ONLINE SUPPLEMENTARY MATERIAL

Appendix 1: Methodology for recruiting adolescents (Wave 2)

Sampling and recruitment

Youth, ages 13 to 17, were recruited from the adult random digit dial (RDD) frames if the household had an eligible adolescent and provided parental or guardian consent. To supplement the adolescent sample, additional interviews were recruited from an electronic white page (EWP) frame that targeted households with teens. Counties with higher prevalence of smoking and poverty were oversampled. To maintain independence between the sampling frames, the targeted sample excluded numbers from the adult frame. Interviews were conducted in both English and Spanish. Adolescents were offered $40 for their participation.

Data collection

The youth sample resulted in 975 completed interviews, took an average of 23 minutes to complete, yielded an overall weighted response rate of 32.8% (American Association for Public Opinion Research Response Rate 4), and was conducted between August 17, 2016 and May 14, 2017. It followed the same field procedures as the Wave 2 adult survey with the exception that minors needed parental consent to participate. RDD households that screened positive for an eligible youth were allowed to complete both adult and youth interviews. The RDD samples yielded 334 adolescent interviews from a pool of 21,224 numbers. Most of the numbers were ineligible (n=76,524) or unknown (n=44,120) and resulted in few refusals from eligible households (n=246). The targeted EWP batch was implemented later (February 28 to May 14, 2017) when it was clear that the RDD batches were not going to produce sufficient youth numbers. It produced 641 completed interviews with 505 refusals, 12,290 ineligibles and 11,929 numbers of indeterminable eligibility status.

Weights

Base weights were calculated by taking the inverse sampling rate and multiplying it by the number of eligible youths over the number of telephone numbers entering the household per

stratum. Like the adult sample, strata with sample sizes less than 10 were collapsed with similar strata for variance estimation purposes (Step 1). Stratum-specific household-level nonresponse was adjusted by using the inverse strata-specific response rate. Variable weights were also trimmed at this stage by implementing a procedure outlined by Potter[1] (Step 2). Finally, the nonresponse adjusted weights were calibrated to estimates from the American Community Survey (ACS; 2011-2013)[2] on the following classifications: census region, gender, age (13-14 & 15-17), and race (White vs non-White) (Step 3). Final weights were normalized.[3]

Representativeness

In comparing the unweighted and weighted survey estimates to the national estimates of the 2011-2015 ACS, six estimates had 95% confidence intervals that did not include the national estimate. Hispanics as well as 13 year olds, Asians, and multiracial youth were under-represented whereas 9th and 11th graders were slightly over-represented. The rest of the estimates showed good representation of the target population. Specific smoking estimates were compared to the 2016 National Youth Tobacco Survey (NYTS) for middle school only because our eligibility criterion restricted high school seniors 18 years of age or older. Our middle school estimates, however, were lower than the national average, but admittedly unstable due to the small sample size.

References

1. Potter FJ. Survey of procedures to control extreme sampling weights. *Proceedings of the Section on Survey Research Methods, American Statistical Association.* 1988:453-458.
2. American Community Survey United States Census Bureau. 2012; https://www.census.gov/programs-surveys/acs/. Accessed May 10, 2018.
3. Flores-Cervantes I, Shapiro, G., & Brock-Roth, S. P. Effect of oversampling by poverty status in an RDD survey. *Proceedings of the Section on Survey Research Methods, American Statistical Association.* 1998:469-474.

Supplementary Table 1. Chemical panels

Panel	Chemical 1	Chemical 2	Chemical 3	Chemical 4
1	Lead	Toluene*	1-Aminonaphthalene*	Crotonaldehyde*
2	Nicotine*	Hydrogen cyanide	Isoprene*	Acrylonitrile*
3	Formaldehyde*	Benzo-a-pyrene*	Napthalene	NNK*
4	Arsenic	Benzene*	Acrolein*	2-Aminonaphthalene*
5	Carbon monoxide*	Uranium	1,3-Butadiene*	N-nitrosonornicotine*
6	Ammonia*	Acetaldehyde*	Nitrosamine	4-Aminobiphenyl*

N.N.K. = nicotine-derived nitrosamine ketone. *Chemicals published on FDA's list of harmful and potentially harmful chemicals.

Supplementary Table 2. Description of ads asked in surveys.

Campaign Name (Sponsor)	Campaign Target Audience/Location	Ad Theme	Ad Description	Ad Launch Date
Wave 1 Survey (2014-2015)				
The Real Cost (FDA)	Youth*/National US	Health consequences, cosmetic effects	A young man pulls his tooth out with pliers	Mar 2014
The Real Cost (FDA)	Youth*/National US	Health consequences, cosmetic effects	A young woman pulls some skin off her face	Feb 2014
Tips from a Former Smoker (CDC)	Adult smokers/National US	Health consequences	A woman must talk through a hole in her throat	Mar 2012
The Real Cost (FDA)	Youth*/National US	Loss of control, addiction	A tiny man bullies a teenager	Feb 2014
The Real Cost (FDA)	Youth*/National US	Loss of control, addiction	A high school girl sits at a lunch table and talks about a bad relationship	Mar 2014
Wave 2 Survey (2016-2017)				
The Real Cost (FDA)	Youth*/National US	Loss of control, addiction	A tiny man bullies a teenager	Feb 2014
The Real Cost (FDA)	Youth*/National US	Health consequences, chemicals	A scary, insect-like creature appears in a high school science class or under the bleachers	Jun 2015
The Real Cost (FDA)	Male youth*/35 rural US markets	Health consequences	About the harms of smokeless tobacco showing a young man with scars from mouth cancer	Apr 2016
The Fresh Empire (FDA)	Multicultural youth, hip-hop peer crowd/ 37 US markets	Social norms	A young person talks about rejecting smoking to keep it fresh for themselves and their family [a]	Oct 2015 [b]
Tips from a Former Smoker (CDC)	Adult smokers/National US	Health consequences	A former smoker talks about their serious health problems caused by smoking [a]	Mar 2012 [b]

Note. Youth = age 12-17; adults = age 18-54. CDC = Centers for Disease Control and Prevention. FDA = US Food and Drug Administration.
*Youth who are open to smoking or already experimenting with cigarettes. [a] Description of overall campaign theme, rather than a specific ad.
[b] Launch date of overall campaign, rather than a specific ad.

Supplementary Table 3. Awareness of chemicals in cigarette smoke among adults

Chemical	Wave 1 2014-2015 (%)	Wave 2 2016-2017 (%)	Difference (95% CI)	*p*
1,3-Butadiene	8.0	10.6	2.6 (-2.1, 7.2)	0.129
1-Aminoaphthalene	10.7	11.7	1.0 (-4.9, 6.8)	0.756
2-Aminonaphthalene	12.9	11.0	-1.9 (-7.3, 3.5)	0.132
4-Aminobiphenyl	9.2	9.3	0.1 (-5.7, 5.9)	0.950
Acetaldehyde	20.4	17.2	-3.2 (-10.2, 3.8)	0.077
Acrolein	5.9	6.2	0.3 (-3.8, 4.4)	0.439
Acrylonitrile	9.0	10.2	1.1 (-4.0, 6.2)	0.479
Ammonia	38.7	40.0	1.2 (-7.5, 10.0)	0.249
Arsenic	50.1	50.9	0.8 (-8.4, 10.1)	0.186
Benzene	39.0	35.3	-3.6 (-12.8, 5.5)	**<0.001**
Benzo-a-pyrene	18.6	23.8	5.2 (-4.1, 14.5)	0.967
Carbon monoxide	61.2	56.1	-5.2 (-14.3, 3.9)	0.554
Crotonaldehyde	17.5	23.4	5.9 (-1.3, 13.1)	0.448
Formaldehyde	49.1	56.5	7.4 (-2.4, 17.2)	0.068
Hydrogen cyanide	31.2	30.1	-1.0 (-9.8, 7.7)	0.701
Isoprene	13.3	9.6	-3.7 (-9.5, 2.1)	**0.041**
Lead	22.9	18.9	-4.0 (-10.9, 3.0)	0.188
Napthalene	14.2	15.4	1.2 (-7.5, 9.9)	0.442
Nicotine	88.7	91.2	2.5 (-4.5, 9.5)	0.222
Nitrosamine	10.7	13.7	3.0 (-3.2, 9.1)	0.301
N-nitrosonornicotine	39.1	51.7	12.6 (3.8, 21.4)	**<0.001**
N.N.K.	4.8	4.1	-0.7 (-4.2, 2.7)	0.782
Toluene	12.9	18.3	5.3 (-0.6, 11.3)	0.509
Uranium	7.4	8.4	1.0 (-3.7, 5.6)	0.298
Overall	24.9	25.7	0.8 (-0.9, 2.4)	0.192

Note. 2014-2015 *n* = 5,014; 2016-2017 *n* = 4,208. N.N.K. = nicotine-derived nitrosamine ketone. The *n*s for each chemical differ slightly but are comparable. Percentages are weighted.