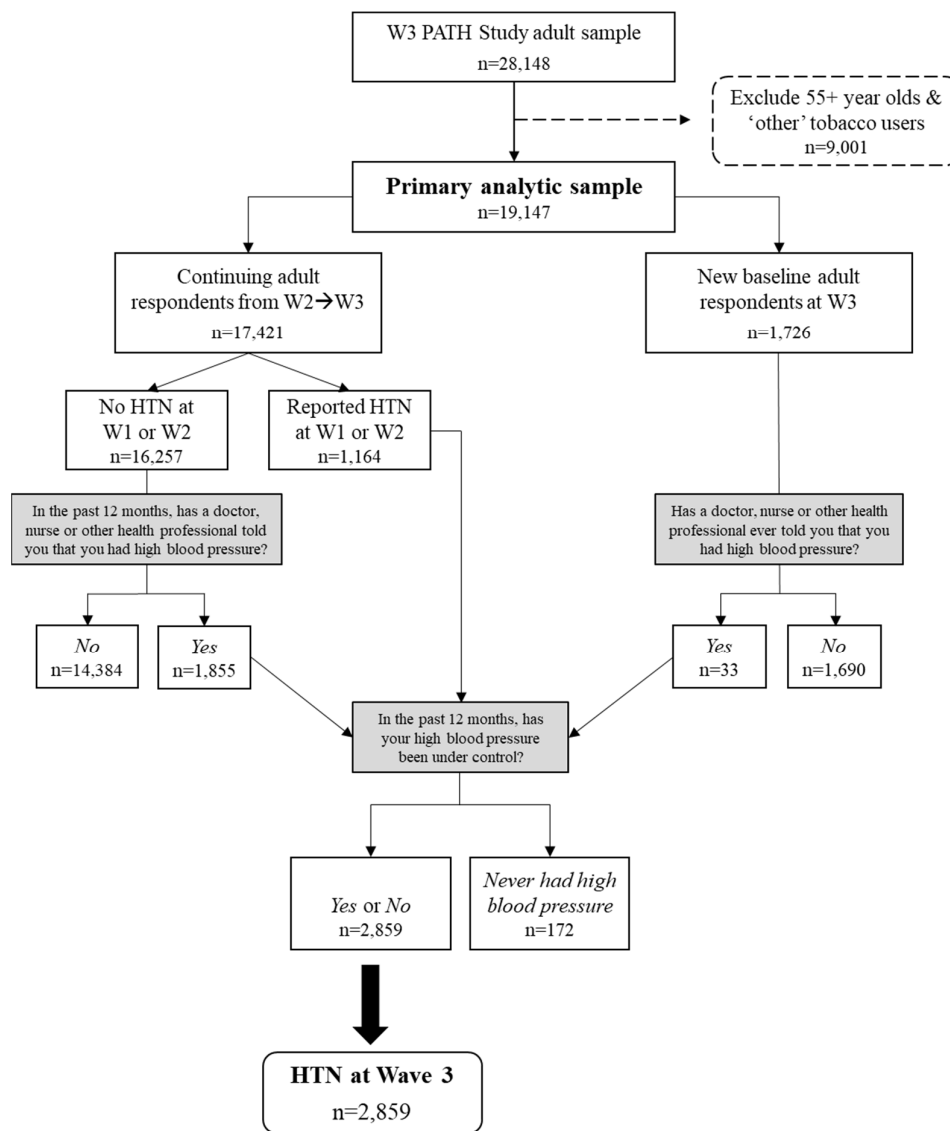


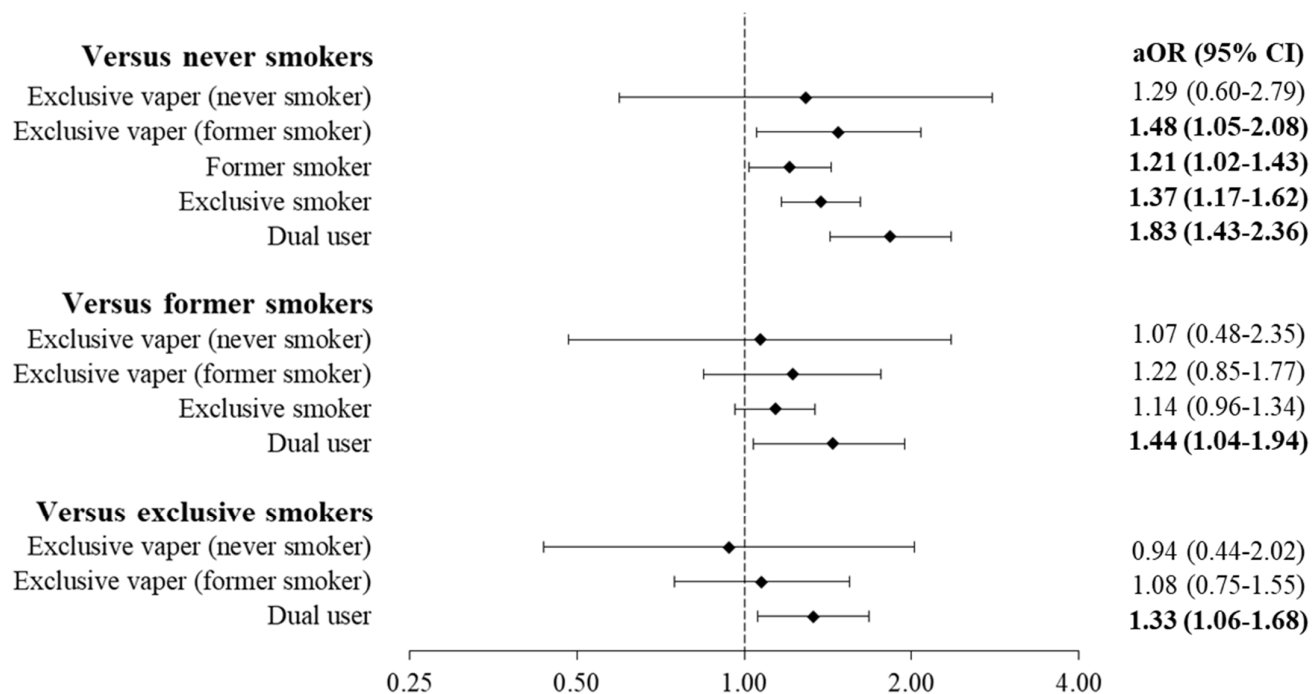
# Supplementary Materials: Cross-Sectional Associations of Smoking and E-cigarette Use with Self-Reported Diagnosed Hypertension: Findings from Wave 3 of the Population Assessment of Tobacco and Health Study

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**Supplemental Figure S1.** Flow diagram describing the analytic sample and detailing the study’s case definition for hypertension.

HTN=Hypertension; W=Wave.



**Supplemental Figure S2.** Multivariable odds for hypertension among PATH Wave 3 respondents aged 18-54 years **including users of ‘other’ tobacco users**, modeling smoking and vaping as a composite variable.

Note: all results come from weighted logistic regression models controlling for age, race-ethnicity, sex, annual household income, education, leisure time physical activity, BMI, heavy alcohol use, insurance status, marital status, hypercholesterolemia, diabetes mellitus, current-established 'other' combusted tobacco use, and current-established 'other' smokeless tobacco use. aOR=adjusted odds ratio; CI=confidence interval.

**Table S1.** Descriptive statistics of the analytic sample, according to a composite variable accounting for current vaping status, current smoking status, and former smoking status.

|                                      | Never Smoker<br>(n=8783) |                  | Current Exclusive<br>Vaper:<br>Never Smoker<br>(n=183) |                  | Current Exclusive<br>Vaper:<br>Former Smoker<br>(n=334) |                  | Former Smoker<br>(n=3938) |                  | Current Exclusive<br>Smoker<br>(n=5056) |                  | Current Dual User<br>(n=581) |                  |
|--------------------------------------|--------------------------|------------------|--|------------------|---|------------------|---------------------------|------------------|---|------------------|------------------------------|------------------|
|                                      | n                        | % (95% CI)       | n  | % (95% CI)       | n   | % (95% CI)       | n                         | % (95% CI)       | n                                       | % (95% CI)       | n                            | % (95% CI)       |
| <b>Hypertension</b>                  |                          |                  |  |                  |   |                  |                           |                  |   |                  |                              |                  |
| No                                   | 7954                     | 86.4 (85.2-87.4) | 171  | 92.4 (85.9-96.1) | 270   | 77.5 (70.8-83.0) | 3232                      | 79.1 (77.2-80.9) | 3941                                    | 77.6 (76.1-79.1) | 454                          | 76.2 (72.4-79.6) |
| Yes                                  | 823                      | 13.6 (12.6-14.8) | 10   | 7.6 (3.9-14.1)   | 64  | 22.5 (17.0-29.2) | 702                       | 20.9 (19.1-22.8) | 1106                                    | 22.4 (20.9-23.9) | 127                          | 23.8 (20.4-27.6) |
| <b>Age</b>                           |                          |                  |  |                  |   |                  |                           |                  |   |                  |                              |                  |
| 18-24 years                          | 4860                     | 24.9 (24.0-25.8) | 156  | 78.7 (69.6-85.7) | 71  | 15.0 (11.6-19.3) | 907                       | 9.2 (8.3-10.1)   | 918                                     | 11.9 (10.9-12.9) | 161                          | 18.7 (15.6-22.3) |
| 25-34 years                          | 1988                     | 28.5 (27.0-30.1) | 21   | 14.6 (9.1-22.6)  | 99  | 33.7 (28.0-39.8) | 1117                      | 22.4 (21.0-23.9) | 1552                                    | 30.5 (28.8-32.3) | 161                          | 30.1 (26.3-34.3) |
| 35-44 years                          | 1044                     | 23.5 (22.0-25.0) | 4  | 4.3 (1.5-11.3)   | 92  | 26.9 (22.4-32.0) | 972                       | 30.4 (28.4-32.6) | 1263                                    | 28.2 (26.6-29.9) | 143                          | 28.5 (24.6-32.7) |
| 45-54 years                          | 891                      | 23.1 (21.8-24.5) | 2  | 2.4 (0.6-8.6)    | 72  | 24.4 (19.2-30.5) | 942                       | 38.0 (35.8-40.2) | 1323                                    | 29.4 (27.9-30.9) | 116                          | 22.7 (19.1-26.6) |
| <b>Sex</b>                           |                          |                  |  |                  |   |                  |                           |                  |   |                  |                              |                  |
| Female                               | 4919                     | 56.3 (55.0-57.5) | 76   | 40.4 (32.0-49.5) | 152   | 40.7 (34.0-47.7) | 2131                      | 52.7 (50.9-54.5) | 2767                                    | 49.9 (48.3-51.4) | 310                          | 48.5 (44.4-52.7) |
| Male                                 | 3852                     | 43.7 (42.5-45.0) | 107  | 59.6 (50.5-68.0) | 182   | 59.3 (52.3-66.0) | 1805                      | 47.3 (45.5-49.1) | 2287                                    | 50.1 (48.6-51.7) | 271                          | 51.5 (47.3-55.6) |
| <b>Race-ethnicity</b>                |                          |                  |  |                  |   |                  |                           |                  |   |                  |                              |                  |
| Non-Hispanic<br>White                | 4143                     | 53.7 (52.3-55.1) | 99   | 55.5 (46.6-64.1) | 252   | 77.8 (72.4-82.4) | 2209                      | 64.5 (62.7-66.3) | 3193                                    | 67.5 (65.7-69.2) | 433                          | 79.6 (75.3-83.4) |
| Non-Hispanic<br>Black                | 1410                     | 12.8 (12.0-13.6) | 13   | 9.0 (4.8-16.1)   | 18  | 5.1 (3.0-8.7)    | 475                       | 9.1 (8.1-10.1)   | 674                                     | 12.5 (11.4-13.8) | 26                           | 4.6 (3.0-6.9)    |
| Hispanic                             | 2363                     | 22.3 (21.4-23.3) | 56   | 26.9 (19.7-35.6) | 36  | 9.8 (7.0-13.5)   | 903                       | 19.0 (17.6-20.4) | 746                                     | 14.1 (13.0-15.2) | 69                           | 9.0 (6.6-12.0)   |
| Non-Hispanic<br>Other                | 785                      | 11.2 (10.2-12.2) | 14   | 8.6 (4.3-16.4)   | 28  | 7.3 (4.7-11.2)   | 310                       | 7.5 (6.4-8.7)    | 364                                     | 5.9 (5.2-6.8)    | 52                           | 6.8 (4.7-9.8)    |
| <b>Annual house-<br/>hold income</b> |                          |                  |  |                  |   |                  |                           |                  |   |                  |                              |                  |
| ≥ \$50000                            | 3376                     | 50.2 (48.6-51.7) | 47   | 31.6 (23.8-40.7) | 136   | 45.9 (40.0-51.9) | 1779                      | 59.5 (57.2-61.7) | 1232                                    | 29.4 (27.5-31.3) | 156                          | 33.0 (28.4-37.8) |
| < \$50000                            | 4665                     | 49.8 (48.3-51.4) | 116  | 68.4 (59.3-76.2) | 182   | 54.1 (48.1-60.0) | 1937                      | 40.5 (38.3-42.8) | 3588                                    | 70.6 (68.7-72.5) | 390                          | 67.0 (62.2-71.6) |
| <b>Education status</b>              |                          |                  |  |                  |   |                  |                           |                  |   |                  |                              |                  |
| Bachelors & be-<br>yond              | 2200                     | 36.2 (35.0-37.3) | 14   | 10.5 (5.9-18.1)  | 52  | 15.9 (11.8-21.1) | 1221                      | 35.9 (34.1-37.8) | 502                                     | 11.6 (10.3-13.0) | 67                           | 14.4 (10.8-19.0) |
| Some college                         | 3034                     | 31.4 (30.2-32.6) | 64   | 37.5 (29.4-46.4) | 168   | 51.0 (45.3-56.8) | 1449                      | 33.8 (31.8-35.8) | 1752                                    | 34.4 (32.7-36.1) | 263                          | 43.9 (39.2-48.8) |
| High school or<br>less               | 3511                     | 32.5 (31.3-33.7) | 105  | 52.0 (42.8-61.0) | 113   | 33.0 (26.8-40.0) | 1258                      | 30.3 (28.4-32.2) | 2780                                    | 54.0 (52.2-55.8) | 244                          | 41.6 (36.6-46.8) |

|                                       |      |                  |     |                  |     |                  |      |                  |      |                  |     |                  |
|---------------------------------------|------|------------------|-----|------------------|-----|------------------|------|------------------|------|------------------|-----|------------------|
| <b>Leisure-time physical activity</b> |      |                  |     |                  |     |                  |      |                  |      |                  |     |                  |
| ≥ 4 days/week                         | 3634 | 38.6 (37.1-40.3) | 82  | 44.4 (36.4-52.8) | 125 | 39.1 (33.0-45.5) | 1530 | 36.7 (34.5-39.1) | 1920 | 38.4 (36.8-40.1) | 230 | 37.8 (33.4-42.4) |
| 1-3 days/week                         | 4057 | 48.3 (46.8-49.8) | 84  | 48.4 (40.0-56.8) | 143 | 41.1 (35.7-46.7) | 1800 | 48.3 (46.1-50.5) | 1998 | 39.3 (37.8-40.8) | 230 | 41.6 (36.7-46.6) |
| 0 days/week                           | 1067 | 13.1 (11.9-14.3) | 17  | 7.2 (4.3-11.9)   | 66  | 19.8 (15.3-25.2) | 593  | 15.0 (13.6-16.4) | 1118 | 22.3 (21.1-23.6) | 116 | 20.6 (16.7-25.1) |
| <b>Body mass index</b>                |      |                  |     |                  |     |                  |      |                  |      |                  |     |                  |
| < 18.5 kg/m <sup>2</sup>              | 300  | 2.6 (2.2-3.0)    | 4   | 1.6 (0.6-4.8)    | 13  | 3.5 (1.9-6.3)    | 60   | 1.3 (0.9-1.8)    | 131  | 2.4 (2.0-3.0)    | 15  | 2.3 (1.3-4.1)    |
| 18.5-24.9 kg/m <sup>2</sup>           | 3555 | 35.2 (33.7-36.7) | 85  | 45.9 (37.4-54.7) | 105 | 30.4 (24.8-36.6) | 1234 | 30.0 (28.1-32.0) | 1665 | 32.9 (31.5-34.4) | 218 | 35.5 (31.1-40.2) |
| 25.0-29.9 kg/m <sup>2</sup>           | 2412 | 31.6 (30.1-33.2) | 52  | 29.9 (23.7-37.0) | 84  | 24.6 (19.7-30.3) | 1217 | 33.5 (31.4-35.6) | 1497 | 32.2 (30.7-33.7) | 136 | 26.1 (21.9-30.8) |
| ≥ 30 kg/m <sup>2</sup>                | 2263 | 30.7 (29.1-32.3) | 38  | 22.5 (15.8-31.0) | 128 | 41.6 (34.7-48.8) | 1320 | 35.2 (33.0-37.5) | 1617 | 32.5 (30.9-34.1) | 201 | 36.1 (32.1-40.3) |
| <b>Heavy alcohol use</b>              |      |                  |     |                  |     |                  |      |                  |      |                  |     |                  |
| No                                    | 8471 | 97.5 (97.1-97.9) | 158 | 80.6 (71.9-87.1) | 312 | 93.5 (90.1-95.8) | 3746 | 95.9 (95.0-96.6) | 4455 | 88.5 (87.3-89.6) | 518 | 91.7 (89.1-93.7) |
| Yes                                   | 282  | 2.5 (2.1-2.9)    | 23  | 19.4 (12.9-28.1) | 21  | 6.5 (4.2-9.9)    | 177  | 4.1 (3.4-5.0)    | 544  | 11.5 (10.4-12.7) | 54  | 8.3 (6.3-10.9)   |
| <b>Insurance status</b>               |      |                  |     |                  |     |                  |      |                  |      |                  |     |                  |
| Insured                               | 7296 | 86.3 (85.2-87.3) | 147 | 82.8 (75.5-88.3) | 276 | 83.6 (77.6-88.2) | 3325 | 89.7 (88.4-90.9) | 3786 | 75.1 (73.4-76.8) | 465 | 82.8 (79.3-85.7) |
| Uninsured                             | 1378 | 13.7 (12.7-14.8) | 32  | 17.2 (11.7-24.5) | 56  | 16.4 (11.8-22.4) | 584  | 10.3 (9.1-11.6)  | 1228 | 24.9 (23.2-26.6) | 110 | 17.2 (14.3-20.7) |
| <b>Marital status</b>                 |      |                  |     |                  |     |                  |      |                  |      |                  |     |                  |
| Married                               | 2477 | 49.9 (48.2-51.6) | 19  | 10.6 (6.7-16.5)  | 142 | 43.0 (36.8-49.4) | 1869 | 62.4 (60.6-64.3) | 1638 | 35.6 (33.6-37.6) | 185 | 35.3 (30.6-40.2) |
| Widowed divorced or separated         | 518  | 9.5 (8.6-10.6)   | 8   | 6.6 (3.1-13.5)   | 53  | 17.9 (13.8-22.8) | 490  | 12.9 (11.8-14.2) | 1171 | 24.9 (23.3-26.5) | 115 | 22.5 (18.7-26.8) |
| Never married                         | 5712 | 40.5 (39.0-42.1) | 156 | 82.7 (74.9-88.5) | 136 | 39.1 (32.4-46.3) | 1520 | 24.6 (23.1-26.2) | 2173 | 39.6 (37.7-41.5) | 272 | 42.3 (37.7-47.0) |
| <b>Hyperlipidemia</b>                 |      |                  |     |                  |     |                  |      |                  |      |                  |     |                  |
| No                                    | 8061 | 86.8 (85.5-87.9) | 181 | 99.1 (96.5-99.8) | 273 | 81.7 (76.7-85.8) | 3341 | 79.6 (77.7-81.3) | 4265 | 83.0 (81.8-84.1) | 491 | 84.3 (80.8-87.2) |
| Yes                                   | 721  | 13.2 (12.1-14.5) | 2   | 0.9 (0.2-3.5)    | 60  | 18.3 (14.2-23.3) | 597  | 20.4 (18.7-22.3) | 790  | 17.0 (15.9-18.2) | 90  | 15.7 (12.8-19.2) |
| <b>Diabetes mellitus</b>              |      |                  |     |                  |     |                  |      |                  |      |                  |     |                  |
| No                                    | 8346 | 92.4 (91.3-93.3) | 174 | 95.8 (91.2-98.1) | 301 | 89.2 (83.5-93.1) | 3599 | 90.0 (88.5-91.4) | 4579 | 90.9 (90.0-91.7) | 528 | 91.1 (88.3-93.3) |
| Yes                                   | 433  | 7.6 (6.7-8.7)    | 8   | 4.2 (1.9-8.8)    | 32  | 10.8 (6.9-16.5)  | 335  | 10.0 (8.6-11.5)  | 463  | 9.1 (8.3-10.0)   | 51  | 8.9 (6.7-11.7)   |

Reported statistics (other than frequencies) represent weighted values according to PATH Study specifications.

Due to some missing data points, subgroup frequencies do not all add up to the full analytic sample (n=19,147). Details provided in supplement file.

CI=confidence interval.

Table S2. Missing data in the analytic sample.

| Variable                            | Analytic Sample | n Missing | Unweighted %<br>of Analytic<br>Sample Missing |
|-------------------------------------|-----------------|-----------|---|
| <b>Exposure(s)</b>                  |                 |           |   |
| Vaping (2 cat. separate)            | 19,147          | 34        | 0.2%  |
| Smoking (2 cat. separate)           | 19,147          | 12        | 0.1%  |
| Vaping & smoking (6 cat. composite) | 19,147          | 272       | 1.4%  |
| <b>Outcome</b>                      |                 |           |   |
| Hypertension                        | 19,147          | 21        | 0.1%  |
| <b>Covariates</b>                   |                 |           |   |
| Age                                 | 19,147          | 0         | 0.0%  |
| Sex                                 | 19,147          | 16        | 0.1%  |
| Race-ethnicity                      | 19,147          | 209       | 1.1%  |
| Annual household income             | 19,147          | 1309      | 6.8%  |
| Education status                    | 19,147          | 84        | 0.4%  |
| Leisure-time physical activity      | 19,147          | 67        | 0.3%  |
| Body mass index                     | 19,147          | 539       | 2.8%  |
| Heavy alcohol use                   | 19,147          | 116       | 0.6%  |
| Insurance status                    | 19,147          | 200       | 1.0%  |
| Marital status                      | 19,147          | 226       | 1.2%  |
| Hypercholesterolemia                | 19,147          | 3         | 0.0%  |
| Diabetes mellitus                   | 19,147          | 27        | 0.1%  |

**Table S3.** Respondents excluded from regression analyses due to missing data points during primary analyses of the analytic sample.

| Regression Model                    | Analytic Sample | n Used in Model | Case-Wise De-letions | Unweighted % of Analytic Sample Excluded |
|-------------------------------------|-----------------|-----------------|----------------------|--|
| Vaping & smoking (2 cat. separate)  | 19,147          | 16,879          | 2268                 | 11.8%                                    |
| Vaping & smoking (6 cat. composite) | 19,147          | 16,699          | 2448                 | 12.8%                                    |

**Table S4.** Prevalence of hypertension and multivariable odds for hypertension among Wave 3 PATH respondents, stratified by age.

| Tobacco Use                   | n    | HTN Cases, n (%) | aOR (95% CI)            |
|-------------------------------|------|------------------|-------------------------|
| <b>18-34 years (n=13,677)</b> |      |                  |                         |
| <b>Smoking</b>                |      |                  |                         |
| Never-established smoker      | 5467 | 262 (6.9)        | 1.00 (ref)              |
| Former-established smoker     | 3889 | 331 (9.3)        | <b>1.38 (1.06-1.81)</b> |
| Current-established smoker    | 4321 | 511 (12.0)       | <b>1.51 (1.18-1.93)</b> |
| <b>Vaping</b>                 |      |                  |                         |
| Never-established vaper       | 9541 | 670 (8.1)        | 1.00 (ref)              |
| Former-established vaper      | 3116 | 313 (10.9)       | 1.26 (0.99-1.61)        |
| Current-established vaper     | 1020 | 121 (12.7)       | 1.25 (0.94-1.66)        |
| <b>35-54 years (n=7,525)</b>  |      |                  |                         |
| <b>Smoking</b>                |      |                  |                         |
| Never-established smoker      | 1609 | 380 (20.5)       | 1.00 (ref)              |
| Former-established smoker     | 2581 | 740 (27.1)       | <b>1.33 (1.06-1.66)</b> |
| Current-established smoker    | 3335 | 1113 (31.8)      | <b>1.31 (1.07-1.60)</b> |
| <b>Vaping</b>                 |      |                  |                         |
| Never-established vaper       | 5505 | 1565 (24.6)      | 1.00 (ref)              |
| Former-established vaper      | 1513 | 502 (31.6)       | 1.12 (0.84-1.48)        |
| Current-established vaper     | 507  | 166 (34.0)       | 1.18 (0.86-1.62)        |
| <b>55+ years (n=5,857)</b>    |      |                  |                         |
| <b>Smoking</b>                |      |                  |                         |
| Never-established smoker      | 1209 | 662 (54.6)       | 1.00 (ref)              |
| Former-established smoker     | 2489 | 1437 (57.6)      | 1.02 (0.83-1.25)        |
| Current-established smoker    | 2159 | 1202 (55.1)      | 0.94 (0.76-1.15)        |
| <b>Vaping</b>                 |      |                  |                         |
| Never-established vaper       | 4823 | 2729 (56.2)      | 1.00 (ref)              |
| Former-established vaper      | 813  | 462 (57.7)       | 0.91 (0.65-1.28)        |
| Current-established vaper     | 221  | 110 (48.1)       | <b>0.66 (0.49-0.88)</b> |

In addition to separate smoking and vaping status variables, models were adjusted for age, race-ethnicity, sex, annual household income, education, leisure time physical activity, BMI, heavy alcohol use, insurance status, marital status, hypercholesterolemia, diabetes mellitus, current-established 'other' combusted tobacco use, and current-established 'other' smokeless tobacco use. Data presented for 27,059 Wave 3 PATH respondents with available data for age, current and former smoker, and current smoking status, former smoking status, current vaping status and former vaping status (n missing / excluded = 1,089). HTN=hypertension, aOR=adjusted odds ratio, CI=confidence interval.

**Table S5.** Prevalence of annual doctor visits during the past three years among the analytic sample, stratified by tobacco use.

|                                       | Overall | Visited Doctor in P12M: Yes |                  | Rao-Scott<br>$\chi^2$ p value |
|---------------------------------------|---------|-----------------------------|------------------|-------------------------------|
|                                       | n       | n                           | % (95%CI)        |                               |
| <b>Response at Wave 1 (n=15,906*)</b> |         |                             |                  |                               |
| Never smoker                          | 7435    | 5769                        | 77.7 (76.4-79.0) | <0.001                        |
| Exclusive vaper (never smoker)        | 81      | 61                          | 76.3 (65.9-84.2) |                               |
| Exclusive vaper (former smoker)       | 318     | 230                         | 70.2 (63.7-76.0) |                               |
| Former smoker                         | 2489    | 1926                        | 79.0 (76.8-81.1) |                               |
| Exclusive smoker                      | 4883    | 3424                        | 68.7 (66.9-70.3) |                               |
| Dual user                             | 534     | 409                         | 75.1 (69.8-79.7) |                               |
| <b>Response at Wave 2 (n=16,829†)</b> |         |                             |                  |                               |
| Never smoker                          | 8577    | 5759                        | 68.7 (67.2-70.1) | <0.001                        |
| Exclusive vaper (never smoker)        | 123     | 81                          | 62.3 (52.7-71.0) |                               |
| Exclusive vaper (former smoker)       | 316     | 205                         | 61.7 (54.7-68.2) |                               |
| Former smoker                         | 2436    | 1696                        | 72.6 (70.0-75.1) |                               |
| Exclusive smoker                      | 4797    | 2914                        | 59.5 (57.8-61.3) |                               |
| Dual user                             | 539     | 364                         | 69.1 (64.9-72.9) |                               |
| <b>Response at Wave 3 (n=19,147)</b>  |         |                             |                  |                               |
| Never smoker                          | 10,164  | 7101                        | 72.3 (70.9-73.6) | <0.001                        |
| Exclusive vaper (never smoker)        | 183     | 122                         | 63.1 (53.6-71.7) |                               |
| Exclusive vaper (former smoker)       | 334     | 225                         | 66.9 (61.0-72.2) |                               |
| Former smoker                         | 2,557   | 1849                        | 76.2 (74.2-78.0) |                               |
| Exclusive smoker                      | 5,056   | 3145                        | 61.5 (59.7-63.3) |                               |
| Dual user                             | 581     | 404                         | 70.0 (65.3-74.3) |                               |

Reported statistics (other than frequencies) represent weighted values according to PATH Study Wave 3 specifications.

\*excluding n=3241 respondents who were in the youth cohort during Wave 1 of the PATH Study (youth were not asked about annual doctor visits).

†excluding n=2318 respondents who were in the youth cohort during Wave 2 of the PATH Study (youth were not asked about annual doctor visits).

P12M=Past 12 months.