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## Associations Between Exposure to *The Real Cost* Campaign, Pro-Tobacco Advertisements, and Tobacco Use Among Youth in the U.S.

Elise M. Stevens, PhD<sup>1</sup>, Emily T. Hébert, DrPH<sup>2</sup>, Brittney Keller-Hamilton, PhD, MPH<sup>3</sup>, Summer G. Frank-Pearce, PhD, MPH<sup>4</sup>, Alayna P. Tackett, PhD<sup>5</sup>, Glenn Leshner, PhD<sup>6</sup>, Theodore L. Wagener, PhD<sup>3,7</sup>

<sup>1</sup>T.H. Chan School of Public Health and Dana-Farber Cancer Institute, Harvard University, Boston, Massachusetts

<sup>2</sup>University of Texas Health Science Center (UTHealth) School of Public Health, Austin, Texas

<sup>3</sup>Center for Tobacco Research, The Ohio State University Comprehensive Cancer Center, Columbus, Ohio

<sup>4</sup>University of Oklahoma Health Sciences Center, Stephenson Cancer Center, Health Promotion Research Center, Oklahoma City, Oklahoma

<sup>5</sup>Department of Preventive Medicine, Keck School of Medicine of USC, University of Southern California, Los Angeles, California

<sup>6</sup>Gaylord College of Journalism and Mass Communication, University of Oklahoma, Norman, Oklahoma

<sup>7</sup>Department of Internal Medicine, The Ohio State University, Columbus, Ohio

### Abstract

**Introduction:** E-cigarette use is rising among youth. Advertising and anti-tobacco campaigns may be associated with use of e-cigarettes and other tobacco products. This study examines associations between tobacco use and exposure to *The Real Cost's* first campaign focusing on e-cigarettes.

**Methods:** Using the 2019 National Youth Tobacco Survey, a national survey of middle and high school students, associations between exposure to *The Real Cost* anti-tobacco campaign, exposure to pro-tobacco advertising, and use of tobacco products in the past 30 days (exclusive e-cigarettes, exclusive other tobacco use, and dual/poly use of e-cigarettes and other tobacco products) was examined. Other tobacco included anything but e-cigarettes.

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Address correspondence to: Elise M. Stevens, PhD, T.H. Chan School of Public Health, Dana-Farber Cancer Institute, Harvard University, 375 Longwood Avenue, LW637, Boston MA 02215. estevens@hsph.harvard.edu.

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**Results:** Participants (N=13,165) were aged 11–17 years. Exposure to *The Real Cost* was associated with decreased odds of using other tobacco products (AOR=0.60, 95% CI=0.43, 0.84) and dual/poly use (AOR=0.77, 95% CI=0.63, 0.94) but not e-cigarettes. Greater e-cigarette advertising exposure was associated with increased odds of being an exclusive e-cigarette user (AOR=1.90, 95% CI=1.52, 2.30) or dual/poly user (AOR=1.69, 95% CI=1.31, 2.18). Greater exposure to other tobacco advertising was associated with increased odds of being a dual/poly user (AOR=1.32, 95% CI=1.01, 1.71) but lower odds of exclusive e-cigarette use (AOR=0.76, 95% CI=0.60, 0.97).

**Conclusions:** Exposure to *The Real Cost* campaign was associated with decreased odds of using other tobacco products and dual/poly use. Exposure to pro-tobacco advertising was also associated with use. Future studies should assess the long-term effectiveness of anti-tobacco messaging.

## INTRODUCTION

E-cigarette use is rising among young people,<sup>1</sup> with 27.5% of high school students and 10.5% of middle school students reporting current use.<sup>2</sup> Marketing is likely associated with the increase in e-cigarette use among youth,<sup>1,3–5</sup> as exposure to e-cigarette advertising can increase use in this group.<sup>1,3–5</sup>

One way to combat the effects of advertising on e-cigarette use is through public health message campaigns. In 2018, *The Real Cost (RC)* unveiled a new campaign aimed at decreasing tobacco and e-cigarette use among young people.<sup>6</sup> Campaigns from *RC* aimed at reducing cigarette smoking have been evaluated and found to be successful<sup>7–11</sup>; however, the novel 2018 campaign, aimed at reducing e-cigarette use, has not been evaluated.

The current study examines whether self-reported exposure to *RC* campaign was associated with current use of e-cigarettes and other tobacco products in a nationally representative sample of youth, hypothesizing that exposure would be associated with decreased use. It also estimates associations between self-reported exposure to pro-tobacco advertisements (both for e-cigarettes and other tobacco products) and current use of e-cigarettes and other tobacco products among youth to understand how each uniquely contributed to use of tobacco products. It is hypothesized that greater exposure to e-cigarette advertisements and other tobacco advertisements is directly associated with use of e-cigarettes and other tobacco products, respectively.

## METHODS

### Study Sample

The data were collected through the 2019 National Youth Tobacco Survey.<sup>12</sup> The University of Oklahoma Health Sciences Center's IRB waived the review.

### Measures

The full survey can be found on the Centers for Disease Control and Prevention's website.<sup>12</sup>

The authors constructed a 4-level dependent variable representing past 30-day tobacco use: (1) no past 30-day use of e-cigarettes or other tobacco products; (2) past 30-day use of

e-cigarettes, but not other tobacco products; (3) no past 30-day use of e-cigarettes, but past 30-day use of other tobacco products; and (4) past 30-day dual/poly use of e-cigarettes and 1 other tobacco product. Other tobacco products included cigarettes, cigars, hookah, smokeless tobacco, snus, pipes, roll-your-own cigarettes, dissolvable tobacco, and bidis.

Participants were asked 4 questions concerning how often they see ads for e-cigarettes and other tobacco products (e.g., other products listed above) on the Internet, in magazines, at retailers, and on TV. Responses for *I don't use [medium]*, *never*, and *rarely, sometimes, most of the time*; and *always* were recoded on a scale from 0 to 3, with 0 being assigned to the first 3 responses, and then summed across the 4 questions (range from 0 to 12) for e-cigarettes and for other tobacco products, separately. Owing to violations of linearity in regression models, these variables were categorized into low (0–1), medium (2–3), and high (4) exposure groups based on tertiles of the distributions.

Exposure to the campaign was assessed with 1 question<sup>13</sup>: *In the past 12 months, have you seen or heard The Real Cost, on television, the internet, social media, or radio as part of ads about tobacco?* Response options included: *yes, no, and not sure*. The RC e-cigarette campaign launched in September 2018, and National Youth Tobacco Survey data were collected February to May 2019. The main focus of the campaign was e-cigarettes but did mention cigarettes and other products.

Participants reported how much harm was associated with using e-cigarettes some days, but not every day. Responses ranged from *no harm to a lot of harm*. Participants also reported perceived addictiveness of e-cigarettes relative to cigarettes. Responses included *less addictive, equally addictive, more addictive, I have never heard of e-cigarettes, and I don't know enough about these products*.

Covariates included age, sex, and race/ethnicity (Table 1).

### Statistical Analysis

Sampling weights and strata were used to account for the complex sampling design in all analyses. The analytic subpopulation included participants who were aged 11–17 years, responded *yes* or *no* to the item assessing exposure to RC campaign (i.e., those answering *not sure* were excluded), and had complete data for all variables used in modeling.

Distributions of all variables were evaluated overall and according to self-reported exposure to RC campaign; Rao–Scott chi-square tests were used to evaluate whether distributions differed according to exposure to RC campaign. Multinomial logistic regression was used to model associations between self-reported exposure to RC campaign, advertisement exposure, and past 30-day tobacco use, while controlling for demographics and ad exposure. Stata/SE, version 16.1 was used for all analyses, and  $\alpha=0.05$  was used to assess statistical significance.

## RESULTS

A total of 19,018 youth participated in the 2019 National Youth Tobacco Survey, and 13,165 were included in the analytic subpopulation (Table 1).

In adjusted models, self-reported exposure to the *RC* campaign was associated with lower odds of past 30-day use of other tobacco products (AOR=0.60, 95% CI=0.43, 0.84) and dual/poly use of e-cigarettes and other tobacco products (AOR=0.77, 95% CI=0.63, 0.94), but it was not associated with odds of exclusive e-cigarette use (Table 2). A high level of exposure to e-cigarette advertising was associated with higher odds of exclusive e-cigarette use (AOR=1.90, 95% CI=1.52, 2.30) and dual/poly use of e-cigarettes and other tobacco (AOR=1.69, 95% CI=1.31, 2.18), but not with exclusive use of other tobacco. A high level of exposure to other tobacco advertising was associated with lower odds of exclusive e-cigarette use (AOR=0.76, 95% CI=0.60, 0.97) and higher odds of dual/poly use of e-cigarettes and other tobacco (AOR=1.32, 95% CI=1.01, 1.71), but it was not associated with odds of exclusive other tobacco use. Several covariates were associated with tobacco use outcomes (Table 2).

## DISCUSSION

The current study provides preliminary information about youth exposure to pro-tobacco advertising and *RC* at a time when e-cigarette use was high in this population.<sup>1</sup> Even though *RC*'s 2018 campaign focused on e-cigarettes, the authors did not see an association between exposure to it and reduced odds of exclusive use of the product. However, there was an association between exposure to *RC* and reduced odds of other tobacco use and dual/poly use. It may be that youth were recalling older campaigns focused on other tobacco use, and with time and repeated exposure, exposure to the campaign focused on e-cigarettes may have an association with decreased odds of exclusive use of e-cigarettes. Past research has found that increased exposure to the *RC*, when focused on other tobacco use, was associated with decreased risk of smoking initiation.<sup>14</sup> Consistent with past research,<sup>3-5</sup> this study found that each level of e-cigarette advertising exposure was associated with e-cigarette use. However, other tobacco advertising exposure was not associated with exclusive other tobacco use, possibly because of the fact that youth know the harms of cigarettes, and use is on the decline.<sup>15</sup>

### Limitations

Advertising and *RC* exposure were based on participant recall and may be subject to recall bias.<sup>16</sup> As this study is only cross-sectional, future studies may benefit from the use of ecological momentary assessment, which would allow evaluation in real time.<sup>17</sup> The authors cannot make causal conclusions owing to the cross-sectional design. Nonetheless, this study is the first to examine these associations.

## CONCLUSIONS

This study examined the association between exposure to *RC*, pro-tobacco advertising, and use of tobacco products. Campaign exposure was associated with decreased odds of using other tobacco products (not e-cigarettes) and dual/poly use. High e-cigarette advertising exposure was associated with increased odds of being an exclusive e-cigarette user or dual/poly user. High other tobacco advertising exposure was associated with increased odds of being a dual/poly user. Results highlight the importance of continued youth anti-tobacco communication.

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**Table 1.**

Distributions of Demographics and Advertising Exposures Overall and According to Recalled Exposure to *The Real Cost* Campaign, National Youth Tobacco Survey, U.S., 2019<sup>a</sup>

Variable	Recalled exposure to <i>The Real Cost</i>			<i>p</i> -value <sup>b</sup>
	Total (N=13,165)	Yes (N=10,136)	No (N=3,029)	
Age, years, %				0.12
11–13	35.3	34.7	37.3	
14–15	32.9	33.4	31.1	
16–17	31.8	31.9	31.7	
Sex, %				0.12
Male	51.8	52.4	49.8	
Female	48.2	47.6	50.2	
Race, %				<0.001
Non-Hispanic White	53.6	55.8	46.3	
Non-Hispanic Black	11.9	11.1	14.9	
Hispanic	23.7	22.7	27.1	
Other/Multiple races	10.8	10.5	11.7	
Past 30-day tobacco use, %				0.004
No past 30-day use	79.4	79.7	78.1	
E-cigarettes only	12.1	12.3	11.7	
Other tobacco only	2.4	2.1	3.5	
E-cigarettes and other tobacco	6.1	6.0	6.7	
Exposure to e-cigarette advertising, %				<0.001
Low	45.5	42.7	55.1	
Medium	28.6	30.0	23.8	
High	25.9	27.3	21.1	
Exposure to other tobacco advertising, %				<0.001
Low	33.5	29.8	46.3	
Medium	36.0	37.6	30.5	
High	30.5	32.6	23.2	
Perceived harm of using e-cigarettes some days but not every day, %				<0.001
No harm	5.3	4.8	7.1	
Little harm	22.4	23.0	20.5	
Some harm	39.9	40.5	37.9	
A lot of harm	32.3	31.7	34.5	
Perceived addictiveness of e-cigarettes compared to cigarettes, %				<0.001
Less addictive	18.1	18.7	16.1	
Equally addictive	37.1	38.4	32.6	
More addictive	27.5	28.5	24.3	
Never heard of e-cigarettes	2.2	1.5	4.5	
I don't know enough	15.0	12.9	22.6	

Notes: Percentages might not sum to 100% due to rounding. Boldface indicates statistical significance ( $p < 0.05$ ).

<sup>a</sup>Estimated proportions were weighted to account for the complex sampling design; unweighted participant counts are reported. Estimates were derived from the analytic subpopulation of youth who were: ages 11- to 17-years-old; answered *yes* or *no* to the item assessing exposure to *The Real Cost* campaign; and had complete data for all independent variables, dependent variables, and covariates used in the multivariable model. Compared to youth included in the analytic subpopulation, those excluded from analyses (for reasons unrelated to being outside the ages of interest) were younger and more likely to use non-e-cigarette tobacco products, be non-Hispanic Black or Hispanic, and to have low exposures to e-cigarette and tobacco advertising.

<sup>b</sup>*P*-values were calculated using Rao-Scott chi-square tests.

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**Table 2.**

Adjusted Associations Between Recalled Exposure to *The Real Cost* Campaign and Past 30-day Tobacco Use Among Youth, National Youth Tobacco Survey, U.S., 2019<sup>a</sup>

Variable	E-cigarettes only AOR (95% CI)	Other tobacco only AOR (95% CI)	E-cigarettes and other tobacco AOR (95% CI)
Recall of exposure to <i>The Real Cost</i> campaign (ref: no)			
Yes	0.93 (0.78, 1.10)	<b>0.60 (0.43, 0.84)</b>	<b>0.77 (0.63, 0.94)</b>
Age (ref: 11–13 years)			
14–15 years	<b>3.07 (2.37, 3.98)</b>	<b>2.02 (1.33, 3.08)</b>	<b>2.57 (1.84, 3.58)</b>
16–17 years	<b>4.65 (3.67, 5.89)</b>	<b>3.42 (2.28, 5.12)</b>	<b>3.98 (2.90, 5.46)</b>
Sex (ref: male)			
Female	<b>1.34 (1.16, 1.56)</b>	0.85 (0.61, 1.19)	<b>0.69 (0.56, 0.85)</b>
Race (ref: non-Hispanic White)			
Non-Hispanic Black	<b>0.42 (0.32, 0.56)</b>	<b>2.63 (1.68, 4.14)</b>	<b>0.68 (0.49, 0.94)</b>
Hispanic	0.91 (0.75, 1.11)	1.49 (0.93, 2.38)	<b>0.74 (0.56, 0.97)</b>
Other/Multiple races	<b>0.70 (0.52, 0.94)</b>	1.32 (0.68, 2.57)	<b>0.58 (0.42, 0.81)</b>
Exposure to e-cigarette advertising (ref: low)			
Medium	<b>1.53 (1.28, 1.82)</b>	1.08 (0.74, 1.58)	1.14 (0.88, 1.46)
High	<b>1.90 (1.57, 2.30)</b>	1.27 (0.80, 2.03)	<b>1.69 (1.31, 2.18)</b>
Exposure to other tobacco advertising (ref: low)			
Medium	0.88 (0.76, 1.03)	0.67 (0.45, 1.00)	1.02 (0.80, 1.30)
High	<b>0.76 (0.60, 0.97)</b>	1.12 (0.78, 1.60)	<b>1.32 (1.01, 1.71)</b>

Notes: Boldface indicates statistical significance ( $p < 0.05$ ).

<sup>a</sup>Survey-weighted multinomial logistic regression was used; the reference group included youth who had not e-cigarettes or other tobacco products in the past 30-days. Estimates were derived from the analytic subpopulation of youth who were: ages 11- to 17-years-old; answered *yes* or *no* to the item assessing exposure to *The Real Cost* campaign; and had complete data for all independent variables, dependent variables, and covariates used in this analysis.