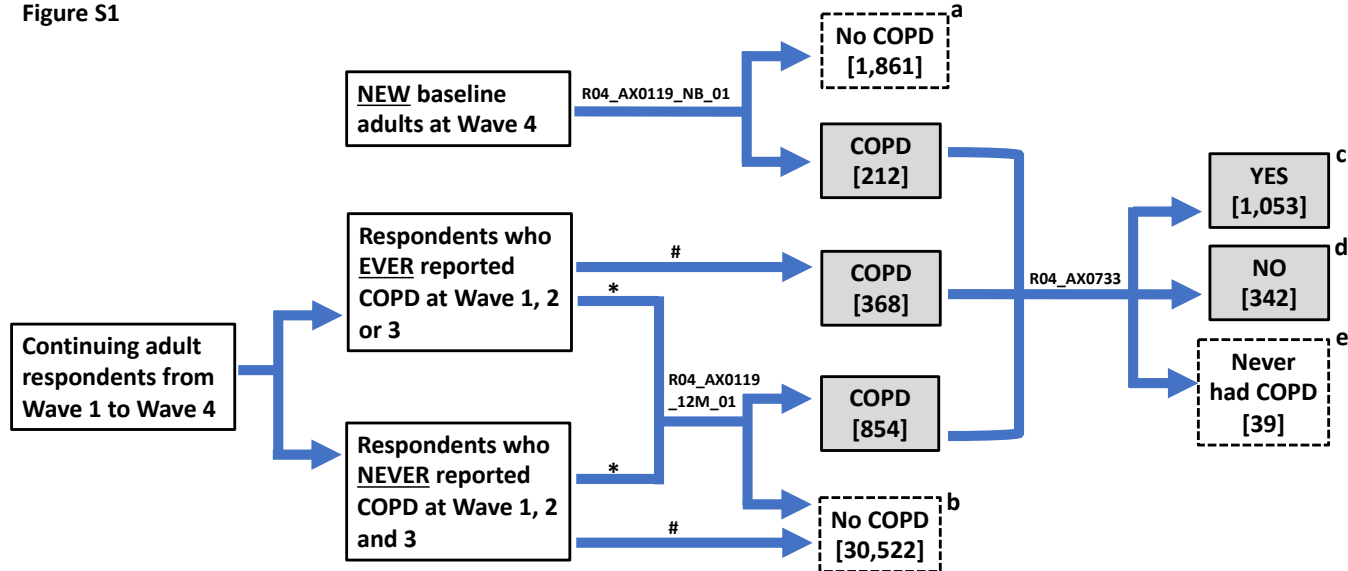


## Supplementary Figure S1 & Tables S1-S7

COPD definition:

Figure S1



Notes:

1. COPD = Chronic Obstructive Pulmonary Disease;
2. Self-reported COPD prevalent cases : non-COPD cases = (c + d) : (a + b + e);
3. \* Respondents who have seen a medical doctor, nurse or other health professional in the past 12 months;
4. # Respondents who NEVER see a medical doctor, nurse or other health professional in the past 12 months.

Figure S1: Flowchart of the process for classifying COPD cases

**Figure S1 notes (cont'd):**

**R04\_AX0119\_12M\_01**

In past 12 months, doctor, nurse or other health professional said you had: COPD?

ASK: Continuing adult respondents who have seen a medical doctor, nurse or other health professional in the past 12 months.

Values: 1 = Yes; 2 = No; Missing data.

**R03\_AX0111\_NB\_01**

Doctor, nurse or other health professional said you had: COPD?

ASK: New baseline adult respondents.

Values: 1 = Yes; 2 = No; Missing data.

**R04\_AX0733:**

Troubled by shortness of breath when hurrying on level ground or walking up a slight hill due to COPD.

ASK: Adult respondents who reported being diagnosed with COPD as of their last completed interview, or new baseline adult respondents who have ever been told they had COPD, or continuing adult respondents who have been told they had COPD in the past 12 months.

Values: 1 = Yes; 2 = No; 3 = I have never had COPD; Missing data.

**Table S1. Pearson correlation coefficients matrix of five flavor categories**

|  | <b>Tobacco</b> | <b>Menthol/<br/>mint</b> | <b>Fruit</b> | <b>Candy/<br/>desserts/<br/>sweets</b> | <b>Others</b> |
|--|----------------|--------------------------|--------------|--|---------------|
| <b>Tobacco</b>                         | 1.00           |                          |              |  |               |
| <b>Menthol/<br/>mint</b>               | 0.11           | 1.00                     |              |  |               |
| <b>Fruit</b>                           | 0.34           | 0.21                     | 1.00         |  |               |
| <b>Candy/<br/>desserts/<br/>sweets</b> | 0.21           | 0.16                     | 0.02         | 1.00                                   |               |
| <b>Others</b>                          | 0.08           | 0.04                     | 0.03         | -0.11                                  | 1.00          |

**Table S2. Characteristics of PATH wave 4 adult ever established ENDS users across flavors (weighted % with 95%CI)**

| Variables             | ENDS flavors use     |                                 |                      |  |                      |
|-----------------------|----------------------|---------------------------------|----------------------|--|----------------------|
|                       | Tobacco<br>(n = 588) | Menthol or<br>Mint<br>(n = 672) | Fruit<br>(n = 1,568) | Candy, desserts,<br>or Sweets<br>(n = 1,047) | Others<br>(n = 464)  |
| <b>COPD</b>           |                      |                                 |                      |  |                      |
| Yes                   | 19.9<br>(17.2, 23.1) | 8.9<br>(7.3, 10.8)              | 5.3<br>(4.3, 6.5)    | 5.1<br>(4.2, 6.3)                            | 10.3<br>(7.0, 15.2)  |
| No                    | 80.1<br>(79.7, 80.5) | 91.1<br>(90.7, 91.5)            | 94.7<br>(94.7, 94.7) | 94.9<br>(94.6, 95.2)                         | 89.7<br>(89.0, 90.4) |
| <b>Smoking status</b> |                      |                                 |                      |  |                      |
| Current smoker        | 67.1<br>(65.7, 68.5) | 57.8<br>(56.2, 59.5)            | 51.8<br>(50.5, 53.1) | 57.3<br>(56.1, 58.5)                         | 58.4<br>(56.7, 60.2) |
| Former smoker         | 28.2<br>(25.6, 31.1) | 26.0<br>(23.4, 29.0)            | 27.8<br>(25.1, 30.7) | 25.5<br>(23.3, 28.0)                         | 22.3<br>(19.4, 25.7) |
| Non-smoker            | 4.7<br>(3.1, 7.2)    | 16.1<br>(13.9, 18.8)            | 20.4<br>(19.3, 21.7) | 17.2<br>(15.3, 19.3)                         | 19.2<br>(16.8, 22.0) |
| <b>Age (years)</b>    |                      |                                 |                      |  |                      |
| 18-44                 | 47.2<br>(45.3, 49.1) | 70.4<br>(69.0, 71.8)            | 81.5<br>(81.3, 81.8) | 85.8<br>(84.9, 86.7)                         | 75.2<br>(74.8, 75.6) |
| 45-64                 | 41.3<br>(38.6, 44.2) | 24.3<br>(21.4, 27.7)            | 16.2<br>(14.3, 18.4) | 13.2<br>(11.5, 15.1)                         | 20.4<br>(17.3, 24.1) |
| 65+                   | 11.5<br>(8.8, 15.1)  | 5.3<br>(3.2, 8.9)               | 2.3<br>(1.5, 3.4)    | 1.0<br>(0.5, 2.1)                            | 4.4<br>(2.8, 6.9)    |
| <b>Sex</b>            |                      |                                 |                      |  |                      |
| Male                  | 55.6<br>(53.2, 58.1) | 51.5<br>(48.8, 54.5)            | 56.6<br>(55.8, 57.5) | 59.79<br>(58.37, 61.25)                      | 55.8<br>(52.2, 59.6) |

|                       |                       |                      |                      |                      |                      |
|-----------------------|-----------------------|----------------------|----------------------|----------------------|----------------------|
| Female                | 44.4<br>(42.4, 46.5)  | 48.5<br>(46.4, 50.6) | 43.4<br>(41.7, 45.1) | 40.2<br>(38.7, 41.8) | 44.2<br>(42.9, 45.5) |
| Race/Ethnicity        |                       |                      |                      |                      |                      |
| Non-Hispanic white    | 83.4<br>(82.2, 84.7)  | 62.8<br>(61.5, 64.2) | 70.3<br>(69.0, 71.6) | 75.4<br>(74.4, 76.4) | 71.4<br>(69.6, 73.3) |
| Non-Hispanic black    | 6.0<br>(4.3, 8.5)     | 13.2<br>(10.6, 16.3) | 8.8<br>(7.5, 10.3)   | 5.3<br>(4.2, 6.6)    | 7.4<br>(5.4, 10.2)   |
| Hispanic              | 5.8<br>(4.6, 7.3)     | 16.2<br>(13.6, 19.3) | 13.5<br>(12.0, 15.2) | 10.4<br>(9.0, 12.0)  | 11.6<br>(9.7, 13.9)  |
| Others                | 4.7<br>(3.7, 6.1)     | 7.9<br>(5.7, 10.9)   | 7.5<br>(6.3, 8.9)    | 9.0<br>(7.1, 11.2)   | 9.6<br>(7.6, 12.1)   |
| Asthma                |                       |                      |                      |                      |                      |
| Yes                   | 16.4<br>(13.8, 19.5)  | 15.1<br>(13.0, 17.6) | 15.2<br>(13.9, 16.6) | 16.8<br>(15.2, 18.6) | 22.5<br>(19.9, 25.1) |
| No                    | 83.6<br>(83.1, 84.1)  | 84.9<br>(83.8, 86.0) | 84.8<br>(84.3, 85.3) | 83.2<br>(82.6, 83.9) | 77.5<br>(76.8, 78.3) |
| Marijuana use in ENDS |                       |                      |                      |                      |                      |
| Never                 | 77.4<br>(76.3, 78.6)  | 73.8<br>(72.4, 75.1) | 67.1<br>(66.0, 68.1) | 63.7<br>(62.6, 64.9) | 67.0<br>(64.2, 69.9) |
| Rarely                | 10.2<br>(8.44, 12.23) | 12.4<br>(10.7, 14.5) | 14.9<br>(13.6, 16.4) | 17.2<br>(15.6, 18.8) | 14.1<br>(12.1, 16.4) |
| Sometimes             | 7.1<br>(5.6, 9.1)     | 8.2<br>(6.4, 10.5)   | 11.2<br>(9.6, 13.0)  | 12.8<br>(10.8, 15.2) | 11.3<br>(8.9, 14.2)  |
| Most of the time      | 3.0<br>(2.0, 4.4)     | 3.1<br>(2.1, 4.5)    | 4.0<br>(3.3, 4.9)    | 4.4<br>(2.9, 6.6)    | 4.6<br>(3.4, 6.4)    |
| Every time            | 2.4<br>(1.5, 3.7)     | 2.6<br>(1.5, 4.2)    | 2.9<br>(2.2, 3.8)    | 2.0<br>(1.4, 2.9)    | 3.1<br>(1.8, 5.3)    |
| Income                |                       |                      |                      |                      |                      |
| Less than \$10 000    | 19.2                  | 22.6                 | 14.8                 | 13.7                 | 20.6                 |

|                      |              |              |              |              |              |
|----------------------|--------------|--------------|--------------|--------------|--------------|
|                      | (16.3, 22.6) | (19.7, 26.1) | (13.4, 16.4) | (12.0, 15.6) | (17.1, 24.9) |
| \$10 000 to \$24 999 | 23.3         | 22.0         | 24.1         | 26.1         | 24.3         |
|                      | (21.4, 25.5) | (19.8, 24.4) | (22.5, 25.7) | (24.8, 27.5) | (22.3, 26.5) |
| \$25 000 to \$49 999 | 25.3         | 24.8         | 24.3         | 24.1         | 24.7         |
|                      | (22.8, 28.1) | (21.8, 28.2) | (22.6, 26.1) | (22.1, 26.4) | (22.7, 26.9) |
| \$50 000 to \$99 999 | 21.2         | 18.4         | 22.9         | 23.8         | 17.6         |
|                      | (18.8, 23.8) | (16.5, 20.6) | (21.1, 24.9) | (21.6, 26.3) | (14.8, 20.8) |
| \$100 000 or more    | 11.1         | 12.1         | 13.9         | 12.3         | 12.8         |
|                      | (8.9, 13.9)  | (9.8, 15.0)  | (12.4, 15.6) | (10.4, 14.6) | (10.7, 15.3) |

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COPD, Chronic Obstructive Pulmonary Disease; PATH, Population Assessment of Tobacco and Health study.

**Table S3. Characteristics of PATH wave 4 adult ever established ENDS users across COPD stratified by smoking status (weighted % with 95%CI)**

| Variables                            | Non-smoker<br>(n = 842) |                       | P<br>value | Former smoker<br>(n = 1215) |                         | P<br>value | Current smoker<br>(n = 2772) |                         | P<br>value |
|--------------------------------------|-------------------------|-----------------------|------------|-----------------------------|-------------------------|------------|------------------------------|-------------------------|------------|
|                                      | COPD<br>(n = 23)        | Non-COPD<br>(n = 819) |            | COPD<br>(n = 92)            | Non-COPD<br>(n = 1,123) |            | COPD<br>(n = 300)            | Non-COPD<br>(n = 2,472) |            |
| Tobacco flavor use                   |                         |                       | 0.31       |                             |                         | 0.01       |                              |                         | <.000<br>1 |
| Yes                                  | 29.8<br>(18.8, 47.5)    | 5.7<br>(3.4, 9.5)     |            | 43.8<br>(36.9, 52.1)        | 18.8<br>(16.4, 21.6)    |            | 47.3<br>(42.1, 53.2)         | 21.8<br>(20.0, 23.2)    |            |
| No                                   | 70.2<br>(61.6, 80.0)    | 94.3<br>(92.7, 95.9)  |            | 56.2<br>(50.4, 62.7)        | 81.2<br>(79.5, 83.1)    |            | 52.7<br>(51.1, 54.3)         | 78.2<br>(76.8, 79.7)    |            |
| Menthol or mint flavor use           |                         |                       | 0.60       |                             |                         | 0.69       |                              |                         | 0.69       |
| Yes                                  | 17.0<br>(12.6, 23.2)    | 23.1<br>(20.0, 26.9)  |            | 22.6<br>(16.2, 31.7)        | 19.8<br>(16.8, 23.4)    |            | 21.3<br>(18.4, 24.5)         | 22.3<br>(20.6, 24.1)    |            |
| No                                   | 83.0<br>(72.4, 95.0)    | 77.0<br>(74.7, 79.9)  |            | 77.4<br>(73.2, 81.8)        | 80.2<br>(78.3, 82.2)    |            | 78.8<br>(76.2, 81.4)         | 77.7<br>(76.9, 78.7)    |            |
| Fruit flavor use                     |                         |                       | 0.68       |                             |                         | 0.01       |                              |                         | 0.01       |
| Yes                                  | 67.1<br>(55.5, 81.0)    | 59.6<br>(56.8, 63.0)  |            | 23.6<br>(18.0, 31.0)        | 46.1<br>(41.7, 50.9)    |            | 24.6<br>(21.8, 27.7)         | 43.1<br>(40.7, 45.7)    |            |
| No                                   | 32.9<br>(22.4, 48.5)    | 40.4<br>(37.2, 44.4)  |            | 76.4<br>(67.9, 85.6)        | 53.9<br>(49.7, 58.2)    |            | 75.4<br>(72.6, 78.4)         | 56.9<br>(54.9, 59.0)    |            |
| Candy, desserts or sweets flavor use |                         |                       | 0.76       |                             |                         | 0.03       |                              |                         | 0.03       |
| Yes                                  | 40.3<br>(22.4, 72.1)    | 34.3<br>(31.0, 38.3)  |            | 15.8<br>(11.0, 22.6)        | 28.9<br>(25.4, 32.9)    |            | 15.1<br>(12.9, 18.9)         | 33.0<br>(30.7, 35.4)    |            |
| No                                   | 59.7<br>(58.8, 61.0)    | 65.7<br>(62.7, 69.4)  |            | 84.2<br>(81.6, 87.0)        | 71.1<br>(67.9, 74.3)    |            | 84.4<br>(82.3, 86.5)         | 67.0<br>(65.3, 68.8)    |            |

|                    |                      |                      |      |                      |                      |            |                      |                      |
|--------------------|----------------------|----------------------|------|----------------------|----------------------|------------|----------------------|----------------------|
| Other flavors use  |                      |                      | 0.17 |                      |                      | 0.61       |                      | 0.61                 |
| Yes                | 7.3<br>(3.4, 16.0)   | 17.4<br>(14.2, 21.4) |      | 8.9<br>(4.6, 17.6)   | 10.9<br>(8.8, 13.6)  |            | 18.8<br>(12.8, 27.4) | 13.4<br>(12.0, 15.0) |
| No                 | 92.7<br>(89.2, 96.2) | 82.6<br>(80.3, 85.4) |      | 91.1<br>(89.8, 92.5) | 89.1<br>(87.4, 90.6) |            | 81.3<br>(82.0, 80.6) | 86.6<br>(86.1, 87.1) |
| Age (years)        |                      |                      | 0.08 |                      |                      | <.000<br>1 |                      | <.000<br>1           |
| 18-44              | 35.4<br>(33.6, 37.4) | 94.0<br>(92.5, 95.4) |      | 13.1<br>(8.0, 21.3)  | 68.9<br>(66.4, 71.3) |            | 22.1<br>(19.4, 25.1) | 75.0<br>(73.6, 76.4) |
| 45-64              | 64.6<br>(50.7, 82.1) | 5.4<br>(3.29, 8.74)  |      | 48.2<br>(46.0, 50.2) | 25.2<br>(22.6, 28.0) |            | 63.9<br>(61.0, 66.8) | 22.4<br>(20.3, 24.6) |
| 65+                | n/a                  | 0.6<br>(0.23, 1.69)  |      | 38.8<br>(31.9, 46.9) | 6.0<br>(4.2, 8.4)    |            | 14.1<br>(11.4, 17.4) | 2.6<br>(1.9, 3.6)    |
| Sex                |                      |                      | 0.07 |                      |                      | 0.01       |                      | 0.01                 |
| Male               | 29.9<br>(23.2, 38.6) | 62.8<br>(60.1, 65.6) |      | 43.3<br>(37.8, 49.6) | 59.2<br>(56.3, 62.2) |            | 41.6<br>(37.4, 46.3) | 56.8<br>(55.6, 58.1) |
| Female             | 70.2<br>(58.3, 84.1) | 37.2<br>(34.2, 40.7) |      | 56.7<br>(53.9, 59.8) | 40.8<br>(37.8, 44.0) |            | 58.4<br>(55.9, 61.0) | 43.2<br>(41.7, 44.7) |
| Race/Ethnicity     |                      |                      | 0.60 |                      |                      | <.000<br>1 |                      | <.000<br>1           |
| Non-Hispanic white | 55.8<br>(40.2, 77.1) | 51.1<br>(48.3, 54.5) |      | 89.6<br>(88.5, 90.8) | 75.4<br>(73.6, 77.3) |            | 81.9<br>(80.3, 83.4) | 75.5<br>(74.1, 76.9) |
| Non-Hispanic black | 18.6<br>(13.7, 25.4) | 15.1<br>(12.0, 18.9) |      | 5.1<br>(2.5, 10.5)   | 6.9<br>(5.4, 8.8)    |            | 8.7<br>(6.7, 11.5)   | 7.4<br>(6.4, 8.6)    |
| Hispanic           | 13.8<br>(7.5, 25.3)  | 27.2<br>(23.1, 32.0) |      | 3.2<br>(1.5, 6.9)    | 10.1<br>(8.7, 11.8)  |            | 3.6<br>(2.3, 5.7)    | 10.2<br>(9.1, 11.5)  |
| Others             | 11.9                 | 6.6                  |      | 2.1                  | 7.6                  |            | 5.8                  | 6.9                  |



|                       |              |              |      |              |              |       |              |              |       |
|-----------------------|--------------|--------------|------|--------------|--------------|-------|--------------|--------------|-------|
|                       | (7.4, 19.1)  | (4.8, 9.2)   |      | (0.8, 5.7)   | (5.9, 9.6)   |       | (4.1, 8.1)   | (5.8, 8.1)   |       |
| Asthma                |              |              | 0.08 |              |              | 0.002 |              |              | 0.002 |
| Yes                   | 55.9         | 20.0         |      | 34.0         | 11.7         |       | 38.7         | 12.0         |       |
|                       | (43.6, 71.4) | (17.2, 23.2) |      | (29.1, 39.7) | (10.2, 13.6) |       | (35.2, 42.5) | (10.8, 13.4) |       |
| No                    | 44.2         | 80.1         |      | 66.0         | 88.3         |       | 61.3         | 88.0         |       |
|                       | (39.8, 49.2) | (78.1, 82.4) |      | (60.1, 72.4) | (87.8, 88.9) |       | (59.0, 63.7) | (87.1, 88.8) |       |
| Marijuana use in ENDS |              |              | 0.57 |              |              | 0.52  |              |              | 0.52  |
| Never                 | 53.7         | 60.3         |      | 85.4         | 78.3         |       | 83.6         | 73.5         |       |
|                       | (49.5, 58.4) | (57.4, 63.6) |      | (82.5, 88.4) | (76.7, 80.0) |       | (81.7, 85.6) | (71.9, 75.0) |       |
| Rarely                | 2.8          | 15.1         |      | 6.2          | 10.1         |       | 9.8          | 12.3         |       |
|                       | (0.7, 10.8)  | (12.5, 18.2) |      | (3.3, 11.8)  | (8.5, 12.0)  |       | (7.8, 12.4)  | (11.0, 13.7) |       |
| Sometimes             | 22.6         | 11.6         |      | 3.0          | 6.1          |       | 3.2          | 8.2          |       |
|                       | (8.2, 61.7)  | (9.2, 14.6)  |      | (1.2, 7.5)   | (4.4, 8.3)   |       | (2.0, 5.2)   | (7.0, 9.6)   |       |
| Most of the time      | 9.3          | 6.8          |      | 3.1          | 3.3          |       | 1.5          | 3.0          |       |
|                       | (5.2, 16.8)  | (4.8, 9.5)   |      | (1.2, 7.8)   | (2.1, 5.2)   |       | (0.7, 3.3)   | (2.4, 3.7)   |       |
| Every time            | 11.7         | 6.3          |      | 2.3          | 2.3          |       | 1.8          | 3.1          |       |
|                       | (7.3, 18.9)  | (4.7, 8.5)   |      | (0.6, 8.7)   | (1.6, 3.4)   |       | (0.9, 3.6)   | (2.3, 4.0)   |       |
| Income                |              |              |      |              |              | 0.03  |              |              | 0.03  |
| Less than \$10 000    | 65.9         | 20.1         |      | 8.6          | 9.3          |       | 28.1         | 16.6         |       |
|                       | (55.0, 78.8) | (16.7, 24.1) |      | (5.6, 13.1)  | (7.5, 11.5)  |       | (23.2, 34.2) | (15.3, 18.0) |       |
| \$10 000 to \$24 999  | 30.3         | 23.8         |      | 35.7         | 19.1         |       | 33.9         | 24.0         |       |
|                       | (21.0, 43.9) | (20.6, 27.5) |      | (30.9, 42.3) | (16.4, 22.2) |       | (29.9, 38.3) | (22.4, 25.6) |       |
| \$25 000 to \$49 999  | 2.2          | 22.2         |      | 20.9         | 26.1         |       | 20.8         | 26.1         |       |
|                       | (0.5, 10.5)  | (19.0, 26.1) |      | (15.3, 28.7) | (23.5, 29.5) |       | (18.4, 23.7) | (24.0, 28.4) |       |
| \$50 000 to \$99 999  | 1.5          | 18.0         |      | 16.1         | 27.5         |       | 13.2         | 23.0         |       |

|                   |            |              |              |              |              |              |
|-------------------|------------|--------------|--------------|--------------|--------------|--------------|
|                   | (0.2, 9.7) | (15.3, 21.3) | (11.0, 23.5) | (25.1, 30.3) | (10.2, 17.0) | (21.0, 25.1) |
| \$100 000 or more | n/a        | 16.0         | 18.8         | 17.8         | 4.0          | 10.4         |
|                   |            | (13.4, 19.1) | (14.4, 24.5) | (15.7, 20.2) | (2.3, 7.0)   | (8.9, 12.0)  |

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COPD, Chronic Obstructive Pulmonary Disease; PATH, Population Assessment of Tobacco and Health study.

n/a: number of COPD cases is insufficient for calculation.

**Table S4. Characteristics of PATH wave 4 adult participants across COPD stratified by ENDS use status (weighted % with 95%CI)**

| Variables                         | All established ENDS users<br>(n = 4,909) |                         | P value | Current established ENDS users<br>(n = 1,988) |                         | P value | Former established ENDS users<br>(n = 2,921) |                         | P value |
|-----------------------------------|---|-------------------------|---------|---|-------------------------|---------|--|-------------------------|---------|
|                                   | COPD<br>(n = 418)                         | Non-COPD<br>(n = 4,491) |         | COPD<br>(n = 152)                             | Non-COPD<br>(n = 1,836) |         | COPD<br>(n = 266)                            | Non-COPD<br>(n = 2,655) |         |
|                                   |   |                         |         |   |                         |         |  |                         |         |
| <b>Tobacco flavor use</b>         |   |                         |         |   |                         |         |  |                         |         |
| Yes                               | 45.18<br>(41.20, 49.74)                   | 18.09<br>(16.89, 19.39) | <.0001  | 43.40<br>(37.03, 50.80)                       | 16.02<br>(14.44, 17.79) | <.0001  | 48.48<br>(43.24, 54.23)                      | 21.47<br>(19.23, 23.96) | <.0001  |
| No                                | 54.72<br>(52.66, 56.89)                   | 81.91<br>(80.90, 82.93) |         | 56.6<br>(55.60, 57.68)                        | 83.98<br>(82.84, 85.13) |         | 51.52<br>(46.18, 57.44)                      | 78.53<br>(76.65, 80.38) |         |
| <b>Menthol or mint flavor use</b> |   |                         |         |   |                         |         |  |                         |         |
| Yes                               | 21.26<br>(18.87, 23.96)                   | 21.64<br>(20.43, 22.94) | 0.89    | 20.79<br>(18.06, 23.97)                       | 19.32<br>(17.49, 21.35) | 0.66    | 22.05<br>(16.95, 28.66)                      | 25.45<br>(22.93, 28.22) | 0.47    |
| No                                | 78.74<br>(77.14, 80.37)                   | 78.36<br>(77.59, 79.18) |         | 79.21<br>(78.10, 80.36)                       | 80.68<br>(79.46, 81.95) |         | 77.95<br>(74.97, 81.20)                      | 74.55<br>(72.50, 76.58) |         |

|                                      |                         |                         |        |                         |                         |                         |                         |
|--------------------------------------|-------------------------|-------------------------|--------|-------------------------|-------------------------|-------------------------|-------------------------|
| Fruit flavor use                     |                         |                         | <.0001 |                         | 0.0009                  |                         | 0.0009                  |
| Yes                                  | 26.39<br>(23.58, 29.55) | 46.85<br>(45.07, 48.70) |        | 27.43<br>(23.18, 32.46) | 49.34<br>(47.59, 51.20) | 24.61<br>(19.58, 30.93) | 42.77<br>(39.35, 46.35) |
| No                                   | 73.61<br>(69.22, 78.20) | 53.15<br>(51.67, 54.69) |        | 72.57<br>(65.55, 80.16) | 50.66<br>(48.98, 52.45) | 75.39<br>(71.36, 79.58) | 57.23<br>(54.24, 60.26) |
| Candy, desserts or sweets flavor use |                         |                         | <.0001 |                         | 0.0025                  |                         | 0.0002                  |
| Yes                                  | 17.39<br>(15.15, 19.97) | 32.04<br>(30.16, 34.04) |        | 19.88<br>(16.64, 23.78) | 33.65<br>(31.64, 35.80) | 13.13<br>(8.39, 20.54)  | 29.42<br>(26.55, 32.54) |
| No                                   | 82.61<br>(80.96, 84.30) | 67.96<br>(66.40, 69.53) |        | 80.12<br>(76.19, 84.18) | 66.35<br>(64.73, 68.05) | 86.87<br>(85.38, 88.38) | 70.58<br>(68.01, 73.12) |
| Other flavors use                    |                         |                         | 0.52   |                         | 0.22                    |                         | 0.02                    |
| Yes                                  | 15.57<br>(10.87, 22.26) | 13.45<br>(12.27, 14.74) |        | 19.17<br>(12.24, 29.91) | 12.10<br>(10.57, 13.86) | 9.43<br>(5.91, 15.04)   | 15.66<br>(13.57, 18.06) |
| No                                   | 84.43<br>(86.14, 82.81) | 86.55<br>(85.90, 87.23) |        | 80.83<br>(82.40, 79.38) | 87.90<br>(87.28, 88.58) | 90.57<br>(90.71, 90.47) | 84.34<br>(82.71, 85.90) |
| Smoking status                       |                         |                         | <.0001 |                         | 0.0048                  |                         | <.0001                  |

|                |                |                |                |                |                |                |        |
|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------|
| Current smoker | 70.21          | 57.46          | 64.04          | 53.09          | 73.93          | 60.49          |        |
|                | (69.80, 70.65) | (56.26, 58.70) | (60.02, 68.29) | (51.06, 55.21) | (73.55, 74.35) | (58.63, 62.36) |        |
| Former smoker  | 25.28          | 28.35          | 29.86          | 31.4           | 22.51          | 26.24          |        |
|                | (22.35, 28.58) | (26.98, 29.79) | (25.99, 34.33) | (29.30, 33.67) | (18.81, 26.92) | (24.37, 28.23) |        |
| Non-smoker     | 4.52           | 14.19          | 6.1            | 15.51          | 3.56           | 13.27          |        |
|                | (2.85, 7.15)   | (13.13, 15.33) | (2.89, 12.86)  | (13.79, 17.45) | (2.22, 5.71)   | (11.96, 14.73) |        |
| Age (years)    |                |                | <.0001         |                | <.0001         |                | <.0001 |
| 18-44          | 20.71          | 76.12          | 19.03          | 75.85          | 21.72          | 76.30          |        |
|                | (18.04, 23.77) | (75.00, 77.23) | (16.43, 22.07) | (74.01, 77.48) | (17.93, 26.31) | (75.00, 77.60) |        |
| 45-64          | 59.73          | 20.64          | 58.50          | 20.61          | 60.47          | 20.66          |        |
|                | (58.15, 61.35) | (19.21, 22.18) | (56.95, 60.14) | (18.65, 22.78) | (58.10, 62.94) | (18.87, 22.62) |        |
| 65+            | 19.57          | 3.24           | 22.48          | 3.54           | 17.80          | 3.03           |        |
|                | (16.29, 23.50) | (2.60, 4.03)   | (17.10, 29.51) | (2.42, 5.17)   | (14.67, 21.60) | (2.36, 3.91)   |        |
| Sex            |                |                | <.0001         |                | 0.02           |                | 0.02   |
| Male           | 41.73          | 58.34          | 36.05          | 61.29          | 45.17          | 56.32          |        |
|                | (37.51, 46.39) | (57.45, 59.28) | (27.77, 46.65) | (59.65, 63.01) | (40.58, 50.24) | (54.86, 57.82) |        |
| Female         | 58.27          | 41.66          | 63.95          | 38.71          | 54.83          | 43.68          |        |

|                    |                   |                   |                   |                   |                   |                   |
|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|                    | (56.44,<br>60.17) | (40.55,<br>42.81) | (63.61,<br>64.36) | (37.03,<br>40.52) | (50.62,<br>59.34) | (42.10,<br>45.33) |
| Race/Ethnicity     |                   |                   | <.0001            |                   | 0.0032            | <.0001            |
| Non-Hispanic white | 82.70             | 71.72             | 82.79             | 74.78             | 82.65             | 69.60             |
|                    | (81.56,<br>83.86) | (70.52,<br>72.92) | (79.99,<br>85.64) | (72.82,<br>76.72) | (81.02,<br>84.29) | (68.07,<br>71.14) |
| Non-Hispanic black | 8.27              | 8.49              | 7.75              | 7.35              | 8.60              | 9.28              |
|                    | (6.69,<br>10.24)  | (7.53,<br>9.57)   | (5.54,<br>10.85)  | (5.92,<br>9.10)   | (6.42,<br>11.53)  | (8.25,<br>10.45)  |
| Hispanic           | 3.94              | 12.74             | 3.94              | 10.84             | 3.94              | 14.04             |
|                    | (2.80,<br>5.53)   | (11.64,<br>13.94) | (2.30,<br>6.75)   | (9.43,<br>12.48)  | (2.52,<br>6.14)   | (12.56,<br>15.69) |
| Others             | 5.09              | 7.05              | 5.52              | 7.03              | 4.82              | 7.07              |
|                    | (3.82,<br>6.78)   | (6.28,<br>7.92)   | (3.60,<br>8.49)   | (5.78,<br>8.56)   | (3.26,<br>7.12)   | (6.10,<br>8.19)   |
| Asthma             |                   |                   | <.0001            |                   | <.0001            | <.0001            |
| Yes                | 38.49             | 13.07             | 37.22             | 11.85             | 39.27             | 13.91             |
|                    | (36.43,<br>40.68) | (12.16,<br>14.05) | (31.78,<br>43.55) | (10.56,<br>13.31) | (36.75,<br>41.96) | (12.73,<br>15.20) |
| No                 | 61.51             | 86.93             | 62.78             | 88.15             | 60.73             | 86.09             |
|                    | (59.13,<br>63.97) | (86.44,<br>87.44) | (62.02,<br>63.62) | (87.58,<br>88.80) | (57.11,<br>64.55) | (85.23,<br>86.95) |

|                          |                            |                            |                            |                            |                            |                            |        |
|--------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|--------|
| Marijuana use<br>in ENDS |                            |                            | <.0001                     |                            | 0.02                       |                            | 0.0024 |
| Never                    | 82.81<br>(81.26,<br>84.38) | 73.00<br>(71.87,<br>74.13) | 82.16<br>(79.89,<br>84.49) | 71.01<br>(69.47,<br>72.61) | 83.21<br>(81.33,<br>85.10) | 74.37<br>(72.96,<br>75.76) |        |
| Rarely                   | 8.55<br>(6.89,<br>10.62)   | 11.97<br>(11.06,<br>12.97) | 7.97<br>(5.40,<br>11.77)   | 14.19<br>(12.59,<br>16.01) | 8.91<br>(6.60,<br>12.04)   | 10.44<br>(9.36,<br>11.65)  |        |
| Sometimes                | 4.02<br>(2.61,<br>6.22)    | 8.07<br>(7.16,<br>9.11)    | 5.98<br>(3.08,<br>11.61)   | 9.47<br>(8.12,<br>11.06)   | 2.83<br>(1.53,<br>5.24)    | 7.11<br>(6.20,<br>8.16)    |        |
| Most of the<br>time      | 2.24<br>(1.18,<br>4.26)    | 3.61<br>(3.04,<br>4.30)    | 2.15<br>(0.99,<br>4.66)    | 2.91<br>(2.21,<br>3.85)    | 2.29<br>(0.92,<br>5.67)    | 4.10<br>(3.32,<br>5.05)    |        |
| Every time               | 2.37<br>(1.49,<br>3.78)    | 3.34<br>(2.85,<br>3.92)    | 1.73<br>(0.72,<br>4.15)    | 2.41<br>(1.70,<br>3.41)    | 2.76<br>(1.60,<br>4.78)    | 3.99<br>(3.26,<br>4.88)    |        |
| Income                   |                            |                            | <.0001                     |                            | 0.0065                     |                            | <.0001 |
| Less than<br>\$10 000    | 24.95<br>(21.78,<br>28.58) | 14.97<br>(13.83,<br>16.19) | 21.86<br>(16.67,<br>28.63) | 13.52<br>(11.81,<br>15.49) | 26.80<br>(22.89,<br>31.35) | 15.95<br>(14.50,<br>17.54) |        |

|                         |                            |                            |                            |                            |                            |                            |
|-------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| \$10 000 to<br>\$24 999 | 33.97<br>(30.57,<br>37.73) | 22.54<br>(21.20,<br>23.97) | 33.25<br>(29.69,<br>37.26) | 22.19<br>(20.33,<br>24.24) | 34.40<br>(29.58,<br>39.96) | 22.79<br>(20.92,<br>24.80) |
| \$25 000 to<br>\$49 999 | 20.03<br>(17.87,<br>22.46) | 25.73<br>(24.37,<br>27.17) | 18.27<br>(14.48,<br>24.22) | 25.40<br>(23.41,<br>27.57) | 20.81<br>(18.19,<br>23.82) | 25.96<br>(24.15,<br>27.88) |
| \$50 000 to<br>\$99 999 | 13.62<br>(10.94,<br>16.95) | 23.45<br>(21.79,<br>25.12) | 15.99<br>(12.65,<br>20.23) | 24.29<br>(22.36,<br>26.39) | 12.20<br>(9.18,<br>16.22)  | 22.87<br>(20.93,<br>24.98) |
| \$100 000 or<br>more    | 7.43<br>(5.27,<br>10.48)   | 13.31<br>(12.11,<br>14.63) | 10.18<br>(6.70,<br>15.47)  | 14.60<br>(12.92,<br>16.50) | 5.79<br>(3.88,<br>8.65)    | 12.43<br>(11.07,<br>13.97) |

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COPD, Chronic Obstructive Pulmonary Disease; PATH, Population Assessment of Tobacco and Health study.



**Table S5. (Model 1) Adjusted ORs (with 95% CI)\* of COPD prevalence associated with ENDS flavors stratified by vaping and smoking status**

|                            | Former established ENDS users |                       |                      | Current established ENDS users |                      |                                    |
|----------------------------|-------------------------------|-----------------------|----------------------|--------------------------------|----------------------|------------------------------------|
|                            | Non-smoker                    | Former-smoker         | Current-smoker       | Non-smoker                     | Former-smoker        | Current-smoker                     |
| Tobacco                    | n/a                           | 2.45<br>(0.26, 24.22) | 2.06<br>(0.96, 4.44) | n/a                            | 2.77<br>(0.90, 8.54) | <b>2.78</b><br><b>(1.46, 5.30)</b> |
| Menthol or mint            | n/a                           | 0.60<br>(0.06, 6.25)  | 1.00<br>(0.39, 2.62) | 0.27<br>(0.00, 16.43)          | 1.76<br>(0.86, 5.55) | 1.07<br>(0.60, 1.93)               |
| Fruit                      | n/a                           | 0.97<br>(0.09, 10.99) | 0.65<br>(0.27, 1.58) | 3.59<br>(0.28, 46.82)          | 0.46<br>(0.12, 1.80) | 0.63<br>(0.38, 1.06)               |
| Candy, desserts, or sweets | n/a                           | 2.76<br>(0.64, 10.41) | 0.25<br>(0.08, 0.76) | n/a                            | 0.23<br>(0.03, 2.11) | 0.63<br>(0.38, 1.04)               |
| Others                     | n/a                           | 0.18<br>(0.01, 3.26)  | 1.27<br>(0.49, 3.34) | n/a                            | 1.86<br>(0.48, 7.28) | <b>2.23</b><br><b>(1.06, 5.01)</b> |

\* Users of a specific flavor vs non-users of this specific flavor as reference. The adjusted ORs controlled the effect of all flavors other than the interested specific flavor.  
n/a: number of COPD prevalent case is insufficient for calculation.

**Table S6. (Model 4) Adjusted ORs (with 95% CI) of COPD prevalence associated with ENDS flavors stratified by vaping status and asthma**

|                                  | Users of a specific flavor vs non-users of this specific flavor as reference |                   |                   |                           |                   |
|----------------------------------|--|-------------------|-------------------|---------------------------|-------------------|
|                                  | Tobacco  | Menthol or mint   | Fruit             | Candy, desserts or sweets | Others            |
| <b>With history of asthma</b>    |  |                   |                   |                           |                   |
| Ever established ENDS users      | 1.91 (0.71, 5.15)  | 0.98 (0.37, 2.60) | 0.99 (0.43, 2.27) | 0.80 (0.34, 1.88)         | 1.14 (0.52, 2.50) |
| Former established ENDS users    | n/a  | n/a               | n/a               | n/a                       | n/a               |
| Current established ENDS users   | 2.83 (0.69, 11.50)   | 0.85 (0.24, 2.95) | 0.77 (0.26, 2.24) | 1.16 (0.36, 3.69)         | 0.97 (0.35, 2.68) |
| <b>Without history of asthma</b> |  |                   |                   |                           |                   |
| Ever established ENDS users      | 1.38 (0.73, 2.61)  | 1.00 (0.50, 2.01) | 0.78 (0.38, 1.61) | 0.72 (0.44, 1.20)         | 1.07 (0.62, 1.84) |
| Former established ENDS users    | 0.63 (0.14, 2.87)  | 0.34 (0.05, 2.42) | 0.48 (0.08, 3.02) | 0.40 (0.06, 2.54)         | 0.26 (0.03, 2.14) |
| Current established ENDS users   | 1.83 (0.88, 3.81)  | 1.44 (0.64, 3.24) | 0.88 (0.46, 1.67) | 0.86 (0.39, 1.91)         | 2.01 (0.75, 5.43) |

The adjusted ORs controlled the effects of all other flavors, smoking status, sex, age, race/ethnicity, and income level.

n/a: number of COPD prevalent case is insufficient for calculation.

**Table S7. (Model 5) Adjusted ORs (with 95% CI) of COPD prevalence associated with ENDS flavors stratified by vaping status and sex**

|                                | Users of a specific flavor vs non-users of this specific flavor as reference |                   |                    |                           |                    |
|--------------------------------|--|-------------------|--------------------|---------------------------|--------------------|
|                                | Tobacco  | Menthol or mint   | Fruit              | Candy, desserts or sweets | Others             |
| <b>Male</b>                    |  |                   |                    |                           |                    |
| Ever established ENDS users    | 1.78 (0.84, 3.77)  | 0.73 (0.25, 2.13) | 0.51 (0.19, 1.38)  | 0.58 (0.24, 1.39)         | 2.22 (1.09, 4.49)  |
| Former established ENDS users  | 1.86 (0.27, 12.89)   | 0.43 (0.04, 5.17) | 1.81 (0.22, 14.77) | 0.35 (0.05, 2.66)         | 1.62 (0.20, 12.94) |
| Current established ENDS users | n/a  | n/a               | n/a                | n/a                       | n/a                |
| <b>Female</b>                  |  |                   |                    |                           |                    |
| Ever established ENDS users    | 1.51 (0.78, 2.89)  | 1.27 (0.72, 2.24) | 1.03 (0.54, 1.98)  | 1.02 (0.61, 1.71)         | 0.58 (0.27, 1.25)  |
| Former established ENDS users  | 0.86 (0.20, 3.67)  | 0.90 (0.19, 4.18) | 0.70 (0.15, 3.19)  | 0.78 (0.13, 4.78)         | 0.32 (0.06, 1.66)  |
| Current established ENDS users | 2.37 (0.99, 5.68)  | 1.63 (0.79, 3.38) | 1.31 (0.60, 2.86)  | 1.37 (0.76, 2.48)         | 0.87 (0.29, 2.63)  |

The adjusted ORs controlled the effects of all other flavors, smoking status, sex, age, race/ethnicity, and income level.  
n/a: number of COPD prevalent case is insufficient for calculation.