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Electronic nicotine delivery systems (ENDS) and acceptability of adult cigarette smoking among Florida youth: Renormalization of smoking?

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Abstract

Purpose—There is a dearth of research into whether ENDS promote acceptance of cigarette smoking. Therefore, we aimed to assess the association between ENDS exposure, acceptance of cigarette smoking, and susceptibility to cigarette smoking.

Methods—Data from the 2014 Florida Youth Tobacco Survey with a state-representative sample of middle and high school students (n=68928) were analyzed. Own ENDS use, exposure to ENDS advertising, and living with ENDS users, acceptance of adult cigarette smoking, demographics and known predictors of cigarette smoking were assessed. Susceptibility to cigarette smoking was assessed among never smokers. Weighted multiple logistic regression models and mediation analyses were conducted, stratifying by middle/high school and never/ever smoking. Analyses were conducted in 2016.

Results—Own ENDS use, exposure to ENDS advertising, and living with ENDS users were associated with acceptance of adult cigarette smoking even among never smokers, after accounting for covariates ($p<0.05$). In a mediation analysis, own ENDS use, exposure to ENDS advertising, and living with ENDS users were indirectly associated with susceptibility to cigarette smoking among never smokers through acceptance of adult cigarette smoking ($p<0.05$).

Conclusions—Youth ENDS exposure may contribute to normalizing adult smoking, and may in turn heighten susceptibility to cigarette smoking. If confirmed by longitudinal studies, these findings suggest that ENDS policy interventions may help prevent youth cigarette smoking.

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Keywords

Electronic nicotine delivery systems; cigarette smoking; acceptability; susceptibility

Reduction in the prevalence of youth smoking is a public health success. The prevalence of youth smoking has decreased since 1998, (1) to 9.3% in 2015. (2) However, other tobacco product use, such as electronic nicotine delivery systems (ENDS), are on the rise. Particularly, youth experimentation of ENDS has risen dramatically, from 4.7% of high school students in 2011 to 27.3% in 2014. (3) Past 30-day ENDS use among high school students also rose from 1.5% in 2011 to 16.0% in 2015. (2) While some evidence suggests that use of ENDS may be a useful approach to reducing harm associated with cigarette smoking among current adult smokers, (4, 5) there remain several concerns about ENDS. (6) One of these concerns is the potential to renormalize smoking, which is to make smoking “acceptable” to the public again. (6) Previous research has showed that denormalization of cigarette smoking is a successful strategy to reduce cigarette smoking. For example, Hammond and colleagues, in an international longitudinal study, found that smokers who perceived societal disapproval of smoking were more likely to intend to quit smoking, and subsequently quit smoking. (7) Thus, renormalization of cigarette smoking could lead to a resurgence of cigarette smoking. However, to date, no studies have examined how ENDS is associated with acceptance of cigarette smoking.

ENDS may make cigarette smoking more acceptable in three ways. First, experimentation with ENDS may lead youth to think that cigarette smoking is acceptable, given that the act of using ENDS is similar to the act of cigarette smoking. This hypothesis is supported by at least four longitudinal studies demonstrating that ENDS use by non-smoking youth was associated with future cigarette smoking. (8–11) However, none of these studies tested whether cigarette smoking initiation was partly due to higher levels of acceptance of cigarette smoking after ENDS use. Second, exposure to ENDS marketing may also promote acceptance of cigarette smoking. ENDS (especially those that are cigalike) are marketed widely, including through television commercials featuring celebrities. (12, 13) Youth exposure to ENDS advertising is also increasing. For example, youth exposure to televised ENDS advertisements increased 256% between 2011 and 2013. (13) Several studies have shown that exposure to ENDS marketing is associated with ENDS use, much like cigarette advertising has been reported to be associated with cigarette use. (14) For example, a dose-response relationship has been found between higher exposure to pro-tobacco advertisements for snus and ENDS, and having tried those products, among U.S. adolescents. (15) In a cross-sectional sample of youth in Scotland, having seen ENDS advertising in shops and supermarkets was associated with having tried an ENDS. (16) More importantly, the study found that having seen ENDS advertising at these points of sale was associated with intending to try ENDS in the next six months, after accounting for ever ENDS use. (16) However, no studies to date have examined the association between exposure to ENDS marketing and acceptance of cigarette smoking. Third, family and peer ENDS use may promote acceptance of cigarette smoking, similar to how parental cigarette smoking and sibling cigarette smoking are predictors of adolescent cigarette smoking. (17) Given the similarities between the acts of smoking and ENDS use, it is possible that youth

who live with ENDS users are more likely than youth who do not live with ENDS users to find cigarette smoking acceptable. This hypothesis was supported by a study conducted in Southern California which showed that family and peer ENDS use were associated with susceptibility to smoking. (18)

To inform the public health discussion related to ENDS, we analyzed data from the 2014 Florida Youth Tobacco Survey (FYTS). The FYTS is unique in that it assesses the degree to which youth perceived adult cigarette smoking to be acceptable, which is not assessed in the National Youth Tobacco Survey (NYTS) or other national youth risk behavior surveillance systems. We aimed to assess whether own ENDS use, exposure to ENDS advertising, and living with ENDS users are associated with acceptability of adult cigarette smoking. We also aimed to assess whether these associations differ between middle and high school youth, and by smoking status (never and ever smokers). Finally, we aimed to investigate whether the associations between own ENDS use, exposure to ENDS advertising, and living with ENDS users and susceptibility to cigarette smoking among never smokers were mediated by acceptability of adult cigarette smoking using structural equation models. (19) These models would shed light on the potential behavioral mechanisms through which ENDS may lead to youth cigarette smoking.

METHODS

Study population

We used data from the 2014 Florida Youth Tobacco Survey (FYTS). The FYTS is an anonymous, school-based, self-administered, paper-and-pencil survey conducted annually in classrooms by the Florida Department of Health, and the details of the study design and survey instruments are described elsewhere. (20) In brief, the sample includes middle school (n=36726) and high school (n=32672) students from 765 schools across the state of Florida, using a two-stage cluster probability design. In the first stage, a random sample of public middle and high schools was selected across the state. In the second stage, a random sample of classrooms was selected within each selected school. All students in the selected classrooms were invited to participate in the survey in spring of 2014. Data were collected from 66 counties in Florida, with two counties excluded due to unrepresentative sampling or refusal to participate. Parental consent was required by all counties, with two counties using active consent and the rest passive consent procedures. Response rate among sampled middle schools was 81%, and response rate among sampled high schools was 78%. In the current analysis, participants missing information on grade level were excluded (n=470). The National Institutes of Health Office of Human Subjects Research determined that the analyses were exempted from IRB review.

Measures

All participants were asked if they had ever used ENDS (“Have you ever tried, even once: using an electronic cigarette?) and if they had used ENDS in the past 30 days (“During the past 30 days, have you: used an electronic cigarette?”). The survey did not inquire about the use of ENDS other than electronic cigarettes (e.g., tank-type e-vapor), and did not ask if the respondents used ENDS that deliver nicotine. Participants reported if they had heard or seen

advertising for ENDS ("During the past 30 days, have you heard or seen advertising for electronic cigarettes in any of the following places: commercials on the radio/on TV, on the Internet, on billboards or outdoor signs, and in magazines or newspapers?"). Participants also reported whether they lived with ENDS users ("Does anyone who lives in your home use any of the following products now: electronic cigarettes?").

Acceptance of cigarette smoking was assessed among all participants by two items. Peer acceptance of adult smoking was assessed by asking, "Do you think your friends view cigarette smoking among adults as acceptable?" Community acceptance of adult smoking was assessed by asking, "Do you think people in your neighborhood or community view cigarette smoking among adults as acceptable?" Four options were provided in both items, and were dichotomized into yes (including those responding "definitely yes" and "probably yes") and no (including those responding "probably not" and "definitely not").

Cigarette smoking behaviors were also assessed. All participants were asked if they had ever tried cigarette smoking, even one or two puffs (yes/no), and if so how many days they smoked cigarettes in the past 30. Participants who reported never having smoking or not having smoked in the past 30 days were classified as "not smoked in the past 30 days", while those who reported smoking one or more days were classified as "smoked in the past 30 days". All participants were asked if they lived with someone who smokes cigarettes (yes/no), if they had recently seen characters smoking cigarettes in movies ("Think about the movie that you watched most recently in a theatre/on video or TV. Did any of the characters in the movie smoke cigarettes?"), and if they had seen tobacco point-of-sale advertisements recently (yes/no). Among participants who had never tried smoking cigarettes, susceptibility to cigarette smoking was assessed using responses to the following items: Whether they think they would try a cigarette soon (yes/no), whether they think they will smoke a cigarette at any time during the next year (definitely yes, probably yes, probably not, definitely not), whether they think they will smoke a cigarette at any time during the next five years (definitely yes, probably yes, probably not, definitely not), and whether they would smoke a cigarette if offered by best friends (definitely yes, probably yes, probably not, definitely not). (21) Participants who answered "no" to the first item and "definitely not" to the second, third, and fourth items were classified as "non-susceptible"; otherwise, they were classified as "susceptible". Lastly, demographics (age, gender, and race/ethnicity) were assessed. Participants were classified as attending a school in a metropolitan (metro) or a non-metropolitan (non-metro) area based on the county where the school was located, using the U.S. Department of Agriculture Economic Research Service Rural-Urban Continuum Code. (22)

Statistical analysis

Data were weighted to account for clustering and to be representative of Florida middle and high school students. All analyses were stratified by middle vs. high school and never vs. ever cigarette smokers. We used weighted logistic regression models to assess the associations between ENDS use, living with ENDS users, exposure to ENDS advertising, and acceptance of cigarette smoking, adjusting for demographics, exposure to cigarette marketing, living with a cigarette smoker, and past-30-day cigarette smoking (only among

ever smokers). Because the cigarette smoking acceptability items were only moderately correlated (r=0.44), they were modeled separately. We conducted these analyses in SAS version 9.3 (Cary, NC) using PROC SURVEYFREQ and PROC SURVEYLOGISTIC. We conducted mediation analysis using structural equation models as shown in Figure 1 to simultaneously estimate the direct and indirect effects (through the acceptance items) of ever ENDS use (dichotomized from the three-level ENDS use variable described above into ever versus never), living with ENDS users, and exposure to ENDS advertising on susceptibility to smoking among never smokers. We conducted the mediation analyses using Mplus version 7.3 (Los Angeles, CA). Robust maximum likelihood (MLR) estimator was used to account for clustering by school. Model indirect statements were used to test statistical significance of each indirect effect. We presented regression coefficients and 95% confidence intervals of the indirect effects from the mediation analysis. Analyses were conducted in 2016.

RESULTS

Sample characteristics are presented in Table 1. High school students were more likely than middle school students to have ever used ENDS (20.1% vs. 8.3%; Chi-square test $p<0.01$) and to live with ENDS users (12.9% vs. 11.6%; Chi-square test $p<0.01$), but they were equally likely to have been exposed to ENDS advertising (64.9% vs. 64.4%; Chi-square test $p=0.75$). Ever cigarette smokers were more likely than never cigarette smokers to live with cigarette smokers (45.4% vs 22.6%), live with ENDS users (24.7% vs 9.5%), and to have used ENDS in their lifetime (53.4% vs. 6.2%; Chi-square test $p<0.01$). While ever cigarette smokers were more likely to have been exposed to ENDS advertising (72.7%), exposure to ENDS advertising among never cigarettes smokers was also prevalent (62.8%; Chi-square test $p<0.01$).

Peer acceptance of adult cigarette smoking

ENDS use and exposure to ENDS advertising were positively associated with perceived peer acceptance of adult cigarette smoking among middle and high school students who never smoked cigarettes (Table 2). Additionally, among high school students who never smoked cigarettes, living with ENDS users was positively associated with perceived peer acceptance of adult cigarette smoking. These associations were non-significant among middle and high school students who reported ever smoking cigarettes in their lifetime. Among never smoking youth, the mediation analysis showed significant indirect effects of lifetime ENDS use and exposure to ENDS advertising on susceptibility to cigarette smoking through peer acceptance of adult cigarette smoking among both middle and high school students who never smoked cigarettes (Table 3). Additionally, among high school students who never smoked cigarettes, there was a significant indirect effect of living with ENDS users on susceptibility to cigarette smoking through peer acceptance of adult cigarette smoking.

Community acceptance of adult cigarette smoking

Among Florida middle and high school students who never smoked cigarettes, exposure to ENDS advertising and living with ENDS users were positively associated with perceived community acceptance of adult cigarette smoking (Table 2). Meanwhile, among middle

school students who smoked cigarettes in their lifetime, living with ENDS users was positively associated with perceiving that people from their community would think that adult cigarette smoking is acceptable (Table 2). Among high school students who smoked cigarettes in their lifetime, but not past-30-day, ENDS use was positively associated with community acceptance of adult cigarette smoking. Among never smoking youth, results from the mediation analyses showed a significant indirect effect of exposure to ENDS advertising and living with ENDS users on susceptibility to cigarette smoking through community acceptance of adult cigarette smoking (Table 3). Moreover, among high school students who never smoked cigarettes, there was a significant indirect effect of ever ENDS use on susceptibility to cigarette smoking through community acceptance of adult cigarette smoking.

DISCUSSION

The potential for renormalization of cigarette smoking due to the increasing prevalence and public display of ENDS use has been cited as a public health concern. (6) We provide the first empirical assessment of this concern. Overall, our findings suggest that ENDS (namely ENDS use, exposure to ENDS advertising, and living with ENDS users) may contribute to normalizing cigarette smoking among non-smoking youth by promoting a normative perception of cigarette smoking, even after accounting for risk factors for cigarette smoking (e.g., exposure to cigarette advertising, living with cigarette smokers). The potential normalization of cigarette smoking through ENDS exposure, as suggested by our findings, if confirmed to be true in longitudinal studies, could complicate public health efforts to de-normalize cigarette smoking, which has been successful at discouraging cigarette smoking behavior over the past three decades. (7) The relationships found in our study indicate that with the increasing prevalence of ENDS use among youth and adults, (2, 23) and increasing youth exposure to ENDS advertising, (13) we can expect an increasing number of youth to believe that cigarette smoking is an acceptable behavior, and perhaps an increasing number of youth experimenting with cigarettes. Currently, national surveillance systems such as the National Youth Tobacco Survey do not monitor youth acceptability of adult cigarette smoking. This measure could be incorporated in these national surveillance systems alongside ENDS exposure, so that we can better understand whether the relationships found in present study are also found in analyses with nationally-representative samples.

Because the data were collected from a cross-sectional survey, these findings should be interpreted with caution and cannot infer causality. It is possible that youth who are interested in cigarette smoking, compared to those who are not interested in cigarette smoking, view cigarette smoking as more acceptable, try ENDS, and are more receptive to ENDS advertising. However, both our analytic approach and previous studies may to some extent refute this alternative interpretation. First, a previous cohort study showed that youth and young adults who used ENDS but were uninterested in cigarettes were still more likely to subsequently smoke cigarettes, (9) suggesting that interest in ENDS use is not entirely due to interest in cigarette smoking. Second, it is unlikely that curiosity about cigarette smoking would lead to living with an ENDS user among middle and high school students. We also controlled for living with cigarette smokers to account for its confounding effect on living with ENDS users and acceptability of adult cigarette smoking. Third, assessment of

exposure to ENDS advertising was based on a dichotomous variable that measured whether they had seen ENDS advertisements, which would minimize the level of recall bias. Fourth, the directionality of the associations specified in the mediation analysis are supported by findings from previous observational studies. (15, 16) Additionally, previous experimental studies have shown the influence of ENDS advertisements on harm perceptions and affective responses towards ENDS among young adult non-smokers, (24) intention to use ENDS among adolescent non-smokers, (25) and harm perception of cigarette smoking among adolescent cigarette and e-cigarette never users. (26)

The current study is also limited because the data were collected from a single state and from youth who attend school. Thus, these findings may not be generalizable to all youth and those who are not in school. All measures were based on self-report and are subject to nondisclosure and recall inaccuracy. Additionally, the survey likely only measured one type of ENDS (those that are cigalikes), and did not obtain information on the nicotine contents of ENDS used by the respondents. Therefore, it is unclear if our findings apply to other (e.g., tank-based) types of ENDS, and whether the nicotine content of ENDS moderates the reported associations. Also, acceptability of adult cigarette smoking may be only one of the social influences on cigarette smoking, as a previous study suggested six different social influences on smoking cessation. (27) Furthermore, the indirect effects of ENDS exposure on susceptibility to cigarette smoking through acceptance of cigarette smoking were small. On the other hand, given the ubiquity of ENDS exposure (especially electronic cigarette advertising that reached 24 million youth in 2014 (13)), the effect at the population level could be substantial. In contrast, a strength of the analysis is its large sample size which provides us sufficient statistical power to model ENDS use with multiple categories even among middle school never smokers whose prevalence of ENDS use is low.

CONCLUSIONS

Among the Florida middle and high school students in our study, ENDS use, exposure to ENDS advertising, and living with ENDS users are associated with acceptability of cigarette smoking, particularly among never smokers. These variables were also associated with susceptibility to cigarette smoking among never smokers. If future longitudinal studies confirm the present findings, interventions to reduce youth ENDS use, regulations to reduce youth exposure to ENDS marketing, and policies to reduce youth exposure to ENDS use at home may uphold the successful public health effort to denormalize cigarette smoking and prevent smoking initiation due to electronic cigarettes.

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List of abbreviations

ENDS Electronic Nicotine Delivery Systems

FYTS	Florida Youth Tobacco Survey
NYTS	National Youth Tobacco Survey

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Implications and contribution

Positive associations were found between ENDS exposure (i.e., ENDS use, exposure to ENDS advertising, and living with ENDS users), acceptance of cigarette smoking, and openness to try cigarette smoking among Florida youth. Findings will inform the discussion of the impact of ENDS on adolescent health.

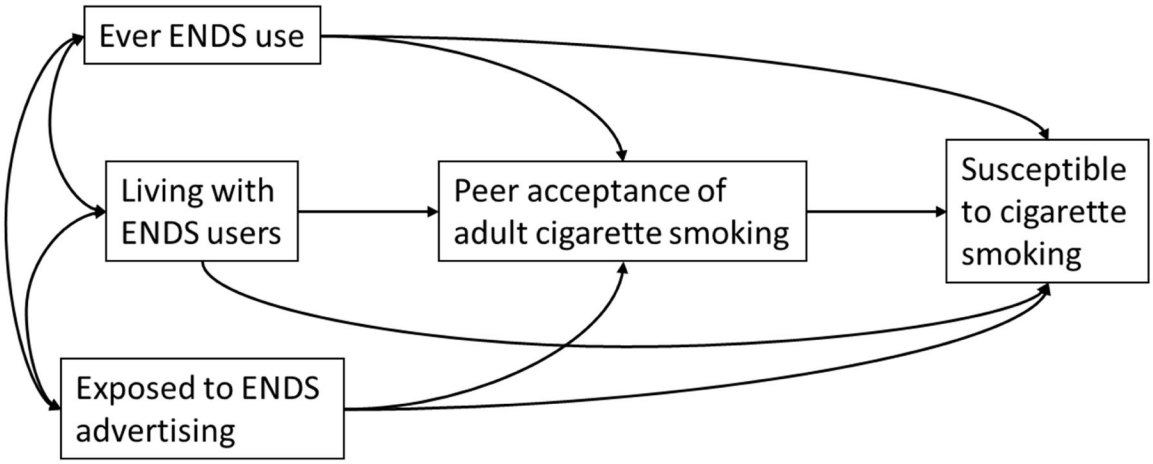

Figure 1. Schematic of the structural equation models used for mediation analysis

Note: A similar model was used to conduct mediation analysis with community acceptance of adult cigarette smoking. For simplicity, covariates (age, gender, race/ethnicity, metropolitan status, living with cigarette smokers, exposure to cigarette smoking images on screen, and exposure to cigarette point-of-sale advertising) were not included in this schematic. They were included in the actual mediation analysis.

Table 1

Sample characteristics by middle school and high school, 2014 Florida Youth Tobacco Survey.

	Middle school		High school	
	Never cigarette smokers	Ever cigarette smokers	Never cigarette smokers	Ever cigarette smokers
Characteristics	**Weighted % (95% CI)**	**Weighted % (95% CI)**	**Weighted % (95% CI)**	**Weighted % (95% CI)**
Age (years)	12.7 (12.6, 12.7)	13.4 (13.3, 13.5)	16.0 (15.9, 16.0)	16.4 (16.3, 16.4)
Gender				
Female	48.7 (47.7, 49.8)	46.8 (44.3, 49.3)	50.0 (48.8, 51.2)	45.6 (44.3, 47.0)
Male	51.3 (50.2, 52.3)	53.2 (50.7, 55.7)	50.0 (48.8, 51.2)	54.4 (53.0, 55.7)
Race/ethnicity				
NH-White	37.1 (34.1, 40.0)	37.9 (34.5, 41.2)	37.2 (34.3, 40.1)	45.3 (42.3, 48.3)
Hispanic	29.7 (26.5, 32.9)	30.2 (26.7, 33.6)	29.7 (26.8, 32.6)	32.3 (29.0, 35.7)
NH-AI/AN/NH/PI	1.7 (1.5, 1.9)	2.3 (1.8, 2.9)	1.2 (1.0, 1.4)	1.9 (1.5, 2.2)
NH-Asian	3.1 (2.6, 3.5)	2.1 (1.4, 2.8)	3.0 (2.5, 3.4)	1.8 (1.4, 2.2)
NH-Black	23.2 (19.9, 26.4)	21.9 (19.0, 24.8)	25.0 (22.1, 28.0)	14.6 (12.8, 16.3)
NH-Other	5.3 (4.8, 5.8)	5.7 (4.7, 6.6)	3.9 (3.6, 4.2)	4.1 (3.5, 4.7)
Metropolitan status				
Metropolitan	94.5 (93.2, 95.7)	90.8 (88.8, 92.9)	95.6 (94.3, 96.9)	92.4 (90.4, 94.4)
Non-metropolitan/rural	5.5 (4.3, 6.8)	9.2 (7.1, 11.2)	4.4 (3.1, 5.7)	7.6 (5.6, 9.6)
Smoked cigarettes in past 30 days				
Yes	--	27.2 (24.9, 29.5)	--	30.9 (29.6, 32.3)
No	--	72.8 (70.5, 75.1)	--	69.1 (67.7, 70.4)
Living with cigarette smoker(s)				
Yes	23.8 (22.5, 25.0)	52.3 (49.6, 55.0)	21.7 (20.6, 22.7)	43.4 (41.8, 45.1)
No	76.2 (75.0, 77.5)	47.7 (45.0, 50.4)	78.3 (77.3, 79.4)	56.6 (54.9, 58.2)
Exposed to cigarette smoking images on screen				
Yes	63.6 (62.6, 64.5)	81.8 (80.0, 83.6)	67.8 (66.8, 68.8)	78.5 (77.1, 80.0)
No	36.4 (35.5, 37.4)	18.2 (16.4, 20.0)	32.2 (31.2, 33.2)	21.5 (20.0, 22.9)
Exposed to cigarette POS advertising				
Yes	76.1 (75.0, 77.3)	83.9 (81.9, 85.9)	77.9 (76.8, 78.9)	85.7 (84.5, 86.9)
No	23.9 (22.7, 25.0)	16.1 (14.1, 18.1)	22.1 (21.1, 23.2)	14.3 (13.1, 15.5)

	Middle school		High school	
	Never cigarette smokers	Ever cigarette smokers	Never cigarette smokers	Ever cigarette smokers
Characteristics	**Weighted % (95% CI)**	**Weighted % (95% CI)**	**Weighted % (95% CI)**	**Weighted % (95% CI)**
ENDS use				
In past 30 days	1.5 (1.2, 1.7)	23.9 (21.8, 26.1)	3.5 (3.1, 3.9)	30.1 (28.4, 31.8)
Ever, not in past 30 days	2.4 (2.1, 2.7)	24.5 (22.3, 26.7)	4.7 (4.3, 5.2)	24.6 (23.3, 25.9)
Never	96.1 (95.7, 96.6)	51.8 (49.3, 54.3)	91.8 (91.1, 92.4)	45.4 (43.6, 47.1)
Exposed to ENDS advertising				
Yes	63.2 (62.3, 64.2)	75.0 (72.8, 77.2)	62.4 (61.3, 63.5)	72.1 (70.5, 73.7)
No	36.8 (35.8, 37.7)	25.0 (22.8, 27.2)	37.6 (36.5, 38.7)	27.9 (26.3, 29.5)
Living with ENDS user(s)				
Yes	9.8 (9.1, 73.8)	28.5 (26.2, 30.9)	9.3 (8.7, 10.0)	23.4 (22.1, 24.8)
No	90.5 (89.5, 90.9)	71.5 (69.1, 73.8)	90.7 (90.0, 91.3)	76.6 (75.2, 77.9)

Means are reported for age. NH=Non-Hispanic, AI=American Indian, AN=Alaskan Native, NH=Native Hawaiian, PI=Pacific Islander, POS=point of sale.

Table 2

Associations between ENDS exposure and peer and community acceptability of adult cigarette smoking, 2014 Florida Youth Tobacco Survey.

	Middle School				High School			
	Never cigarette smokers		Ever cigarette smokers		Never cigarette smokers		Ever cigarette smokers	
	Perceived that peers view adult cigarette smoking as acceptable							
	%	AOR (95% CI)	%	AOR (95% CI)	%	AOR (95% CI)	%	AOR (95% CI)
ENDS use								
In past 30 days	34.1%	1.16 (0.82, 1.65)	59.4%	1.35 (0.98, 1.87)	42.8%	**1.25 (1.00, 1.55)**	59.3%	1.28 (0.94, 1.35)
Ever, not in past 30 days	40.3%	**1.72 (1.31, 2.25)**	48.0%	1.12 (0.86, 1.47)	44.6%	**1.36 (1.13, 1.65)**	56.1%	1.17 (0.98, 1.39)
Never	23.0%	1.00	41.3%	1.00	34.3%	1.00	48.5%	1.00
Exposed to ENDS advertising								
Yes	26.3%	**1.29 (1.15, 1.43)**	50.8%	1.24 (0.94, 1.62)	38.7%	**1.19 (1.09, 1.30)**	55.4%	1.11 (0.96, 1.29)
No	18.6%	1.00	38.8%	1.00	29.9%	1.00	49.5%	1.00
Living with ENDS user(s)								
Yes	30.7%	1.11 (0.96, 1.30)	57.2%	1.32 (1.00, 1.73)	47.4%	**1.21 (1.05, 1.39)**	61.0%	1.10 (0.90, 1.35)
No	22.6%	1.00	44.0%	1.00	34.2%	1.00	51.4%	1.00
	Perceived community views adult cigarette smoking as acceptable							
	%	AOR (95% CI)	%	AOR (95% CI)	%	AOR (95% CI)	%	AOR (95% CI)
ENDS use								
In past 30 days	47.8%	0.82 (0.53, 1.29)	64.2%	1.23 (0.90, 1.69)	52.7%	1.07 (0.87, 1.32)	64.1%	1.09 (0.91, 1.32)
Ever, not in past 30 days	55.0%	1.25 (0.97, 1.61)	61.0%	1.20 (0.92, 1.56)	55.6%	1.18 (0.95, 1.47)	64.5%	**1.25 (1.03, 1.52)**
Never	40.2%	1.00	53.1%	1.00	48.3%	1.00	56.9%	1.00
Exposed to ENDS advertising								
Yes	45.1%	**1.29 (1.18, 1.42)**	61.7%	1.28 (0.97, 1.68)	52.4%	**1.13 (1.03, 1.24)**	62.9%	1.09 (0.94, 1.27)
No	33.5%	1.00	48.7%	1.00	42.9%	1.00	57.1%	1.00
Living with ENDS user(s)								
Yes	52.0%	**1.21 (1.05, 1.39)**	66.9%	**1.35 (1.03, 1.76)**	61.0%	**1.22 (1.04, 1.09)**	66.9%	1.01 (0.83, 1.24)
No	39.5%	1.00	54.5%	1.00	47.8%	1.00	59.4%	1.00

All never-smoker models include age, gender, race/ethnicity, metropolitan status, living with cigarette smokers, exposed to cigarette smoking images on screen, exposed to cigarette point-of-sale advertising, ENDS use, exposure to ENDS advertising, and living with ENDS users. All ever-cigarette smoker models additionally include smoking in the past 30 days. Bolded estimates are statistically significant ($p<0.05$).

Table 3

Standardized direct and indirect effects between ENDS exposure and susceptibility to cigarette smoking among middle school and high school never cigarette smokers, 2014 Florida Youth Tobacco Survey.

	→ ***Peer acceptance*** **of adult smoking→ Susceptibility**	→ ***Community acceptance*** **of adult smoking→ Susceptibility**
	ARC (95% CI)	**ARC (95% CI)**
Middle school never cigarette smokers		
Ever ENDS use (vs. never)	**0.013 (0.005, 0.022)**	0.002 (−0.004, 0.008)
Exposed to ENDS advertising (vs. unexposed)	**0.006 (0.003, 0.009)**	**0.006 (0.003, 0.008)**
Living with ENDS users (vs. not living with ENDS users)	0.003 (−0.001, 0.008)	**0.004 (0.001, 0.007)**
High school never cigarette smokers		
Ever ENDS use (vs. never)	**0.008 (0.003, 0.012)**	**0.002 (0.000, 0.004)**
Exposed to ENDS advertising (vs. unexposed)	**0.005 (0.002, 0.007)**	**0.002 (0.000, 0.003)**
Living with ENDS users (vs. not living with ENDS users)	**0.006 (0.002, 0.010)**	**0.002 (0.000, 0.005)**

ARC=Adjusted regression coefficient. All models also include age, gender, race/ethnicity, metropolitan status, living with cigarette smokers, exposed to cigarette smoking images on screen, and exposed to cigarette point-of-sale advertising. Bolded estimates are statistically significant ($p<0.05$).