

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Characteristics of Participating Schools in Reference to Los Angeles County Schools

Baseline Covariates/ Predictors	School										Los Angeles County*
	1	2	3	4	5	6	7	8	9	10 ^a	
Total School Enrollment, <i>N</i>	1,502	2,664	2,176	1,990	2,403	1,734	2,267	2,153	1,026	-	505,582
Total Study Enrollment, <i>N</i>	313	471	413	435	461	246	459	394	154	50	
Gender, <i>n</i> (%)											
Female	735 (48.9%)	1,287 (48.3%)	1,058 (48.6%)	950 (47.7%)	1,161 (48.3%)	839 (48.4%)	1,094 (48.3%)	1,079 (50.1%)	530 (51.7%)	-	246,904 (48.8%)
Male	767 (51.1%)	1,377 (51.7%)	1,118 (51.4%)	1,040 (52.3%)	1,242 (51.7%)	895 (51.6%)	1,173 (51.7%)	1,074 (49.9%)	496 (48.3%)	-	258,678 (51.2%)
Ethnicity, <i>n</i> (%)											
American Indian/Alaska Native	4 (0.3%)	2 (0.1%)	8 (0.4%)	3 (0.2%)	4 (0.2%)	1 (0.1%)	3 (0.1%)	5 (0.2%)	2 (0.2%)	-	1,925 (0.4%)
Asian/Pacific Islander**	198 (13.2%)	307 (11.5%)	1,412 (64.9%)	556 (27.9%)	200 (8.3%)	72 (4.2%)	213 (9.4%)	105 (4.9%)	842 (82.1%)	-	56,916 (11.3%)
Black/African American	166 (11.1%)	59 (2.2%)	141 (6.5%)	324 (16.3%)	38 (1.6%)	34 (2.0%)	53 (2.3%)	88 (4.1%)	23 (2.2%)	-	44,045 (8.7%)
Hispanic/Latino	1,057 (70.4%)	1,253 (47.0%)	386 (17.7%)	904 (45.4%)	838 (34.9%)	1,548 (89.3%)	1,390 (61.3%)	1,837 (85.3%)	94 (9.2%)	-	320,164 (63.3%)
White	65 (4.3%)	962 (36.1%)	169 (7.8%)	164 (8.2%)	1,225 (51.0%)	59 (3.4%)	535 (23.6%)	103 (4.8%)	49 (4.8%)	-	73,256 (14.5%)
Multi-ethnic/Multi-Racial	12 (0.8%)	81 (3.0%)	60 (2.8%)	39 (2.0%)	98 (4.1%)	20 (1.2%)	73 (3.2%)	15 (0.7%)	16 (1.6%)	-	9,276 (1.8%)
Eligible for Free lunch, <i>n</i> (%)	1,028 (68.4%)	640 (24.0%)	380 (17.5%)	855 (43.0%)	332 (13.8%)	1,334 (76.9%)	881 (38.9%)	1,536 (71.3%)	124 (12.1%)	-	260,894 (51.6%)

Note. Data from U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), "Local Education Agency (School District) Universe Survey", 2012-13 v.1a; "Public Elementary/Secondary School Universe Survey", 2012-13 v.1a. ^aCCD Data unavailable for school number 10. **Combined Asian/Native Hawaiian/Pacific Islander category.

eTable 2. Prevalence of Past 6-Month Combustible Tobacco Use at 6- and 12-Month Follow-Ups by Baseline Covariate Status among Baseline Never-Smokers

Outcomes	Covariates									
	Gender		Ethnicity		Living Situation		Family History of Smoking		Substance Use	
	Male (N=1,154)	Female (N=1,328)	Hispanic (N=1,080)	Other (N=1,410)	Lives with Both Biological Parents (N=1,664)	Other (N=802)	Yes (N=1,456)	No (N=933)	Ever Use (N=477)	Never Use (N=2,040)
6-Month Follow-Up										
Any Combustible Tobacco Product, <i>n</i> (%)	117 (10.1%)	134 (10.1%)	142 (13.2%)	111 (7.9%)	153 (9.2%)	99 (12.3%)	167 (11.5%)	75 (8.0%)	101 (22.6%)	152 (7.5%)
Combustible Cigarettes, <i>n</i> (%)	57 (5.0%)	33 (2.5%)	47 (4.4%)	43 (3.1%)	60 (3.6%)	29 (3.6%)	58 (4.0%)	26 (2.8%)	25 (5.6%)	65 (3.2%)
Cigars, <i>n</i> (%)	60 (5.3%)	50 (3.8%)	56 (5.3%)	55 (4.0%)	57 (3.5%)	53 (6.7%)	74 (5.1%)	30 (3.3%)	48 (11.0%)	63 (3.1%)
Hookah, <i>n</i> (%)	66 (5.8%)	96 (7.4%)	102 (9.6%)	61 (4.4%)	102 (6.2%)	60 (7.7%)	105 (7.3%)	53 (5.8%)	66 (15.1%)	97 (4.8%)
Number of Different Combustible Tobacco Products, <i>n</i> (%)										
0 products	1,037 (89.9%)	1,191 (89.9%)	935 (86.8%)	1,298 (92.1%)	1,510 (90.8%)	703 (87.7%)	1,288 (88.5%)	858 (92.0%)	346 (77.4%)	1,887 (92.6%)
1 product	64 (5.6%)	101 (7.6%)	94 (8.7%)	73 (5.2%)	102 (6.1%)	65 (8.1%)	111 (7.6%)	50 (5.4%)	69 (15.4%)	98 (4.8%)
2 products	40 (3.5%)	21 (1.6%)	33 (3.1%)	28 (2.0%)	36 (2.2%)	25 (3.1%)	42 (2.9%)	16 (1.7%)	26 (5.8%)	35 (1.7%)
3 products	13 (1.1%)	12 (0.9%)	15 (1.4%)	10 (0.7%)	15 (0.9%)	9 (1.1%)	14 (1.0%)	9 (1.0%)	6 (1.3%)	19 (0.9%)
12-Month Follow-Up										
Any Combustible Tobacco Product, <i>n</i> (%)	116 (10.2%)	151 (11.4%)	140 (13.0%)	127 (9.1%)	153 (9.2%)	114 (14.3%)	168 (11.6%)	86 (9.3%)	108 (24.2%)	159 (7.8%)
Combustible Cigarettes, <i>n</i> (%)	44 (3.9%)	47 (3.5%)	42 (3.9%)	49 (3.5%)	53 (3.2%)	38 (4.8%)	64 (4.4%)	25 (2.7%)	35 (7.9%)	56 (2.8%)
Cigars, <i>n</i> (%)	71 (6.5%)	57 (4.5%)	65 (6.2%)	63 (4.7%)	70 (4.3%)	58 (7.7%)	72 (5.2%)	48 (5.4%)	54 (12.6%)	74 (3.8%)
Hookah, <i>n</i> (%)	54 (4.9%)	100 (7.8%)	86 (8.2%)	68 (5.1%)	88 (5.5%)	66 (8.8%)	101 (7.2%)	49 (5.5%)	61 (14.3%)	93 (4.8%)

Number of Different Combustible Tobacco Products, n (%)										
0 products	1,027	1,176	940	1,270	1,508	682	1,284	838	338	1,872
	(89.9%)	(88.6%)	(87.0%)	(90.9%)	(90.8%)	(85.7%)	(88.4%)	(90.7%)	(75.8%)	(92.2%)
1 product	75	108	97	86	110	73	112	59	74	109
	(6.6%)	(8.1%)	(9.0%)	(6.2%)	(6.6%)	(9.2%)	(7.7%)	(6.4%)	(16.6%)	(5.4%)
2 products	29	33	33	29	28	34	43	18	26	36
	(2.5%)	(2.5%)	(3.1%)	(2.1%)	(1.7%)	(4.3%)	(3.0%)	(2.0%)	(5.8%)	(1.8%)
3 products	12	10	10	12	15	7	13	9	8	14
	(1.1%)	(0.8%)	(0.9%)	(0.9%)	(0.9%)	(0.9%)	(0.9%)	(1.0%)	(1.8%)	(0.7%)

Note. Sample Ns and respective denominator category Ns range due to missing data on covariates and outcomes. Covariate data not imputed.

eTable 3. Prevalence of Past 6-month E-Cigarette Use at 6- and 12-Month Follow-Ups by Baseline Ever Combustible Tobacco Use Among Baseline Never E-Cigarette Users

Baseline Ever Combustible Tobacco Use		Past 6-Month E-Cigarette Use	
Category	Overall Prevalence of Respective Combustible Tobacco Use Category	6-Month Follow-Up	12-Month Follow-Up
Any Combustible Tobacco Product			
Never Use, <i>n</i> (%)	2,305 (86.2%)	192 (8.6%)	148 (6.6%)
Ever Use, <i>n</i> (%)	368 (13.8%)	128 (37.7%)	102 (29.1%)
Difference in prevalence rates, % (95%CI)	-	29.1 (23.8, 34.4)*	22.5 (17.6, 27.3)*
Combustible Cigarettes			
Never Use, <i>n</i> (%)	2,523 (94.4%)	264 (10.8%)	207 (8.5%)
Ever Use, <i>n</i> (%)	149 (5.6%)	56 (40.9%)	43 (29.9%)
Difference in prevalence rates, % (95%CI)	-	30.1 (21.7, 38.4)*	21.4 (13.9, 29.0)*
Cigars			
Never Use, <i>n</i> (%)	2,511 (93.9%)	261 (10.7%)	206 (8.4%)
Ever Use, <i>n</i> (%)	162 (6.1%)	59 (39.3%)	44 (28.6%)
Difference in prevalence rates, % (95%CI)	-	28.6 (20.7, 36.5)*	20.1 (12.9, 27.4)*
Hookah			
Never Use, <i>n</i> (%)	2,450 (92.0%)	239 (10.1%)	185 (7.8%)
Ever Use, <i>n</i> (%)	214 (8.0%)	79 (40.5%)	65 (32.0%)
Difference in prevalence rates, % (95%CI)	-	30.5 (23.5, 37.5)*	24.3 (17.8, 30.8)*
Number of Different Combustible Tobacco Products			
0 products, <i>n</i> (%)	2,305 (86.2%)	192 (8.6%)	148 (6.6%)
1 product, <i>n</i> (%)	242 (9.1%)	74 (32.7%)	64 (27.8%)
2 products, <i>n</i> (%)	95 (3.6%)	42 (48.8%)	26 (28.3%)
3 products, <i>n</i> (%)	31 (1.2%)	12 (42.9%)	12 (41.4%)

Note. Sample includes participants with follow-up data on e-cigarette use. *Chi-square test, *p* <.001.

eTable 4. Association of Baseline Combustible Tobacco Use and Covariates to E-Cigarette Use at 6- and 12-Month Follow Ups among Baseline E-cigarette Never-Users

Baseline Regressors and Covariates	Baseline Combustible Tobacco Use Regressor Variable									
	Any Tobacco Product Ever (vs. Never) Use ^a		Cigarettes Ever (vs. Never) use ^b		Cigars Ever (vs. Never) Use ^c		Hookah Ever (vs. Never) Use ^d		Number of Tobacco Products (0 – 3) ^e	
	OR (95%CI) ^f	P	OR(95%CI) ^f	P	OR (95%CI) ^f	P	OR (95%CI) ^f	P	OR (95%CI) ^f	P
Unadjusted Models										
Baseline combustible tobacco use variable	5.82 (4.62, 7.35)	<.001	5.00 (3.60, 6.92)	<.001	4.67 (3.38, 6.43)	<.001	5.51 (4.16, 7.30)	<.001	2.75 (2.39, 3.18) ^f	<.001
Time (12- vs. 6-month follow-up)	0.72 (0.60, 0.87)	<.001	0.73 (0.61, 0.88)	<.001	0.74 (0.61, 0.88)	.001	0.73 (0.61, 0.88)	.001	0.72 (0.60, 0.87)	<.001
Baseline ever combustible tobacco use variable x Time ^g	0.89 (0.59, 1.32)	.55	0.78 (0.45, 1.35)	.37	0.77 (0.45, 1.32)	.35	0.91 (0.56, 1.46)	.69	0.87 (0.68, 1.11)	.27
Adjusted Models										
Categorical covariates										
Female (vs. male)	1.24 (0.99, 1.55)	.06	1.22 (0.97, 1.52)	.08	1.21 (0.97, 1.52)	.09	1.28 (1.03, 1.61)	.03	1.25 (1.00, 1.56)	.05
Hispanic (vs. other) ethnicity	1.07 (0.83, 1.38)	.60	1.05 (0.81, 1.34)	.73	1.04 (0.81, 1.33)	.78	1.01 (0.79, 1.30)	.93	1.04 (0.81, 1.34)	.76
Lives with both biological parents (vs. other living situation)	0.84 (0.68, 1.05)	.13	0.84 (0.68, 1.05)	.12	0.82 (0.66, 1.03)	.09	0.81 (0.65, 1.01)	.06	0.84 (0.68, 1.05)	.13
Substance ever (vs. never) use	1.89 (1.46, 2.44)	<.001	2.50 (1.96, 3.18)	<.001	2.49 (1.93, 3.20)	<.001	2.28 (1.78, 2.91)	<.001	2.03 (1.57, 2.62)	<.001
Family history of smoking	1.10 (0.87, 1.39)	.42	1.12 (0.89, 1.41)	.34	1.13 (0.89, 1.42)	.31	1.09 (0.87, 1.38)	.45	1.10 (0.87, 1.39)	.41

(yes vs. no)										
Continuous covariates ^h										
Age	0.99 (0.89, 1.10)	.82	1.00 (0.90, 1.12)	.93	1.01 (0.91, 1.12)	.84	1.00 (0.90, 1.12)	.94	1.00 (0.90, 1.11)	.97
Parental education	0.95 (0.83, 1.07)	.39	0.94 (0.83, 1.06)	.32	0.94 (0.83, 1.06)	.31	0.93 (0.82, 1.06)	.29	0.94 (0.83, 1.06)	.30
Peer smoking	1.04 (0.93, 1.17)	.48	1.05 (0.94, 1.18)	.37	1.06 (0.94, 1.18)	.35	1.05 (0.94, 1.18)	.38	1.03 (0.92, 1.16)	.56
CESD- Depressive Symptoms	0.99 (0.88, 1.11)	.81	0.97 (0.86, 1.09)	.59	0.97 (0.87, 1.09)	.63	0.98 (0.87, 1.10)	.72	0.99 (0.88, 1.11)	.84
TCI- Impulsivity	1.21 (1.09, 1.35)	<.001	1.22 (1.09, 1.36)	<.001	1.21 (1.09, 1.35)	<.001	1.21 (1.08, 1.35)	<.001	1.22 (1.10, 1.36)	<.001
Delinquent Behavior	1.22 (1.07, 1.40)	.003	1.31 (1.15, 1.49)	<.001	1.30 (1.14, 1.48)	<.001	1.24 (1.09, 1.42)	.001	1.22 (1.07, 1.39)	.004
Smoking susceptibility	1.09 (0.95, 1.24)	.21	1.09 (0.95, 1.25)	.20	1.16 (1.02, 1.32)	.03	1.14 (1.00, 1.30)	.06	1.07 (0.93, 1.22)	.33
Smoking expectancies	1.13 (1.00, 1.27)	.05	1.14 (1.01, 1.28)	.04	1.14 (1.01, 1.29)	.03	1.14 (1.01, 1.29)	.03	1.14 (1.01, 1.28)	.04
Regressors										
Baseline ever combustible tobacco use variable	3.05 (2.31, 4.03)	<.001	1.88 (1.28, 2.76)	.001	1.43 (0.98, 2.09)	.06	2.94 (2.16, 3.99)	<.001	1.75 (1.46, 2.09) ⁱ	<.001
Time (12- vs. 6-month follow-up)	0.71 (0.59, 0.86)	<.001	0.72 (0.60, 0.87)	<.001	0.72 (0.60, 0.87)	<.001	0.72 (0.60, 0.87)	<.001	0.72 (0.59, 0.87)	<.001
Baseline combustible tobacco use variable x Time ^g	0.89 (0.59, 1.33)	.56	0.78 (0.44, 1.38)	.39	0.78 (0.45, 1.35)	.37	0.92 (0.56, 1.50)	.73	0.88 (0.69, 1.13)	.32

Note. All analyses include only never users of combustible tobacco products at baseline. -2 Res Log Pseudo-Likelihood fit index for unadjusted models without the interaction term: ^a26,375.48, ^b25,946.03, ^c25,937.55, ^d25,986.36, ^e26,211.32. -2 Res Log Pseudo-Likelihood fit index for unadjusted models with the interaction term: ^a26,364.92, ^b25,938.1, ^c25,928.98, ^d25,982.23, ^e26,199.99. Range of -2 Res Log Pseudo-Likelihood fit indices for adjusted models without the interaction term across the five imputed data sets: ^a26,817.48 – 26,838.87, ^b26,664.97 – 26,689.90, ^c26,663.48 – 26,691.34, ^d26,660.61 – 26,691.55, ^e26,695.88 – 26,722.52. Range of -2 Res Log Pseudo-Likelihood fit indices for adjusted models with the interaction term across the five imputed data sets: ^a26,806.89 – 26,827.96, ^b26,656.18 – 26,680.96, ^c26,653.08 – 26,680.67, ^d26,656.94 – 26,687.71, ^e26,683.8 – 26,709.99. ⁱOR from binary repeated logistic regression model predicting e-cigarette use at follow-ups from baseline ever use of the respective combustible tobacco product variable including school fixed effects. ^gInteraction term added in subsequent model; parameter estimates for other regressors/covariates are from model excluding the interaction term. ^hContinuous covariates rescaled ($M=0, SD=1$), such that the ORs indicate the change in odds in the outcome associated with an increase in one standard deviation unit on the covariate continuous scale. ⁱOR indicates the change in odds of e-cigarette use averaged across the two follow-ups associated with an increase in one tobacco product used at baseline. CESD = Center for Epidemiologic Studies Depression Scale. TCI = Temperament and Character Inventory.

eTable 5. Prevalence of Past 6-Month E-Cigarette Use at 6- and 12-Month Follow-Ups by Baseline Covariate Status among Baseline E-Cigarette Never-Users

	Covariates									
	Gender		Ethnicity		Living Situation		Family History of Smoking		Substance Use	
E-Cigarette Use in the Prior 6 Months	Male (N=1,160)	Female (N=1,429)	Hispanic (N=1,170)	Other (N=1,429)	Lives with Both Biological Parents (N=1,719)	Other (N=853)	Yes (N=1,534)	No (N=955)	Ever Use (N=584)	Never Use (N=2,010)
6-Month Follow-Up, n (%)	141 (12.2%)	179 (12.6%)	182 (15.8%)	138 (9.7%)	188 (11.0%)	131 (15.4%)	214 (14.0%)	96 (10.1%)	156 (27.0%)	164 (8.2%)
12-Month Follow-Up, n (%)	126 (10.9%)	123 (8.6%)	119 (10.2%)	131 (9.2%)	143 (8.3%)	105 (12.3%)	165 (10.8%)	73 (7.6%)	124 (21.2%)	126 (6.3%)

Note. Total sample Ns and respective denominator category Ns range due to missing data on covariates and outcomes. Covariate data not imputed.

eSensitivity Analyses

We categorized the sample of baseline never-smokers into ‘non-users’ (reported no past 6-month use of any tobacco product at both follow-ups; $n=2,007$ [83.4%]), ‘experimenters’ (past 6-month use of any combustible product at 6-month but not 12-month follow-up; $n=139$ [5.8%]), ‘later initiators’ (reported past 6-month use of any combustible product at 12-month but not 6-month follow-up; $n=161$ [6.7%]), and ‘sustained users’ (reported past 6-month use of any combustible product at both follow-ups; $n=99$ [4.1%]). A polytomous generalized linear mixed model (GLMM) using a generalized logit function including school and baseline ever e-cigarette use as fixed effects with ‘non-users’ as the reference category showed that baseline ever (vs. never) e-cigarette users were more likely to be ‘experimenters’ ($OR[95\% CI]=7.92[5.18, 12.11]$; $n=43[20.5\%]$ vs. $n=96[4.4\%]$, % difference [95% CI]=16.1[8.2, 25.0]), ‘later initiators’ ($OR[95\% CI]=4.74[3.04, 7.40]$; $n=33[15.7\%]$ vs. $n=128[5.8\%]$, % difference [95% CI]=9.9[2.75, 17.1]), or ‘sustained users’ ($OR[95\% CI]=4.33[2.53, 7.41]$; $n=21[10.0\%]$ vs. $n=78[3.6\%]$, % difference [95% CI]= 6.4[0.5, 12.3]) of combustible tobacco.

To clarify the role of blunt use in the findings, post-hoc analyses excluding blunts from the cigar use classifications were performed. Past 6-month non-blunt cigar use was more prevalent in baseline ever (vs. never) e-cigarette users at the 6-month ($n=13[5.4\%]$ vs. $n=26[1.1\%]$, % difference [95% CI], 4.3[1.4, 7.2]) and 12-month ($n=19[8.4\%]$ vs. $n=57[2.6\%]$, % difference [95% CI], 5.8[2.1, 9.5]) follow-ups.

To examine the impact of attrition, the unadjusted and adjusted GLMMs for the any combustible tobacco product outcome using the same strategy as the primary analysis were refit under the assumption that participants with missing data had used combustible tobacco at that follow-up, and then assuming that participants with missing data had not used at the respective follow-up. Under both conditions, baseline e-cigarette ever use was associated with any combustible tobacco use at follow-ups in all models.

Following from prior work,¹ participants were characterized as possible mischievous responders based on extreme responses on index variables. Adolescents were categorized into those who were 2.5 SD above or below the mean for height, weight, and delinquent behaviors versus those who were not. From there, an ‘extreme responder’ score was created based on the number of extreme responses across these three variables (zero vs. one vs. two vs. three). Among baseline e-cigarette ever-users, the proportions in each extreme responder score category were: zero ($n=201$, 89.3%), one ($n=20$, 8.9%), two ($n=3$, 1.3%), and three ($n=1$, 0.4%). The corresponding proportions of extreme responder score categories among baseline e-cigarette never-users were: zero ($n=2145$, 91.9%), one ($n=155$, 6.6%), two ($n=30$, 1.3%), and three ($n=3$, 0.1%). The extreme responder score proportions did not significantly differ between baseline e-cigarette ever (vs. never) users ($p=0.40$), suggesting that mischievous responses did not account for the associations involving e-cigarette use found in the primary analysis.

eReferences

1. Robinson-Cimpian JP. Inaccurate estimation of disparities due to mischievous responders: Several suggestions to assess conclusions. *Educational Researcher*. 2014;43(4):171-185.