterns, and (4) the association of initiation patterns with cigarette risk perceptions, use, and future intentions.

METHODS

The present study used national data from the Monitoring the Future (MTF) study which annually surveys a cross-sectional, nationally representative sample of 8th and 10th grade students attending U.S. public and private secondary schools, using self-administered paper-and-pencil questionnaires in classrooms. Although MTF also samples 12th graders, they were not included in the present study to limit cohort differences and because of the limited sample of 12th graders that were asked all questions relevant to this study. The MTF study uses a multi-stage sampling procedure. Stage 1 is the selection of geographic areas within the four regions of the country, being the Northeast, South, Midwest, and West. Stage 2 is the random selection of public and private high schools with replacement (schools that decline are replaced with schools that are similar on geographic location, size, and urbanicity; see Miech et al., 2019 [20] for more detail). Stage 3 is the selection of students within each school. Sample weights were used in the present analyses to account for the unequal probabilities of selection that occurred at any stage of sampling. The samples analyzed in this study consisted of 8th and 10th grade students surveyed in 2015, 2016, and 2017. The response rates in the MTF study for those surveyed in 2015, 2016, and 2017 were as follows: 89%, 90%, and 87% (8th grade students) and 87%, 88%, and 85% (10th grade students). Additional details about the MTF design and methods are available elsewhere [20]. Approval was granted for this study by the University of Michigan IRB.

Measures

We calculated the *e-cigarette/cigarette use initiation patterns* using questions regarding grade of e-cigarette use initiation and grade of cigarette use initiation. Youth were asked to report

what grade level they first used e-cigarettes and separately what grade level they first used cigarettes. Response options ranged from (1) “Never” to (6) “Grade 8” for respondents in 8th grade; (1) “Never” to (8) “Grade 10” for respondents in 10th grade. From these variables we created six mutually exclusive *e-cigarette/cigarette use initiation pattern* categories. (1) e-cigarette use before cigarette use, (2) e-cigarette use and cigarette use in the same grade, (3) cigarette use before e-cigarette use, (4) e-cigarette use only, (5) cigarette use only, or (6) no e-cigarette or cigarette use.

Demographic characteristics included *sex*, *race/ethnicity* (Black, White, Hispanic, Other), *parent education* (at least one parent with college experience, no parent with college experience), U.S. Census geographical *region* (Northeast, Midwest, South, and West), metropolitan statistical area (*MSA*) (large, not large), *grade* (8th grade or 10th grade), and *survey year* (2015, 2016, or 2017).

Perceived risk of cigarette use was assessed by asking: “How much do you think people risk harming themselves (physically or in other ways) if they smoke one or more packs of cigarettes per day?” Response options ranged from “no risk,” to “great risk,” or “can’t say/drug unfamiliar.” This was dichotomized into no/slight/moderate risk vs. great risk. Those who responded “can’t say/drug unfamiliar” were coded as missing (2.8%, n=1,039). *Current cigarette use* was assessed by asking whether participants had smoked cigarettes in the past 30 days. *Future intentions to use cigarettes* was assessed by asking respondents “Do you think you will be smoking cigarettes five years from now?” This was dichotomized (definitely will not/probably will not vs. definitely will/probably will). Respondents were randomly assigned different forms of the survey that had core questions and some “form specific questions.” Smoking intentions were only asked of a random one-third of the sample (n=2,952).

Statistical Analysis

All analyses incorporated the MTF sampling weights in estimation of parameters for the target MTF population. We first computed the prevalence of the six e-cigarette/cigarette use initiation groups overall and separately for 8th and 10th graders. We then performed design-based chi-square tests to see if e-cigarette/cigarette use initiation groups differed by survey year. Finally, we examined whether e-cigarette/cigarette use initiation pattern groups differed by sociodemographic characteristics and whether odds of perceived risk of cigarette use, smoking intentions, and current cigarette use differed by initiation pattern. Sociodemographic characteristics were selected based on prior work showing them to be related to cigarette and/or e-cigarette use [13-16, 25-27]. All analyses employed the svy procedures in the Stata software (Version 15 [28]).

RESULTS

E-cigarette and cigarette use initiation pattern prevalence

The majority, 80.04% of 8th graders and 67.24% of 10th graders, had not initiated e-cigarettes or cigarettes. Of those who did report initiation of e-cigarette or cigarette use (n=9,858; Figure 1), almost half initiated only e-cigarette use (48.54% and 47.03% of 8th

and 10th graders, respectively). The second most common pattern was initiating cigarette use before e-cigarette use (17.65% and 19.05% of 8th and 10th graders, respectively). Among those who initiated e-cigarette or cigarette use, few initiated e-cigarettes prior to cigarettes (5.47% and 7.8% of 8th and 10th graders, respectively).

Trends in e-cigarette and cigarette use initiation patterns

Among 8th and 10th graders who reported initiation of e-cigarettes or cigarettes, e-initiation patterns differed significantly by survey year (Figure 2). From 2015 to 2017, there was a significant linear increase in the initiation of e-cigarette use before cigarettes and in the initiation of e-cigarettes only. In 2015, 4.68% of ever users reported initiation of e-cigarettes before cigarettes; by 2017 the prevalence was almost double at 8.67%. The prevalence of initiation of e-cigarettes only increased from 45.54% in 2015 to 49.30% in 2017. There was a significant linear decrease in initiation of cigarettes before e-cigarettes across the 3 years from 22.88% in 2015 to 14.78% in 2017. Initiation of e-cigarettes and cigarettes in the same grade and initiation of cigarettes only did not significantly differ in prevalence by survey year.

Sociodemographic differences in e-cigarette and cigarette use initiation patterns

We found significant sociodemographic differences in initiation patterns across all sociodemographic characteristics (Table 1). Sex differences were small, however, females had higher prevalence of no e-cigarette or cigarette use, lower prevalence of only initiating e-cigarettes and lower prevalence of initiating cigarettes before e-cigarettes. With regard to racial/ethnic differences, Black youth had greater prevalence of no e-cigarette or cigarette use. Black youth had lower prevalence of all tobacco use patterns except cigarette use only, including very low prevalence of initiating e-cigarettes before cigarettes (0.44%). Youth that had at least one parent with college experience had a greater prevalence of no use and lower prevalence of all e-cigarette and cigarette use initiation patterns. Those in the Northeast region had the highest prevalence of no e-cigarette or cigarette use and of e-cigarette only initiation. Those in the South had the highest prevalence of cigarette only initiation and cigarette before e-cigarette initiation. There were large differences between 8th and 10th graders as expected. Eighth graders had higher prevalence of no e-cigarette or cigarette use and lower prevalence of all initiation groups. In terms of survey year, no use of e-cigarettes or cigarettes was higher in 2016 and 2017.

Associations of e-cigarette and cigarette use initiation patterns with cigarette risk perception, use and intentions to use

Table 2 presents the associations of e-cigarette and cigarette use initiation patterns with three cigarette-related constructs: cigarette risk perceptions (e-cigarette only=Reference), current cigarette use in the past 30-days (cigarette only=Reference), and future intention to use cigarettes in the next 5 years (e-cigarette only=Reference). All dual initiators (e-cigarette before cigarette, e-cigarette and cigarette in the same grade, and cigarette before e-cigarette) perceived less risk related to cigarette use (Adjusted odds ratios ranged from 0.66 [95% CI: 0.53, 0.83] to 0.47 [95% CI: 0.41, 0.54]) and were more likely to have future intentions to use cigarettes compared to those who initiated e-cigarettes only (Adjusted odds ratios ranged from 6.43 [95% CI: 3.94, 10.50] to 9.08 [95% CI: 6.21, 13.27]). All dual initiators were also

more likely to report current past 30-day cigarette use compared to cigarette only initiators (Adjusted odds ratios range from 2.43 [95% CI: 1.91, 3.09] to 3.35 [95% CI: 2.54, 4.42]).

Table 3 again examines associations of e-cigarette and cigarette use initiation patterns with the same three cigarette-related constructs but with cigarette before e-cigarette use initiation as the reference in order to make comparisons between dual initiators. Those who initiated e-cigarettes before cigarettes and those who initiated e-cigarettes and cigarettes in the same grade were more likely to perceive cigarettes as risky compared to those who initiated cigarettes before e-cigarettes (aORs: 1.40 [95% CI: 1.11, 1.77] and 1.23[95% CI: 1.03, 1.48], respectively). Those who initiate e-cigarettes before cigarettes were also more likely to currently use cigarettes compared to those who initiate cigarettes before e-cigarettes (aOR: 1.30 [95% CI: 1.03, 1.63]). There were no significant differences among dual initiators in future intentions to use cigarettes. Those who initiated cigarette use only were less likely to currently use cigarettes (aOR: 0.39 [95% CI: 0.31, 0.49]) and less likely to have future intentions to use cigarettes (aOR: 0.52 [95% CI: 0.33, 0.80]) compared to those who initiated cigarettes followed by e-cigarettes.

DISCUSSION

This study used a large national sample to examine e-cigarette and cigarette initiation patterns among 8th and 10th grade youth. Our findings highlight the distinct patterns of initiation among youth and how these patterns are changing rapidly across cohorts of youth. We found that youth that did not initiate cigarette use or e-cigarette use increased from 2015 to 2017. This is in line with previous research findings from other large national studies showing increases in tobacco-naïve adolescents [1, 29]. Among those that did initiate e-cigarettes or cigarettes, initiation of e-cigarettes only was by far the most prevalent initiation pattern for both 8th and 10th graders and this group grew 8% from 2015 to 2017. As a whole, dual initiation of e-cigarettes and cigarettes decreased from 2015 to 2017. Taken together this appears to be good news for public health, particularly given the growing literature showing negative consequences associated with adolescent dual users [9-11]. Finding multiple significant changes in patterns across only three years of data reflects the very quickly changing landscape of nicotine and tobacco use and the need to have current data on use among youth.

Among those that were dual initiators of e-cigarettes and cigarettes, there were also important changes across the three years. While initiation of cigarettes before e-cigarettes was the largest dual initiation group across all three years of the study, it decreased in prevalence by more than a third. Over the same time period, initiating e-cigarettes before cigarettes almost doubled in prevalence. This suggests that the nature of e-cigarette use among youth may be changing. Past research has found that few adolescents report using e-cigarettes to help with quitting cigarettes [30,31]. The use of e-cigarettes as a cigarette cessation aid may be shrinking further for youth, and e-cigarette use initiation followed by cigarette initiation, a pattern which has been the dominant concern of many public health researchers, appears to be increasing. Overall e-cigarette has also considerably increased in prevalence during this short time period. Thus, the availability and opportunity to use e-cigarettes prior to cigarettes was greater in the later survey years. Future research should

examine these patterns in the most recent cohorts of youth and if the prospective risk of cigarette initiation among e-cigarette users is increasing.

We found important sociodemographic differences in patterns of initiation. One of the most striking findings was the low prevalence of e-cigarette use prior to cigarette use among Black adolescents compared to other racial/ethnic groups (0.44% compared to approximately 2% for all other groups). While Black adolescents had lower rates of any e-cigarette or cigarette use, this difference was the starkest. Previous research has found Black adolescents and young adults initiate cigarette use later and have later peaks in use [32] but this has not been examined with regard to e-cigarette use. Future research should explore if these differences remain at later ages and if the association of e-cigarette and cigarette use differs by race/ethnicity. Additionally, research should examine these differences among other racial/ethnic groups including multiracial individuals who are at high risk for nicotine and tobacco use [33].

Corroborating previous research, we also found that dual initiators were less likely to perceive cigarettes as risky, more likely to currently use cigarettes and more likely to have intentions to use cigarettes in the future. This adds to the literature highlighting the high risk of dual use. Lower risk perceptions may play a role in this increased risk.

We also found important and conflicting differences in risk among the different dual initiation groups. As expected, those who initiated e-cigarettes before cigarettes and those who initiated both at the same time were more likely to perceive cigarettes as risky compared to those who initiated cigarettes first. One would expect that, consequently, those who initiated e-cigarettes before cigarettes would also be less likely to currently use cigarettes. However, we found those who initiated e-cigarettes before cigarettes were more likely to be current cigarette users. We investigated whether this may be due to earlier grade of cigarette initiation among those who initiated cigarettes before e-cigarettes compared to those who initiated e-cigarettes prior to cigarettes. When controlling for grade of cigarette initiation in the model, our findings held. It may be that some adolescents initiating e-cigarettes after cigarette initiation may be doing so to help them quit cigarettes leading to lower prevalence of current smoking, though previous research suggests this to be a small number of adolescents [26]. Future research is needed to examine motivations along with initiation patterns among adolescents. Those who initiate e-cigarettes followed by cigarettes may also have some cognitive dissonance around cigarette use whereby they perceive cigarettes as risky but also are using cigarettes. It is important to highlight that the measure of perceived risk asked specifically about the risks of smoking a pack or more of cigarettes a day. Less than 5% of the current cigarette users in the sample smoked a pack or more a day and only 3% of those who initiated e-cigarettes first. Thus, these individuals may not perceive lighter cigarette smoking as risky. These findings also suggest that while those who initiate e-cigarettes first have increased risk of cigarette use, they may also be amenable to intervention as they already perceive risk and may be open to ways to reduce their use. A possible area for future research would be to examine if individuals with different order of initiation have different responses to tobacco cessation efforts.

Importantly, those who had only initiated cigarette use were less likely to both currently use cigarettes and intend to use cigarettes in the future compared to those who initiated cigarettes and then subsequently initiated e-cigarettes. This suggests that the subsequent initiation of e-cigarettes among youth who use cigarettes may place them at increased risk for future and continued cigarette use. While it is true that cigarette only initiators and dual initiators differ in important ways (as shown in Table 1), we accounted for some of these differences in our regression models and found differences. Still, additional differences between the groups may exist and it may be that those who initiate both products have a greater propensity for risk or a predisposition for a higher tolerance to nicotine compared to those that only use cigarettes or only e-cigarettes [6-8]. These findings indicate the need for prospective research to examine temporal associations over time with a wide array of covariates.

Limitations

These study findings should be considered alongside some limitations. First, this study used cross-sectional self-report data. Therefore, we are not able to tease apart the temporality of e-cigarette/cigarette use initiation with cigarette use risk perceptions, current cigarette use, and future intentions to use cigarettes and could not verify adolescent's tobacco use with biological data. Additionally, while we did draw on a nationally-representative sample of 8th and 10th graders, this study does not include students that do not attend public or private schools including home-schooled students and adolescents who have dropped out or do not regularly attend school. E-cigarette/cigarette initiation patterns may differ considerably for those youth not represented. Despite these limitations, this study has considerable strengths including examining these patterns across multiple large nationally representative cohorts of youth.

Conclusions

Tobacco/nicotine use among youth is a quickly evolving landscape and who is using cigarettes and e-cigarettes as well as the patterns in which they are using appears to be changing rapidly. Furthermore, there appears to be heterogeneity of cigarette-related risk by initiation pattern. Up to date data on tobacco use among youth is important and replications of past studies with more recent data is relevant to best understand the public health impact and context of youth tobacco use.

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IMPLICATIONS AND CONTRIBUTION

This study finds that e-cigarette and cigarette initiation patterns among US youth have changed considerably from 2015-2017. Understanding these different initiation patterns is important as they each carry different associations with cigarette risk perception, use, and intentions to use.

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Figure 1.
E-cigarette and cigarette initiation patterns by grade among 8th and 10th grade ever users, 2015-2017 (N_{unweighted}=9,858)

Figure 2.
Trends in e-cigarette and cigarette initiation patterns among 8th and 10th grade ever users
(N_{unweighted}=9,858)
*Significant linear trend using chi-square p<0.05

Table 1.
Correlates of e-cigarette and cigarette initiation patterns among full sample (N_{unweighted}=36,506)

	E-cigarette before cigarette %	E-cigarette and cigarette same grade %	Cigarette before e- cigarette %	Cigarette only %	E-cigarette only %	No e- cigarette or cigarette use %	Chi sq	Pvalue
Sex								
Male	1.88	3.88	5.32	2.94	13.44	72.54	6.01	p<0.0001
Female	1.80	4.01	4.52	3.41	11.82	74.44		
Race/ethnicity								
Black	0.44	1.97	3.08	3.72	9.48	81.30	15.13	p<0.0001
White	2.03	4.62	5.69	2.66	12.33	72.67		
Hispanic	2.07	3.82	3.80	3.91	14.81	71.60		
Other	1.91	3.41	5.00	3.54	12.90	73.26		
Parent education								
Parent(s) with college experience	1.71	3.72	4.50	2.89	12.27	74.91	22.30	p<0.0001
No parents with college experience	2.31	4.79	6.41	4.26	13.81	68.41		
Region								
Northeast	1.69	3.53	3.32	2.20	14.21	75.06	7.12	p<0.0001
North central	1.83	4.27	5.39	3.41	11.83	73.27		
South	1.73	4.11	5.71	3.68	11.54	73.23		
West	2.14	3.67	4.31	2.89	13.89	73.10		
Large Metropolitan Statistical Area								
Yes	2.07	3.89	3.62	2.54	13.45	74.44	13.07	p<0.0001
No	1.73	3.98	5.49	3.47	12.21	73.12		
Grade								
8th	1.09	2.81	3.52	2.84	9.69	80.04	114.28	p<0.0001
10th	2.55	5.05	6.24	3.51	15.41	67.24		
Survey year								
2015	1.39	4.66	6.79	3.33	13.52	70.31	15.99	p<0.0001
2016	1.97	3.50	4.17	3.08	11.94	75.33		
2017	2.17	3.68	3.70	3.14	12.33	74.98		

Table 2.

Associations of e-cigarette and cigarette use initiation patterns (Reference=E-cigarette only and cigarette use only) with cigarette risk perceptions, use, and future intention to use, 2015-2017.

	Perceived risk of cigarette use (n=9,858)	Current cigarette use (n=9,858)	Future intentions to use cigarettes (n=2,952)
	aOR ^a (95% CI)	aOR (95% CI)	aOR (95% CI)
E-cig before cig	0.66 (0.53, 0.83) *	3.35 (2.54, 4.42) *	6.43 (3.94, 10.50) *
E-cig and cig in the same grade	0.58 (0.49, 0.68) *	2.43 (1.91, 3.09) *	7.14 (4.81, 10.60) *
Cig before e-cig	0.47 (0.41, 0.54) *	2.58 (2.06, 3.24) *	9.08 (6.21, 13.27) *
Cig only	0.55 (0.46, 0.66) *	REF.	4.69 (2.90, 7.56) *
E-cig only	REF.	--	REF.

^a adjusted odds ratio. aORs controlled for sex, race/ethnicity, parent education, region, MSA, grade, survey year

* p<0.05

Table 3.

Associations of e-cigarette and cigarette use initiation patterns (Reference=Cigarettes before e-cigarettes) with cigarette risk perceptions, use, and future intention to use, 2015-2017.

	Perceived risk of cigarette use (n=9,858)	Current cigarette use (n=9,858)	Future intentions to use cigarettes (n=2,952)
	aOR ^a (95% CI)	aOR (95% CI)	aOR (95% CI)
E-cig before cig	1.40 (1.11, 1.77) *	1.30 (1.03, 1.63) *	0.71 (0.45, 1.11)
E-cig and cig in the same grade	1.23 (1.03, 1.48) *	0.94 (0.79, 1.12)	0.79 (0.56, 1.10)
Cig before e-cig	REF.	REF.	REF.
Cig only	1.17 (0.96, 1.43)	0.39 (0.31, 0.49) *	0.52 (0.33, 0.80) *
E-cig only	2.12 (1.84, 2.45) *	--	0.22 (0.07, 0.16) *

^a adjusted odds ratio. aORs controlled for sex, race/ethnicity, parent education, region, MSA, grade, survey year

* p<0.05