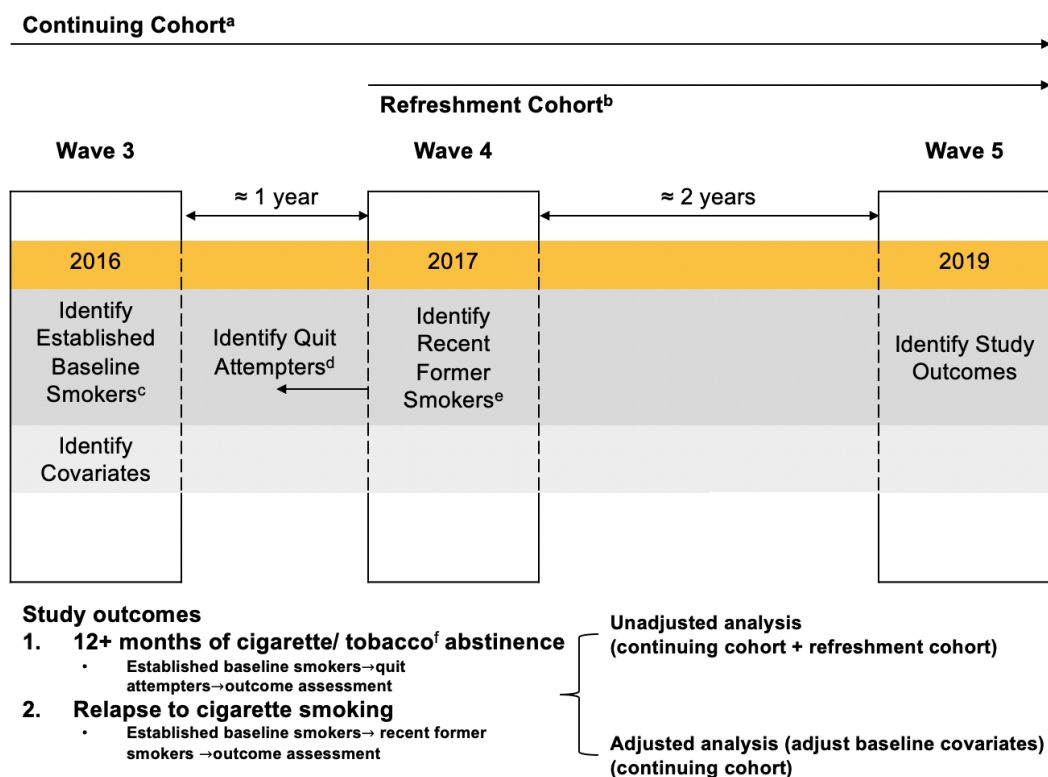


## Supplements for Chen et al. Effectiveness of e-cigarettes as aids for smoking cessation: evidence from the PATH Study, 2017-19

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## Supplement 1. PATH Smoking Cessation Study (2017-2019) Flowchart



Abbreviations: PATH, Population Assessment of Tobacco and Health.

<sup>a</sup> Continuing Cohort: those who were interviewed at each of the three waves.

<sup>b</sup> Refreshment Cohort: who were first interviewed at Wave 4.

<sup>c</sup> Established Baseline Smokers: those who smoked cigarettes at Wave 3.

<sup>d</sup> Quit attempters: those who made at least 1 quit attempt in the year prior to Wave 4.

<sup>e</sup> Recent Former Smokers: those who smoked cigarettes at Wave 3 but didn't smoke cigarettes at Wave 4.

<sup>f</sup> Tobacco: any of e-cigarettes, cigar, cigarillo, filtered cigar, pipe, hookah, snus or smokeless tobacco.

## Supplement 2. Measurement Detail for Pre-identified Study Covariates for Adjusted Analysis of Use of E-cigarettes on 12+ Months Cigarette/Tobacco Abstinence among Quit Attempters (in PATH Study [with variable names])

**Socio-demographics:** Use standard derived variables for age, sex, education, race, ethnicity, and income (R03R\_A\_AGE, R03R\_A\_SEX, R01R\_A\_EDUC, R04R\_A\_EDUC4, R03R\_A\_RACE, R03R\_A\_HISP, R03\_AM0030; Note the variable of education comes from PATH Wave 4 database since it was not asked in Wave 3. If R04R\_A\_EDUC4 is missing but R01R\_A\_EDUC is not, we replaced the value of R04R\_A\_EDUC4 by R01R\_A\_EDUC.

**Cigarette smoking status at W3:** Smoked cigarettes daily or non-daily at W3 (R03\_AC1003).

**Time since last quit attempt:** This was calculated as the date of W4 survey completed minus the end date of the most recent quit attempt reported in W4 (R04R\_A\_INTERVIEW\_MMYR, R04R\_A\_INTERVIEW\_WK, R04\_AN0135).

**Tobacco dependence index:** (R03\_AN0025, R03\_AN0030, R03\_AN0065, R03\_AN0035, R03\_AN0045, R03\_AN0085, R03\_AN0090, R03\_AN0060, R03\_AN0095, R03\_AN0100, R03\_AN0055, R03\_AN0050, R03\_AN0070, R03\_AN0075, R03\_AN0080). Variables are combined to derive the variable tobacco dependence index by calculating the mean of the non-missing scores. Tobacco dependence items take the form of a series of statements on emotional and physical responses to tobacco products (e.g. "I frequently crave {product}", "I usually want to {use product} right after I wake up", "I [would] feel alone without my {product}"). Respondents are asked to rate their level of agreement with each statement on a 5-point scale, where 1="Not true of me at all" and 5="Extremely true of me". Respondents can also answer "don't know" or refuse to answer the question; these are treated as missing responses. Responses are rescaled to a 3-point scale, where 1 (not at all) = 0, 2 or 3 = 50 and 4 or 5 = 100, summed and divided by the number of non-missing values.

**Cigarette consumption at W3:** Average number of cigarettes now smoked each day (R03\_AC1021UN, R03\_AC1021NN). Responses could be reported as cigarettes or packs. For respondents with missingness in those variables, we replaced their cigarette consumption by multiplying average number of cigarettes smoked per day among non-current 30-day smokers (R03\_AC1023UN, R03\_AC1023NN) with the number of days smoked in the past 30 days (R03\_AC1022) and divided by 30 days.

**E-cigarettes use at W3:** Derived with variables R03\_AV1003EC.

**Interest in quitting cigarettes:** On a scale of 1-10 where 1=Not at all interested and 10=Extremely interested (R03\_AN0230).

**Self-efficacy about quitting:** "If you did try to quit {product} altogether in the next 6 months, how likely do you think you would be to succeed?" on a 4-point scale from 1=Not at all likely and 4=Very likely (R03\_AN0245).

**Smoke-free home:** Variables (R03\_AR1045) were used to identify the variable smoke-free home when participants became recent former cigarette smokers. Statement that best describes rules about smoking a combustible tobacco product inside home. It's a 3-point scale from 1 (not allowed anywhere or anytime at all) to 3 (allowed anywhere or anytime at all).

**Exposure to smokers:** "In the past 7 days, number of hours that you were in close contact with others when they were smoking." (R03\_AX0068).

**Perceived harmfulness of cigarettes:** Respondents were asked "How harmful do you think cigarettes are to health?" and could reply on a 5-point scale from 1 (not at all harmful) to 5 (extremely harmful) (R03\_AC9050).

**Relative perceived harmfulness of e-cigarettes:** Respondents were asked "Is using e-cigarettes less harmful, about the same, or more harmful than smoking cigarettes?" and could reply on a 3-point scale, where 1=Less harmful, 2=About the same and 3=More harmful (R03\_AE1099).

**Cigarette pack-years:** Calculated by multiplying the number of packs smoked per day by the number of years the respondent smoked regularly, missing values in the number of packs smoked per day were completed by cigarette consumptions calculated above.

**Age began regular smoking:** (R01\_AC1007, R02\_AC1007\_NB and R03\_AC1007\_NB). If it's still missing, using (R01\_AC1020, R02\_AC1020\_NB and R03\_AC1020\_NB) to replace it.

**Insurance status:** (R03\_AM0026\_01 to R03\_AM0026\_08) Respondents who reported currently being covered by at least one type of health insurance, including insurance purchased directly or through an employer or union, Medicare, Medicaid, VA, TRICARE or other military health care and Indian Health Insurance, were scored as having insurance coverage. Missing data on all of these variables were coded to "did not have insurance".

**External mental health symptoms:** Respondents were asked the last time they had experienced any of 7 externalizing (e.g., had a hard time paying attention or listening to instructions at school, work or home, bullied or started physical fights). The number of reports of experiencing such symptoms in the past month or the past 2-12 months was summed and coded into a 3-level severity indicator, with those reporting 0 or 1 symptom scored as Low, 2-3 symptoms scored as Moderate and 4 or more scored as High.

**Internal mental health symptoms:** Respondents were asked the last time they experienced any of 4 internalizing disorder symptoms: feeling very trapped, lonely, sad, blue, depressed, or hopeless about the future, feeling very anxious, nervous, tense, scared, panicked, or like something bad was going to happen, had sleep problems. The number of reports of experiencing such symptoms in the past month or the past 2-12 months was summed and coded into a 3-level severity indicator, with those reporting 0 or 1 symptom scored as Low, 2-3 symptoms scored as Moderate and 4 or more scored as High.

**Existence of smoking-related disease:** Respondents were asked if they had ever been told by a doctor or health professional that they had any of the listed diseases.

Group A: Heart Disease: High blood pressure (R01\_AX0111\_01, R02\_AX0111\_NB\_01 and R03\_AX0111\_NB\_01), High cholesterol (R01\_AX0111\_02, R02\_AX0111\_NB\_02 and R03\_AX0111\_NB\_02) Congestive heart failure (R01\_AX0111\_03, R02\_AX0111\_NB\_03 and R03\_AX0111\_NB\_03); a stroke (R01\_AX0111\_04, R02\_AX0111\_NB\_04 and R03\_AX0111\_NB\_04); A heart attack (R01\_AX0111\_05, R02\_AX0111\_NB\_05 and R03\_AX0111\_NB\_05); Some other heart condition (R01\_AX0111\_06, R02\_AX0111\_NB\_06 and R03\_AX0111\_NB\_06)

Group B: Respiratory Disease: COPD (R01\_AX0119\_01, R02\_AX0119\_NB\_01 and R03\_AX0119\_NB\_01); chronic bronchitis (R01\_AX0119\_02, R02\_AX0119\_NB\_02 and R03\_AX0119\_NB\_02); emphysema (R01\_AX0119\_03, R02\_AX0119\_NB\_03 and R03\_AX0119\_NB\_03); asthma (R01\_AX0119\_04, R02\_AX0119\_NB\_04 and R03\_AX0119\_NB\_04); some other lung or respiratory condition (R01\_AX0119\_05, R02\_AX0119\_NB\_05 and R03\_AX0119\_NB\_05)

Group C: Cancer: (R01\_AX0144, R02\_AX0144\_NB and R03\_AX0144\_NB)

### Supplement 3. Full Sample Characteristics of Adjusted Analysis of Use of E-cigarettes on 12+ Months Cigarette/ Tobacco Abstinence among Quit Attempters<sup>a</sup> in PATH Study, According to Use of Non-cigarette Tobacco Products in Last Quit Attempt prior to Wave 4

Wtd % is the population in row category (for example, among those aged 18-34, 83.0% didn't use tobacco at the exposure assessment, 14.0% used e-cigarette and 3.0% used other non-cigarette tobacco product etc.).

Variable	Category	Non-cigarette Tobacco Product Use by Recent Former Smokers					
		No tobacco use (n=2054)		Any e-cigarette use(n=311)		Other non-cigarette tobacco use <sup>c</sup> (n=54)	
		Wtd %	95% CL	Wtd %	95% CL	Wtd %	95% CL
Age	18-34	83.0	80.2, 85.7	14.0	11.3, 16.8	3.0	1.6, 4.4
	35-50	84.1	81.0, 87.2	13.4	10.6, 16.2	2.5	1.3, 3.6
	50+	90.0	87.7, 92.3	8.2	6.1, 10.4	1.8	0.8, 2.8
Sex	Male	85.1	82.7, 87.4	11.6	9.3, 13.9	3.3	2.2, 4.4
	Female	86.2	83.8, 88.5	12.3	10.2, 14.3	1.6	0.5, 2.7
Education	Less than high school	87.2	84.5, 89.8	9.9	7.6, 12.3	2.9	1.7, 4.1
	High school graduate	87.3	84.5, 90.2	9.4	6.8, 12.1	3.2	1.3, 5.1
	Some college or higher	83.9	81.4, 86.4	14.3	12.0, 16.6	1.8	0.8, 2.8
Race	White	84.0	81.9, 86.1	13.8	11.8, 15.7	2.3	1.5, 3.0
	Others	89.5	87.2, 91.8	7.4	5.3, 9.4	3.2	1.5, 4.9
Ethnicity	Hispanic	92.2	89.5, 94.9	5.5	3.0, 8.1	2.2	0.3, 4.1
	Non-Hispanic	84.3	82.4, 86.2	13.2	11.3, 15.1	2.5	1.8, 3.2
Income (US\$)	< 35000	85.7	83.7, 87.8	11.0	9.2, 12.7	3.3	2.2, 4.4
	>= 35000	85.1	82.2, 88.0	13.8	11.0, 16.5	1.2	0.4, 1.9
Cigarette smoking status at W3	Daily	84.6	82.6, 86.5	12.7	10.8, 14.6	2.7	1.7, 3.7
	Non-daily	87.9	85.3, 90.5	10.3	7.9, 12.7	1.8	0.9, 2.7
Time since last quit attempt (months)	<=6	84.2	81.8, 86.7	13.9	11.5, 16.2	1.9	1.1, 2.7
	>6	82.7	79.6, 85.7	13.7	10.5, 16.9	3.6	1.5, 5.8
Tobacco dependence index <sup>b</sup>	0-33.3	89.5	86.1, 92.8	9.1	6.1, 12.1	1.4	0.0, 2.8

	33.4-66.7	86.5	84.0, 89.1	11.0	8.5, 13.4	2.5	1.3, 3.7
	66.8-100	82.3	79.0, 85.5	14.7	11.7, 17.8	3.0	1.7, 4.3
Cigarette consumption at W3 (pack)	< 1	87.0	85.3, 88.7	10.9	9.2, 12.6	2.1	1.4, 2.8
	>= 1	80.4	76.6, 84.3	15.8	12.2, 19.3	3.8	1.8, 5.8
E-cigarettes use at W3	Marked	67.2	61.0, 73.3	29.6	23.9, 35.4	3.2	0.7, 5.6
	Not marked	89.3	87.8, 90.9	8.4	7.1, 9.7	2.3	1.5, 3.1
Interest in quitting cigarettes	1-7	87.5	85.0, 89.9	10.5	8.3, 12.8	2.0	1.0, 3.0
	8-9	83.2	79.2, 87.2	14.0	10.7, 17.4	2.7	0.6, 4.8
	10	85.7	83.2, 88.3	11.8	9.4, 14.1	2.5	1.4, 3.6
Self-efficacy about quitting (in the next 6 months)	Not at all likely	91.6	81.2, 100.0	3.6	0.0, 11.0	4.8	0.0, 11.8
	A little likely	84.5	78.3, 90.7	12.6	7.2, 17.9	2.9	0.1, 5.8
	Somewhat likely	86.5	82.7, 90.2	11.5	8.0, 15.1	2.0	0.5, 3.5
	Very likely	90.3	86.7, 93.9	7.8	4.5, 11.1	1.9	0.6, 3.3
Smoke-free home	Yes	85.8	81.9, 89.7	11.4	7.9, 15.0	2.7	0.8, 4.7
	No	85.6	83.9, 87.3	12.1	10.4, 13.8	2.3	1.5, 3.1
Exposure to smokers (in the past 7 days)	<=10 hours	87.2	85.3, 89.1	10.5	8.7, 12.4	2.3	1.4, 3.2
	>10 hours	81.9	78.5, 85.3	15.5	12.2, 18.8	2.6	1.1, 4.1
Perceived harmfulness of cigarettes	Not to somewhat harmful	89.1	85.9, 92.3	8.8	5.9, 11.7	2.1	0.5, 3.6
	Very/extremely harmful	84.7	82.9, 86.4	12.8	11.0, 14.5	2.6	1.7, 3.4
Relative perceived harmfulness of e-cigarettes	1 = Less harmful	75.9	72.0, 79.7	22.1	18.3, 25.8	2.0	1.1, 3.0
	2 = About the same	89.8	87.8, 91.7	7.6	5.9, 9.3	2.6	1.6, 3.6
	3 = More harmful	90.4	86.4, 94.4	8.1	4.3, 11.8	1.6	0.2, 2.9
Cigarette pack-years	<= 20	84.4	82.1, 86.7	13.2	10.9, 15.5	2.4	1.4, 3.4
	21-35	83.5	79.0, 88.1	14.2	10.3, 18.2	2.3	0.4, 4.1
	> 35	84.0	79.3, 88.7	12.4	8.3, 16.5	3.7	1.0, 6.3
Age began regular smoking	18+	85.2	82.9, 87.5	11.6	9.2, 14.1	3.2	1.8, 4.6
	< 18	83.1	80.5, 85.8	14.9	12.3, 17.4	2.0	1.0, 2.9
Insurance Status	Yes	85.3	83.4, 87.2	12.5	10.7, 14.3	2.2	1.4, 3.0
	No	87.1	83.0, 91.2	9.7	6.4, 13.0	3.2	1.1, 5.4
External mental health symptoms	Low	89.2	87.0, 91.3	9.1	7.1, 11.0	1.8	1.1, 2.4
	Moderate	81.6	78.0, 85.2	15.0	12.0, 18.1	3.4	1.5, 5.3

	High	78.9	74.9, 83.0	17.5	13.6, 21.5	3.5	1.1, 6.0
Internal mental health symptoms	Low	88.8	86.7, 91.0	9.3	7.3, 11.4	1.8	1.1, 2.6
	Moderate	83.5	79.8, 87.1	13.9	10.7, 17.1	2.7	1.2, 4.2
	High	80.7	77.1, 84.3	15.7	12.1, 19.3	3.6	1.8, 5.4
Existence of smoking-related disease	Yes	87.2	85.0, 89.4	10.3	8.2, 12.4	2.5	1.6, 3.5
	No	84.1	81.7, 86.5	13.6	11.2, 15.9	2.4	1.3, 3.5

Abbreviations: PATH, Population Assessment of Tobacco and Health; Wtd, Weighted US population estimate (W1-W5 longitudinal weights were used); CL, Confidence Limit; W3, Wave 3, etc.

<sup>a</sup> Quit Attempters: those who made at least 1 quit attempt in the year prior to W4.

<sup>b</sup> Tobacco Dependence Index tertiles based on Strong et al<sup>20</sup>

<sup>c</sup> Other non-cigarette tobacco use include any use of cigar, cigarillo, filtered cigar, pipe, hookah, snus or smokeless tobacco.

## Supplement 4. Measurement Detail for Pre-identified Study Covariates for Adjusted Analysis of Use of E-cigarettes on Relapse to Cigarettes Smoking among Recent Former Cigarette Smokers (in PATH Study [with variable names])

**Socio-demographics:** Use standard derived variables for age, sex, education, race, ethnicity, and income (R03R\_A\_AGE, R03R\_A\_SEX, R01R\_A\_EDUC, R04R\_A\_EDUC4, R03R\_A\_RACE, R03R\_A\_HISP, R03\_AM0030; Note the variable of education comes from PATH Wave 4 database since it was not asked in Wave 3. If R04R\_A\_EDUC4 is missing but R01R\_A\_EDUC is not, we replaced the value of R04R\_A\_EDUC4 by R01R\_A\_EDUC.

**Cigarette smoking status at W3:** Smoked cigarettes daily or non-daily at W3 (R03\_AC1003).

**Tobacco dependence index:** (R03\_AN0025, R03\_AN0030, R03\_AN0065, R03\_AN0035, R03\_AN0045, R03\_AN0085, R03\_AN0090, R03\_AN0060, R03\_AN0095, R03\_AN0100, R03\_AN0055, R03\_AN0050, R03\_AN0070, R03\_AN0075, R03\_AN0080). Variables are combined to derive the variable tobacco dependence index by calculating the mean of the non-missing scores. Tobacco dependence items take the form of a series of statements on emotional and physical responses to tobacco products (e.g. "I frequently crave {product}", "I usually want to {use product} right after I wake up", "I [would] feel alone without my {product}"). Respondents are asked to rate their level of agreement with each statement on a 5-point scale, where 1="Not true of me at all" and 5="Extremely true of me". Respondents can also answer "don't know" or refuse to answer the question; these are treated as missing responses. Responses are rescaled to a 3-point scale, where 1 (not at all) = 0, 2 or 3 = 50 and 4 or 5 = 100, summed and divided by the number of non-missing values.

**Cigarette consumption at W3:** Average number of cigarettes now smoked each day (R03\_AC1021UN, R03\_AC1021NN). Responses could be reported as cigarettes or packs. For respondents with missingness in those variables, we replaced their cigarette consumption by multiplying average number of cigarettes smoked per day among non-current 30-day smokers (R03\_AC1023UN, R03\_AC1023NN) with the number of days smoked in the past 30 days (R03\_AC1022) and divided by 30 days.

**E-cigarettes use at W3:** Derived with variables R03\_AV1003EC.

**Duration of cigarette abstinence reported at W4:** Questions about "How long since you completely quit smoking cigarettes" were identified to derive time of quitting cigarettes (R04\_AC1009UN, R04\_AC1009NN).

**Interest in quitting cigarettes:** On a scale of 1-10 where 1=Not at all interested and 10=Extremely interested (R03\_AN0230).

**Self-efficacy about quitting:** "If you did try to quit {product} altogether in the next 6 months, how likely do you think you would be to succeed?" on a 4-point scale from 1=Not at all likely and 4=Very likely (R03\_AN0245).

**Smoke-free home:** Variables (R04\_AR1045) were used to identify the variable smoke-free home when participants became recent former cigarette smokers. Statement that best describes rules about smoking a combustible tobacco product inside home. It's a 3-point scale from 1 (not allowed anywhere or anytime at all) to 3 (allowed anywhere or anytime at all).

**Exposure to smokers:** "In the past 7 days, number of hours that you were in close contact with others when they were smoking." (R03\_AX0068).

**Perceived harmfulness of cigarettes:** Respondents were asked "How harmful do you think cigarettes are to health?" and could reply on a 5-point scale from 1 (not at all harmful) to 5 (extremely harmful) (R03\_AC9050).

**Relative perceived harmfulness of e-cigarettes:** Respondents were asked "Is using e-cigarettes less harmful, about the same, or more harmful than smoking cigarettes?" and could reply on a 3-point scale, where 1=Less harmful, 2=About the same and 3=More harmful (R03\_AE1099).

**Cigarette pack-years:** Calculated by multiplying the number of packs smoked per day by the number of years the respondent smoked regularly, missing values in the number of packs smoked per day were completed by cigarette consumptions calculated above.

**Age began regular smoking:** (R01\_AC1007, R02\_AC1007\_NB and R03\_AC1007\_NB). If it's still missing, using (R01\_AC1020, R02\_AC1020\_NB and R03\_AC1020\_NB) to replace it.



**Insurance status:** (R03\_AM0026\_01 to R03\_AM0026\_08) Respondents who reported currently being covered by at least one type of health insurance, including insurance purchased directly or through an employer or union, Medicare, Medicaid, VA, TRICARE or other military health care and Indian Health Insurance, were scored as having insurance coverage. Missing data on all of these variables were coded to “did not have insurance”.

**External mental health symptoms:** Respondents were asked the last time they had experienced any of 7 externalizing (e.g., had a hard time paying attention or listening to instructions at school, work or home, bullied or started physical fights). The number of reports of experiencing such symptoms in the past month or the past 2-12 months was summed and coded into a 3-level severity indicator, with those reporting 0 or 1 symptom scored as Low, 2-3 symptoms scored as Moderate and 4 or more scored as High.

**Internal mental health symptoms:** Respondents were asked the last time they experienced any of 4 internalizing disorder symptoms: feeling very trapped, lonely, sad, blue, depressed, or hopeless about the future, feeling very anxious, nervous, tense, scared, panicked, or like something bad was going to happen, had sleep problems. The number of reports of experiencing such symptoms in the past month or the past 2-12 months was summed and coded into a 3-level severity indicator, with those reporting 0 or 1 symptom scored as Low, 2-3 symptoms scored as Moderate and 4 or more scored as High.

**Existence of smoking-related disease:** Respondents were asked if they had ever been told by a doctor or health professional that they had any of the listed diseases.

Group A: Heart Disease: High blood pressure (R01\_AX0111\_01, R02\_AX0111\_NB\_01 and R03\_AX0111\_NB\_01), High cholesterol (R01\_AX0111\_02, R02\_AX0111\_NB\_02 and R03\_AX0111\_NB\_02) Congestive heart failure (R01\_AX0111\_03, R02\_AX0111\_NB\_03 and R03\_AX0111\_NB\_03); a stroke (R01\_AX0111\_04, R02\_AX0111\_NB\_04 and R03\_AX0111\_NB\_04); A heart attack (R01\_AX0111\_05, R02\_AX0111\_NB\_05 and R03\_AX0111\_NB\_05); Some other heart condition (R01\_AX0111\_06, R02\_AX0111\_NB\_06 and R03\_AX0111\_NB\_06)

Group B: Respiratory Disease: COPD (R01\_AX0119\_01, R02\_AX0119\_NB\_01 and R03\_AX0119\_NB\_01); chronic bronchitis (R01\_AX0119\_02, R02\_AX0119\_NB\_02 and R03\_AX0119\_NB\_02); emphysema (R01\_AX0119\_03, R02\_AX0119\_NB\_03 and R03\_AX0119\_NB\_03); asthma (R01\_AX0119\_04, R02\_AX0119\_NB\_04 and R03\_AX0119\_NB\_04); some other lung or respiratory condition (R01\_AX0119\_05, R02\_AX0119\_NB\_05 and R03\_AX0119\_NB\_05)

Group C: Cancer: (R01\_AX0144, R02\_AX0144\_NB and R03\_AX0144\_NB)

### Supplement 5. Full Sample Characteristics of Adjusted Analysis of Use of E-cigarettes on Relapse to Cigarettes Smoking among Recent Former Cigarette Smokers<sup>a</sup> in PATH Study, According to Use of Non-cigarette Tobacco Products at Wave 4

Wtd % is the population in row category (for example, among those aged 18-34, 60.1% didn't use tobacco at the exposure assessment, 17.9% used e-cigarette and 22.0% used other non-cigarette tobacco product etc.).

Variable	Category	Non-cigarette Tobacco Product Use by Recent Former Smokers					
		No tobacco use (n=560)		Any e-cigarette use(n=142)		Other non-cigarette tobacco use <sup>c</sup> (n=160)	
		Wtd %	95% CL	Wtd %	95% CL	Wtd %	95% CL
Age	18-34	60.1	56.0, 64.1	17.9	13.5, 22.3	22.0	18.0, 26.0
	35-50	71.8	63.6, 80.1	18.4	11.7, 25.1	9.7	5.2, 14.3
	50+	84.6	78.7, 90.6	5.4	2.3, 8.5	10.0	4.9, 15.1
Sex	Male	63.1	58.0, 68.3	15.9	12.1, 19.8	20.9	16.5, 25.4
	Female	75.4	70.1, 80.6	13.7	9.4, 18.0	10.9	7.5, 14.4
Education	Less than high school	71.0	63.2, 78.8	11.9	6.7, 17.2	17.1	10.6, 23.5
	High school graduate	70.1	62.9, 77.3	11.8	7.2, 16.3	18.2	11.7, 24.6
	Some college or higher	67.8	63.1, 72.5	17.1	13.0, 21.2	15.1	11.8, 18.5
Race	White	68.0	63.7, 72.2	17.4	13.8, 21.1	14.6	11.1, 18.2
	Others	71.2	64.4, 78.1	8.1	4.7, 11.4	20.7	15.1, 26.3
Ethnicity	Hispanic	77.9	70.8, 85.0	10.9	5.2, 16.6	11.2	6.4, 16.0
	Non-Hispanic	66.8	62.7, 70.8	16.0	12.5, 19.4	17.2	14.0, 20.5
Income (US\$)	< 35000	71.9	67.4, 76.4	12.1	8.8, 15.4	16.0	12.4, 19.6
	>= 35000	65.1	59.3, 71.0	18.9	14.3, 23.5	16.0	11.6, 20.4
Cigarette smoking status at W3	Daily	72.9	67.7, 78.2	16.4	11.6, 21.1	10.7	7.3, 14.1
	Non-daily	66.1	61.2, 71.1	13.8	10.6, 17.1	20.0	16.3, 23.8
Tobacco dependence index <sup>b</sup>	0-33.3	69.9	63.7, 76.0	11.8	7.9, 15.6	18.4	13.6, 23.2
	33.4-66.7	66.0	58.2, 73.9	19.8	13.7, 26.0	14.1	8.6, 19.7
	66.8-100	65.2	55.2, 75.2	20.9	12.1, 29.7	13.9	6.7, 21.2
Cigarette consumption at W3 (pack)	< 1	67.6	63.7, 71.5	16.5	13.0, 19.9	15.9	13.2, 18.7
	>= 1	74.9	65.4, 84.3	12.9	5.4, 20.4	12.3	4.2, 20.3
E-cigarettes use at W3	Marked	41.3	32.9, 49.7	48.5	40.2, 56.9	10.1	5.78, 14.4

	Not marked	74.7	71.1, 78.4	7.8	5.6, 9.9	17.5	14.3, 20.7
Duration of cigarette abstinence reported at W4 (days)	<=90	62.2	56.9, 67.5	20.1	14.7, 25.5	17.7	13.3, 22.0
	>90	73.3	68.5, 78.1	11.4	8.2, 14.7	15.2	11.9, 18.5
	1-7	64.9	58.4, 71.4	14.8	10.7, 18.9	20.3	14.8, 25.8
Interest in quitting cigarettes	8-9	66.1	58.5, 73.6	16.2	8.4, 24.1	17.7	10.7, 24.7
	10	72.9	65.2, 80.6	16.7	10.8, 22.7	10.4	5.4, 15.4
Self-efficacy about quitting (in the next 6 months)	Not at all likely	83.6	47.7, 100.0	0	0.0, 0.0	16.4	0.0, 52.3
	A little likely	64.6	41.2, 88.0	26.3	3.7, 49.0	9.0	0.0, 21.6
	Somewhat likely	75.2	63.8, 86.7	12.0	3.8, 20.3	12.7	4.7, 20.7
	Very likely	70.6	62.1, 79.0	15.7	9.9, 21.4	13.8	8.0, 19.6
Smoke-free home	Yes	61.2	48.1, 74.2	9.6	4.5, 14.7	29.2	18.2, 40.3
	No	69.8	66.0, 73.5	15.5	12.3, 18.7	14.8	11.8, 17.7
Exposure to smokers (in the past 7 days)	<=10 hours	71.2	67.0, 75.4	13.8	10.4, 17.2	15.0	12.0, 17.9
	>10 hours	59.3	50.9, 67.7	19.6	12.6, 26.6	21.1	13.8, 28.4
Perceived harmfulness of cigarettes	Not to somewhat harmful	67.1	59.2, 75.1	15.6	10.1, 21.0	17.3	10.9, 23.7
	Very/extremely harmful	69.5	65.2, 73.7	14.8	11.3, 18.2	15.7	12.4, 19.1
Relative perceived harmfulness of e-cigarettes	1 = Less harmful	53.5	46.5, 60.4	28.8	22.6, 35.1	17.7	12.0, 23.5
	2 = About the same	76.3	72.2, 80.4	8.4	5.7, 11.1	15.3	11.7, 18.8
	3 = More harmful	77.3	68.1, 86.5	8.6	2.2, 15.0	14.1	7.0, 21.3
Cigarette pack-years	<= 20	65.7	60.8, 70.5	20.9	16.2, 25.7	13.4	10.0, 16.8
	21-35	76.7	64.3, 89.1	12.4	2.0, 22.8	10.9	2.7, 19.2
	> 35	78.3	66.8, 89.7	7.3	1.1, 13.5	14.4	5.2, 23.6
Age began regular smoking	18+	70.7	63.4, 78.1	16.5	10.6, 22.3	12.8	8.1, 17.5
	< 18	67.0	60.3, 73.6	18.2	14.0, 22.4	14.8	9.4, 20.2
Insurance Status	Yes	69.2	65.2, 73.2	15.5	12.5, 18.5	15.3	12.0, 18.5
	No	68.3	60.7, 76.0	11.9	6.2, 17.6	19.8	13.5, 26.0
External mental health symptoms	Low	72.2	67.8, 76.5	11.2	8.5, 14.0	16.6	12.9, 20.4
	Moderate	65.9	58.2, 73.5	18.5	11.9, 25.0	15.7	10.1, 21.2

	High	61.8	53.4, 70.3	22.7	15.7, 29.7	15.5	8.8, 22.2
Internal mental health symptoms	Low	69.5	65.0, 74.0	11.8	8.7, 14.9	18.7	14.9, 22.6
	Moderate	71.2	63.7, 78.7	14.7	9.1, 20.3	14.1	8.5, 19.7
	High	65.2	56.6, 73.7	23.2	16.4, 30.1	11.6	6.5, 16.7
Existence of smoking-related disease	Yes	75.0	70.3, 79.6	12.1	8.7, 15.5	12.9	9.0, 16.8
	No	64.7	60.0, 69.3	16.8	12.6, 21.1	18.5	14.8, 22.2

Abbreviations: PATH, Population Assessment of Tobacco and Health; Wtd, Weighted US population estimate (W1-W5 longitudinal weights were used); CL, Confidence Limit; W3, Wave 3, etc.

<sup>a</sup> Recent Former Cigarette Smokers: those who smoked cigarettes at W3 and didn't smoke cigarettes at W4.

<sup>b</sup> Tobacco Dependence Index tertiles based on Strong et al<sup>20</sup>

<sup>c</sup> Other non-cigarette tobacco use includes any use of cigar, cigarillo, filtered cigar, pipe, hookah, snus or smokeless tobacco.

## Supplement 6. Nicotine Concentration in E-cigarettes Used by Recent Former Smokers

Abbreviations: Wtd, weighted US population estimate; CL, confidence limit.

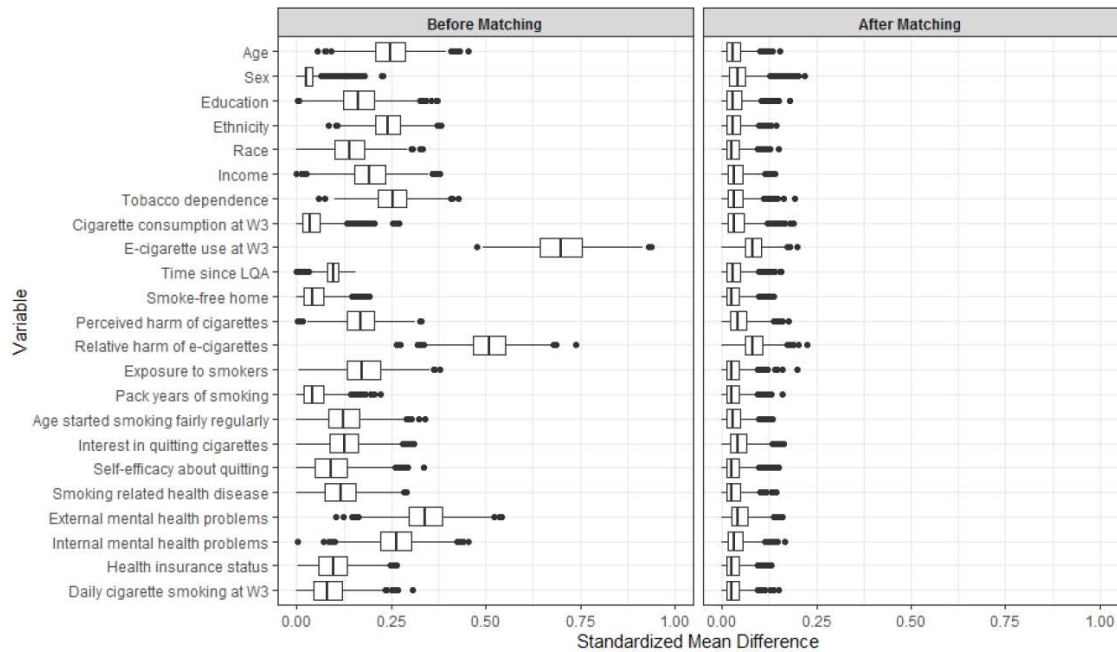
<sup>a</sup>. Recent Former Smoker: those who were not smoking cigarettes but who were established smokers at baseline (one year before).

	Wave 4 (2017)			Wave 5 (2019)		
	n	Wtd %	95% CL	n	Wtd %	95% CL
Previous Year Established Smokers <sup>a</sup>	10614			9053		
Recent former smokers (RFS) <sup>b</sup>	1323	12.4	11.6,13.3	1595	17.0	15.8,18.2
RFS who had switched to e-cigarettes	230	15.3	12.9,17.7	399	22.0	19.6,24.5
<b>Nicotine concentration in e-cigarettes</b>						
I don't know the concentration	30	11.9	6.8, 16.9	46	9.7	6.5, 13.0
0-6mg or 0.0-0.6%	110	48.5	40.3, 56.6	170	44.6	38.8, 50.4
7-12mg or 0.7-1.2%	16	7.3	3.6, 11.1	14	3.1	1.3, 5.0
13-17mg or 1.3-1.7%	3	1.7	0.0, 3.8	7	2.9	0.4, 5.3
18-24mg or 1.8-2.4%	19	8.1	4.1, 12.2	10	2.9	0.7, 5.1
25-39mg or 2.5-3.9%	6	2.7	0.4, 5.0	22	5.9	3.1, 8.7
40+mg or 4.0+%	5	2.2	0.0, 4.4	83	19.9	15.1, 24.6
Missing	41	17.6	11.5, 23.8	47	11	7.3, 14.8

<sup>a</sup> In the year prior to the survey, this was the population of established smokers

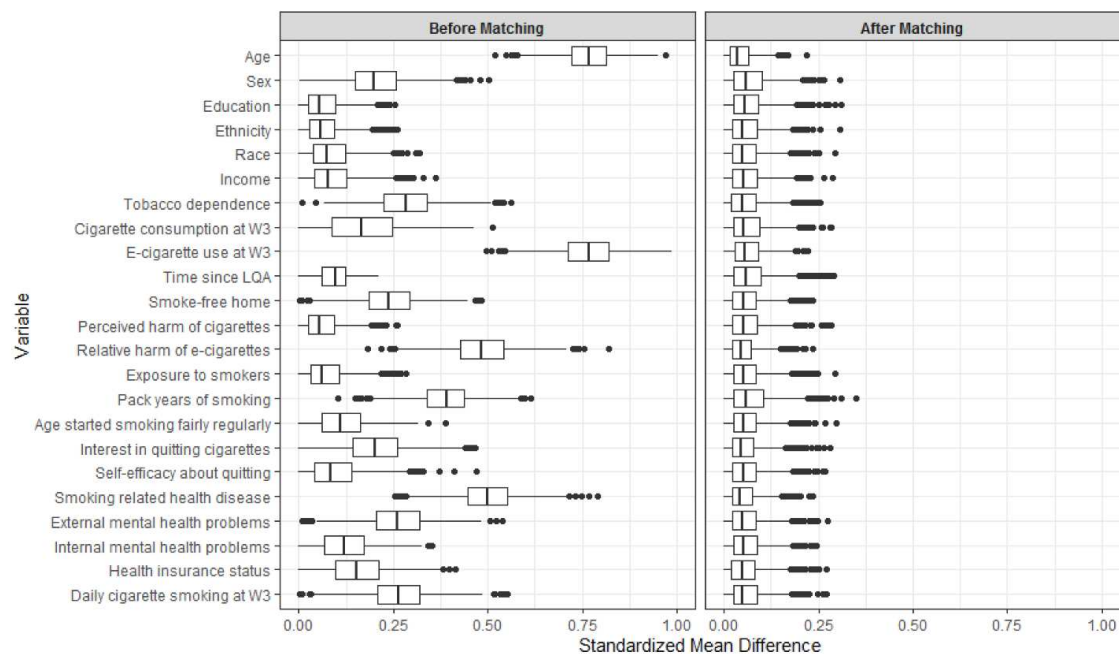
<sup>b</sup> these were the previous year established smokers who were quit at the time of the survey

## Supplement 7. Standardized Differences in 23 Important Covariates between Those Who Used Any E-cigarettes to Quit in 2016-2017 and Those Who Did Not among Quit Attempters, before and after Matching



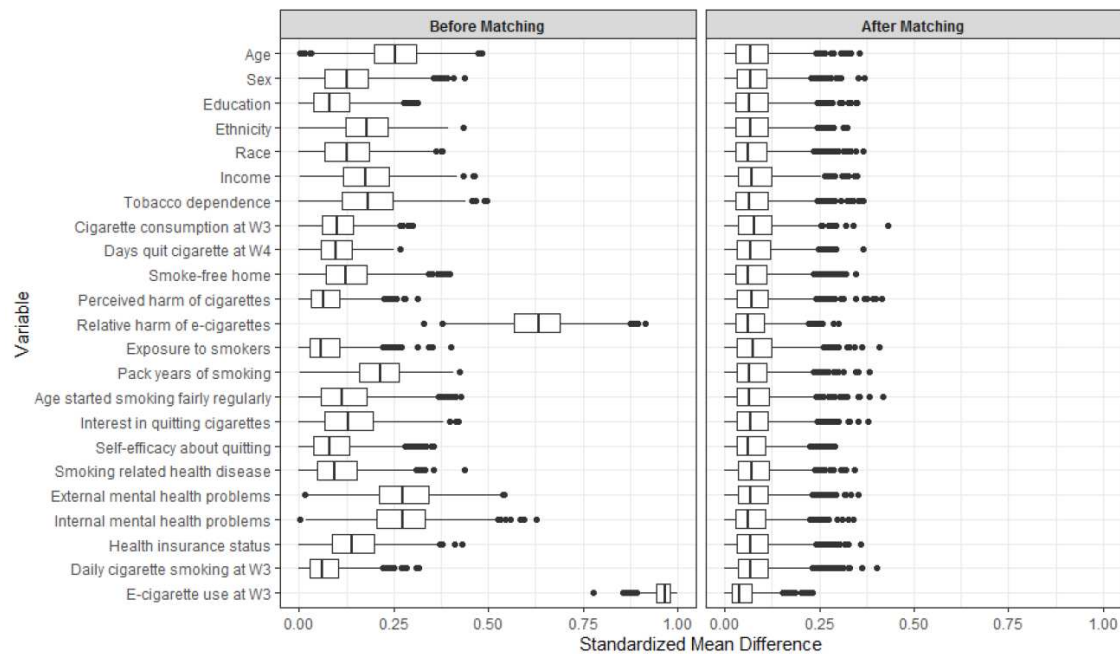
This boxplot presents the bootstrap distribution of the weighted standardized mean difference between baseline smokers who used e-cigarettes to aid their most recent quit attempt prior to PATH Wave 4, and those who did not among quit attempters, on the indicated variable. We consider an optimal match to be a covariate with a standardized median difference of  $< |0.1|$ . Before matching, 15 of the 23 covariates had less than optimal comparability between study groups (standardize mean difference  $> |0.1|$ ). After matching, none of the 23 covariates had less than optimal comparability between study groups. 1500 bootstrap samples were used. For a given covariate, we define “a marked improvement in covariate balance from matching” as a decrease of at least 0.1 units in the median absolute difference of the standardized covariate between exposed and non-exposed subjects, comparing the bootstrap distribution before and after matching. These comparisons do not use the survey weights. For this comparison, the following 12 covariates below achieved a marked improvement in covariate balance from the matching procedure (ordered by size of the difference in medians: E-cigarette use at W3, Relative perceived of harmfulness of e-cigarettes, External mental health symptoms, Internal mental health symptoms, Tobacco dependence index, Age, Ethnicity, Income, Exposure to smokers, Perceived harmfulness of cigarettes, Education and Race).

## Supplement 8. Standardized Differences in 23 Important Covariates between Those Who Used Any E-cigarettes to Quit in 2016-2017 and Those Who Used NRT or Pharmaceutical Aid Only among Quit Attempters, before and after Matching



This boxplot presents the bootstrap distribution of the weighted standardized mean difference between baseline smokers who used e-cigarettes to aid their most recent quit attempt prior to PATH Wave 4, and those who used NRT or pharmaceutical aid only among quit attempters, on the indicated variable. We consider an optimal match to be a covariate with a standardized median difference of  $< |0.1|$ . Before matching, 15 of the 23 covariates had less than optimal comparability between study groups (standardize mean difference  $> |0.1|$ ). After matching, none of the 23 covariates had less than optimal comparability between study groups. 1500 bootstrap samples were used. For a given covariate, we define “a marked improvement in covariate balance from matching” as a decrease of at least 0.1 units in the median absolute difference of the standardized covariate between exposed and non-exposed subjects, comparing the bootstrap distribution before and after matching. These comparisons do not use the survey weights. For this comparison, the following 13 covariates below achieved a marked improvement in covariate balance from the matching procedure (ordered by size of the difference in medians: E-cigarette use at W3, Age, Smoking related health disease, Relative perceived of harmfulness of e-cigarettes, Pack years of smoking, Tobacco dependence index, Daily cigarette smoking status at W3, External mental health symptoms, Smoke-free home, Interest in quitting cigarettes, Sex, Cigarette consumption at W3, Insurance status.

## Supplement 9. Standardized Differences in 23 Important Covariates between Those Who Used Any E-cigarettes and Those Did Not Use E-cigarettes at Wave 4 among Recent Former Smokers, before and after Matching



This boxplot presents the bootstrap distribution of the weighted standardized mean difference between those who used any e-cigarettes and those who didn't use e-cigarettes among recent former smokers at PATH Wave 4, on the indicated variable. We consider an optimal match to be a covariate with a standardized median difference of  $< |0.1|$ . Before matching, 16 of the 23 covariates had less than optimal comparability between study groups (standardize mean difference  $> |0.1|$ ). After matching, none of the 23 covariates had less than optimal comparability between study groups. 1500 bootstrap samples were used. For a given covariate, we define "a marked improvement in covariate balance from matching" as a decrease of at least 0.1 units in the median absolute difference of the standardized covariate between exposed and non-exposed subjects, comparing the bootstrap distribution before and after matching. These comparisons do not use the survey weights. For this comparison, the following 9 covariates below achieved a marked improvement in covariate balance from the matching procedure (ordered by size of the difference in medians: E-cigarette use at W3, Relative perceived of harmfulness of e-cigarettes, External mental health symptoms, Internal mental health symptoms, Age, Pack years of smoking, Tobacco dependence index, Ethnicity and Income).



## Supplement 10. The Change of Perception of Harmfulness of Cigarettes and Relative Harmfulness of E-cigarettes, PATH Study Wave 3 to Wave 5

Variable	Wave 3 (n=28148)		Wave 4 (n=33644)		Wave 5 (n=32687)	
	Wtd %	95% CL	Wtd %	95% CL	Wtd %	95% CL
<b>Perceived harmfulness of cigarettes</b>						
Not to somewhat harmful	9.3	8.9, 9.7	10.1	9.7, 10.6	9.5	9.1, 9.9
Very/extremely harmful	90.4	90.1, 90.8	89.6	89.1, 90.0	90.2	89.8, 90.6
Missingness	0.2	0.2, 0.3	0.3	0.2, 0.4	0.3	0.2, 0.4
<b>Relative perceived harmfulness of e-cigarettes</b>						
1 = Less harmful	23.8	23.1, 24.5	20.7	20.0, 21.3	16.4	15.9, 17.0
2 = About the same	62.9	62.1, 63.7	67.1	66.5, 67.8	68.6	67.9, 69.4
3 = More harmful	11.0	10.5, 11.5	10.5	10.1, 11.0	13.7	13.1, 14.3
Missingness	2.3	2.0, 2.6	1.7	1.4, 1.9	1.2	1.0, 1.4

Abbreviations: PATH, Population Assessment of Tobacco and Health; Wtd, weighted US population estimate; CL, confidence limit.