

# Trends in exclusive and dual use of combustible and non-combustible tobacco products in the United States, 2015 to 2023



International Tobacco Control  
Policy Evaluation Project

TCORS

Center for the  
Assessment of Tobacco  
Regulations  
[CA<sup>s</sup>TO<sup>R</sup>]

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**Presenter:**

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Medical University of South Carolina  
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Baltimore, Maryland  
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<b>Please add “yes” or “no” to each table cell. If “yes”, please turn cell background color to yellow.</b>	<b>Tobacco Industry</b>	<b>E-cigarette &amp; nicotine product industry (excluding pharma)</b>	<b>Pharma Industry</b>
<b>The work being presented has received funding or other means of support from any of the following sources:</b>	<b>No</b>	<b>No</b>	<b>No</b>
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# *My personal disclosures*

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1. NIH grant funding
2. Paid expert witness representing plaintiffs in litigation against cigarette manufacturers.
3. On the record as saying...
  - a) *The world would be better off without cigarettes*
  - b) *I believe cigarette manufacturers should be held accountable for the injuries they've caused*
  - c) *I support transparency, openness, and accountability in the scientific and regulatory process*
  - d) *I also believe in the potential of smoking harm reduction*



# Objectives and Methods

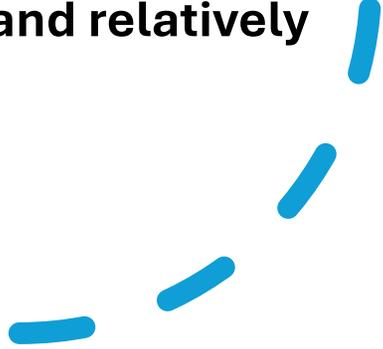
## Objective

Describe trends in the prevalence exclusive and dual use of combustible and non-combustible tobacco products.

## Methods

- We estimated current use prevalence of exclusive and dual use of combustible and non-combustible tobacco products using data from the National Health and Interview Survey (NHIS) from 2015 to 2023.
- **Exclusive combustible tobacco product** use was defined as *only using* any of the following combustible tobacco products: cigarettes, cigars, and pipe and hookah.
- **Exclusive non-combustible tobacco product use** was defined as *only using* either ECs and oral tobacco or both.
- **Dual use** included use of *both a combustible and non-combustible product*.

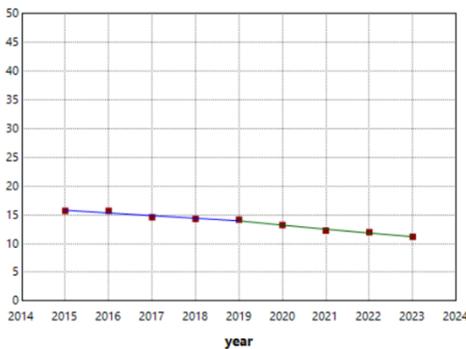
## Topline results

- Overall **exclusive combustible tobacco use prevalence was 2-3x more common than exclusive non-combustible use and dual use.**
  - Between 2015 and 2023, **exclusive combustible tobacco product use decreased** with *change more pronounced in younger age groups, especially after 2020.*
  - **Exclusive non-combustible tobacco product use increased significantly in all age groups** between 2015 to 2023 with the *rate of change greater in females compared to males.*
  - **Dual use prevalence was under 3% and relatively stable** between 2015 and 2023
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# Joinpoint regression plots for the prevalence of exclusive combustible, exclusive non-combustible tobacco use and dual use for adult overall

(Please note: **Bold** indicates statistically significant at  $p < 0.05$ )

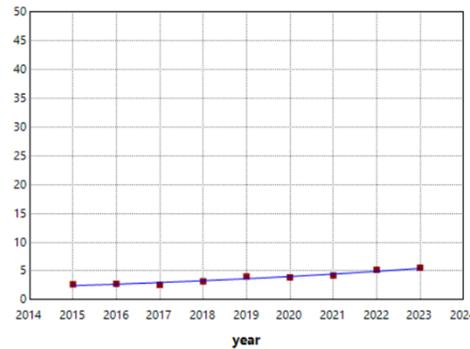
Exclusive combustible tobacco use



Age Group:  $\geq 18$  years  
 Males and Females Combined  
 Time Period: 2015-2019  
**Average percentage change: -3.1%**  
 95% Confidence interval: (-4.5 to 0.08)

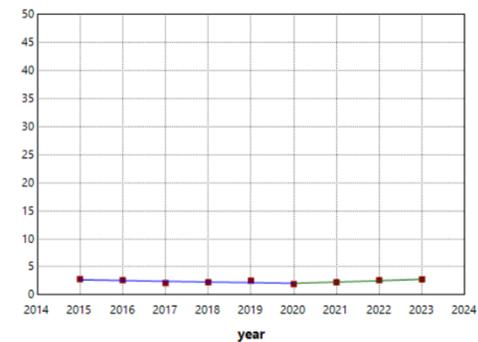
Time Period: 2019-2023  
**Average percentage change: -5.4%**  
 95% Confidence interval: (-9.1 to 3.9)

Exclusive non-combustible tobacco use



Age Group:  $\geq 18$  years  
 Males and Females Combined  
**Average percentage change: 10.5%**  
 95% Confidence interval: (7.2 to 13.9)

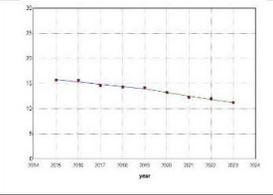
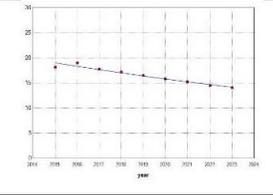
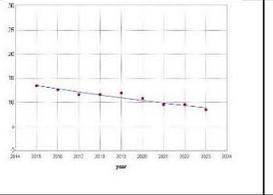
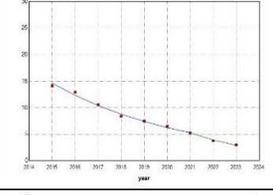
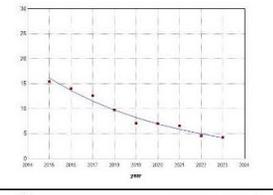
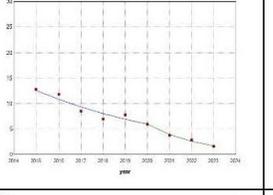
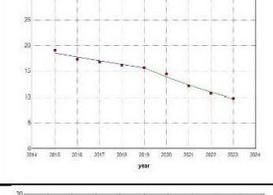
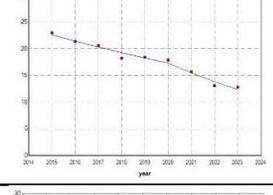
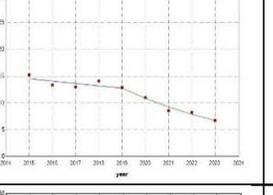
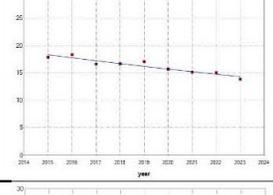
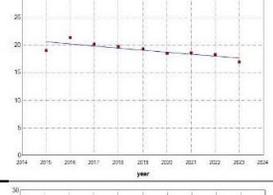
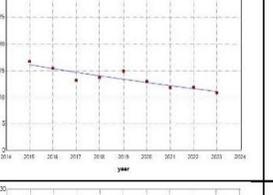
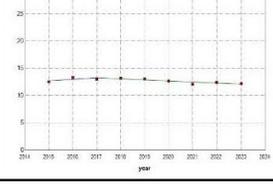
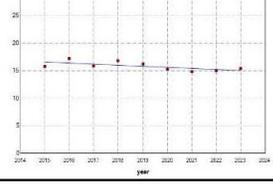
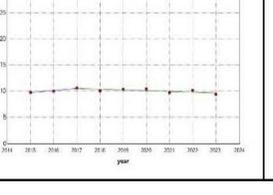
Dual use of combusted & and non-combusted tobacco



Age Group:  $\geq 18$  years  
 Males and Females Combined  
 Time Period: 2015-2020  
**Average percentage change: -5.2%**  
 95% Confidence interval: (-17.9 to 0.6)

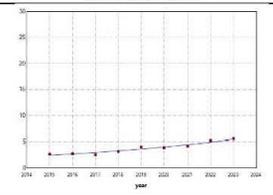
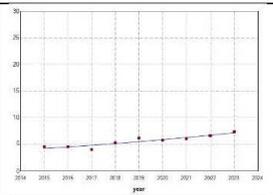
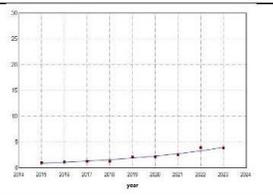
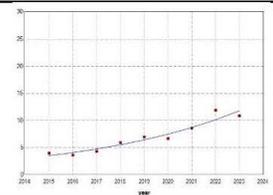
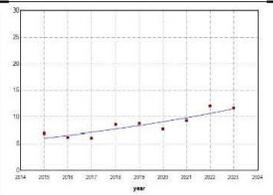
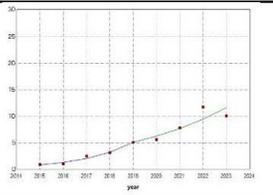
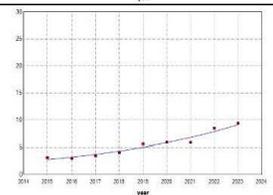
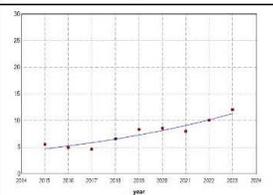
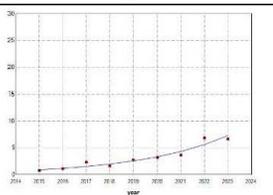
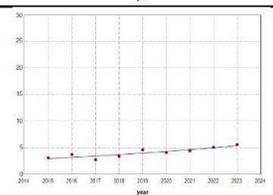
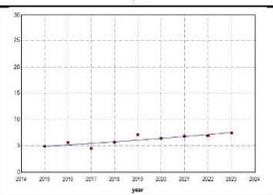
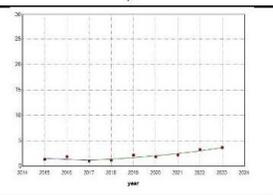
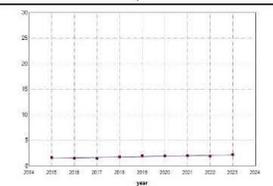
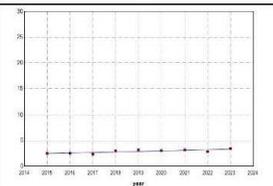
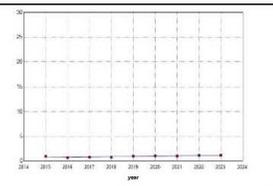
Time Period: 2020-2023  
**Average percentage change: 10.5%**  
 95% Confidence interval: (-0.9 to 28.7)

Figure 1. Joinpoint regression plots for the prevalence<sup>+</sup> of exclusive combustible tobacco use<sup>\*</sup> for adult (≥18 years) participants in the US NHIS from 2015 through 2023 combined and by different age groups and for males and females

Age Groups	Males and Females Combined	APC% (95% CI)	Males Only	APC% (95% CI)	Females Only	APC% (95% CI)
≥18 years		2015-2019 -3.1 (-4.5 to 0.8)  2019-2023 -5.4 (-9.1 to -3.9)		2015-2023 -3.6 (-4.3 to -3.0)		2015-2023 -5.1 (-7.1 to -3.1)
18-24 years		2015-2021 -15.7 (-17.3 to -9.0)  2021-2023 -25.8 (-33.1 to -18.9)		2015-2023 -15.5 (-18.0 to -12.9)		2015-2020 -13.9 (-19.8 to 16.1)  2020-2023 -34.2 (-53.9 to -24.2)
25-34 years		2015-2019 -4.2 (-6.3 to -0.3)  2019-2023 -11.3 (-14.9 to -9.3)		2015-2020 -5.2 (-6.6 to -1.0)  2020-2023 -10.6 (-15.5 to -7.9)		2015-2019 -3.2 (-7.4 to 9.6)  2019-2023 -14.9 (-24.9 to -11.1)
35-54 years		2015-2023 -3.0 (-4.5 to -1.7)		2015-2023 -1.9 (-3.1 to -0.7)		2015-2023 -4.6 (-6.3 to -2.8)
≥55 years		2015-2017 2.2 (-0.4 to 4.7)  2017-2023 -1.5 (-3.3 to -1.0)		2015-2023 -1.2 (-3.5 to 1.1)		2015-2017 4.1 (-2.9 to 13.8)  2017-2023 -1.4 (-10.7 to 3.6)

Overall results combined mask significant declines in exclusive combustible use which vary by age. Average percentage change (APCs), larger in younger age groups; no significant change in those ≥ 55 years of age.

Figure 2. Joinpoint regression plots for the prevalence<sup>†</sup> of for exclusive non-combustible tobacco use<sup>\*</sup> for adult (≥18 years) participants in the US NHIS from 2015 through 2023 combined and by different age groups and for males and females

Age Groups	Males and Females Combined	APC% (95% CI)	Males Only	APC% (95% CI)	Females Only	APC% (95% CI)
≥18 years		2015-2023 <b>10.5</b> (7.2 to 13.9)		2015-2023 <b>7.0</b> (4.1 to 9.9)		2015-2023 <b>19.9</b> (14.9-25.2)
18-24 years		2015-2023 <b>16.5</b> (9.5 to 23.9)		2015-2023 <b>8.4</b> (2.6 to 14.6)		2015-2019 <b>58.2</b> (37.0 to 132.4)  2019-2023 <b>23.0</b> (-18.4 to 42.2)
25-34 years		2015-2023 <b>16.0</b> (10.7 to 21.6)		2015-2023 <b>11.6</b> (7.1 to 16.4)		2015-2023 <b>30.1</b> (20.3 to 40.6)
35-54 years		2015-2023 <b>7.8</b> (3.9 to 12.1)		2015-2023 <b>5.6</b> (2.6 to 8.8)		2015-2017 <b>-14.5</b> (-33.2 to 17.9)  2017-2023 <b>21.2</b> (4.8 to 59.4)
≥55 years		2015-2023 <b>4.4</b> (0.9 to 8.1)		2015-2023 <b>3.8</b> (1.3 to 6.5)		2015-2023 <b>5.9</b> (0.7 to 11.3)

Overall results combined mask significant increases in exclusive non-combustible use which vary by age. Average percentage change (APCs), larger in younger age groups.

Figure 3. Joinpoint regression plots for the prevalence<sup>+</sup> of dual use of combusted and non-combusted tobacco products\* for adult (≥18 years) participants in the US NHIS from 2015 through 2023 combined and by different age groups and for males and females

Age Groups	Males and Females Combined	APC% (95% CI)	Males Only	APC% (95% CI)	Females Only	APC% (95% CI)
≥18 years		2015-2020 -5.2 (-17.9 to 0.6)  2020-2023 10.5 (-0.9 to 28.7)		2015-2021 -3.3 (-13.9 to 1.2)  2021-2023 15.0 (-0.9 to 27.9)		2015-2020 -7.8 (-31.9 to 21.4)  2020-2023 15.1 (-13.0 to 57.5)
18-24 years		2015-2023 -1.2 (-7.4 to 5.4)		2015-2023 -2.7 (-11.9 to 7.5)		2015-2023 2.4 (-5.8 to 11.3)
25-34 years		2015-2023 3.6 (-1.3 to 8.7)		2015-2023 3.4 (-1.1 to 8.1)		2015-2023 3.5 (-5.2 to 13.0)
35-54 years		2015-2017 -19.9 (-32.8 to 2.2)  2017-2023 5.5 (-4.7 to 29.6)		2015-2021 -3.9 (-19.5 to 9.2)  2021-2023 21.6 (-2.1 to 43.4)		2015-2017 -27.9 (-40.8 to 2.6)  2017-2023 7.5 (-0.6 to 31.6)
≥55 years		2015-2020 -14.3 (-35.1 to -4.8)  2020-2023 16.9 (-4.8 to 56.2)		2015-2020 -12.5 (-33.6 to -2.3)  2020-2023 16.3 (-5.1 to 55.2)		2015-2020 -17.0 (-41.3 to -3.8)  2020-2023 17.8 (-9.3 to 68.7)

Dual use prevalence rates are low in all age groups and relatively stable between 2015 to 2023.



**Product specific trends**



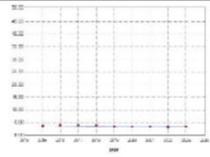
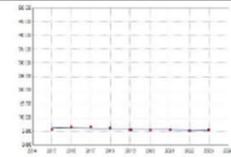
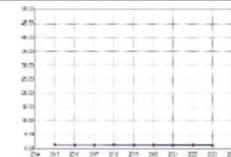
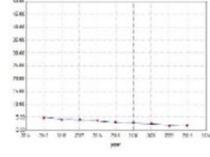
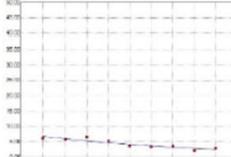
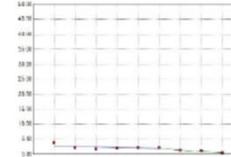
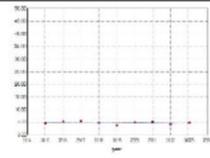
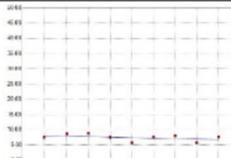
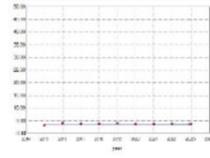
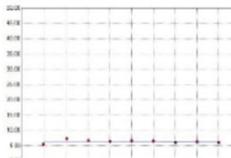
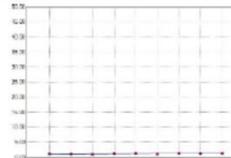
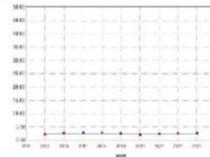
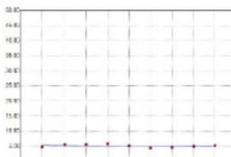
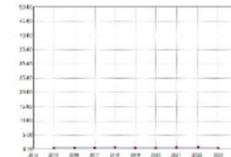
Prevalence<sup>+</sup> of *exclusive cigarette use* for adult (≥18 years) participants in the US NHIS 2015 to 2023 combined and by different age groups and for males and females

Age Groups	Males and Females Combined	APC% (95% CI)	Males Only	APC% (95% CI)	Females Only	APC% (95% CI)
≥18 years		2015-2019 <b>-2.6</b> (-6.1 to 6.0)  2019-2023 <b>-6.6</b> (-14.2 to -3.1)		2015-2020 <b>-3.0</b> (-4.1 to 0.3)  2020-2023 <b>-6.5</b> (-10.0 to -4.4)		2015-2019 <b>-2.6</b> (-4.6 to 3.0)  2019-2023 <b>-7.7</b> (-12.9 to -5.8)
18-24 years		2015-2021 <b>-18.2</b> (-20.5 to -10.9)  2021-2023 <b>-34.6</b> (-43.4 to -24.1)		2015-2023 <b>-20.3</b> (-26.2 to -13.9)		2015-2019 <b>-13.6</b> (-20.0 to 3.3)  2019-2023 <b>-31.2</b> (-42.4 to -25.7)
25-34 years		2015-2019 <b>-3.2</b> (-8.4 to 14.3)  2019-2023 <b>-18.0</b> (-30.7 to -13.3)		2015-2020 <b>-5.6</b> (-9.4 to 6.1)  2020-2023 <b>-20.1</b> (-31.1 to -12.8)		2015-2019 <b>-3.0</b> (-7.8 to 7.1)  2019-2023 <b>-18.8</b> (-26.5 to -14.6)
35-54 years		2015-2023 <b>-3.7</b> (-5.1 to -2.3)		2015-2023 <b>-2.4</b> (-3.6 to -1.2)		2015-2023 <b>-4.9</b> (-6.6 to -3.3)
≥55 years		2015-2019 <b>1.2</b> (-0.9 to 6.8)  2019-2023 <b>-2.2</b> (-7.4 to -0.0)		2015-2023 <b>-0.9</b> (-3.1 to 1.4)		2015-2017 <b>6.4</b> (1.2-10.5)  2017-2023 <b>-1.7</b> (-4.0 to -0.7)

<sup>+</sup>Prevalence estimate based on weighted data; Note: **Bold** indicates statistically significant at the p<0.05 level



Prevalence<sup>+</sup> of *exclusive non-cigarette combustible tobacco use* for adult participants in the US NHIS from 2015 to 2023 combined and by different age groups and for males and females

Age Groups	Males and Females Combined	APC% (95% CI)	Males Only	APC% (95% CI)	Females Only	APC% (95% CI)
≥18 years		2015-2023 <b>-1.7</b> (-3.8 to 0.4)		2015-2023 <b>-2.2</b> (-4.6 to 0.4)		2015-2023 <b>-1.2</b> (-3.3 to 1.0)
18-24 years		2015-2023 <b>-12.3</b> (-14.8 to -9.6)		2015-2023 <b>-11.4</b> (-18.0 to -4.1)		2015-2020 <b>-6.3</b> (-21.1 to 50.7)  2020-2023 <b>-33.5</b> (-61.1 to -12.9)
25-34 years		2015-2023 <b>-1.3</b> (-4.3 to 1.9)		2015-2023 <b>-2.2</b> (-5.9 to 1.9)		2015-2023 <b>0.6</b> (-4.4 to 5.8)
35-54 years		2015-2023 <b>0.2</b> (-1.5 to 2.0)		2015-2023 <b>-0.3</b> (-2.7 to 2.1)		2015-2023 <b>2.7</b> (-0.8 to 6.6)
≥55 years		2015-2023 <b>-0.4</b> (-3.1 to 2.5)		2015-2023 <b>-1.1</b> (-4.3 to 2.4)		2015-2023 <b>1.6</b> (-7.5 to 11.6)

<sup>+</sup>Prevalence estimate based on weighted data; Note: **Bold** indicates statistically significant at the p<0.05 level



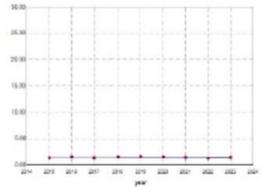
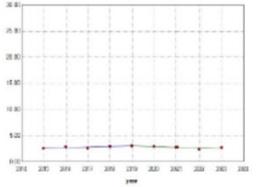
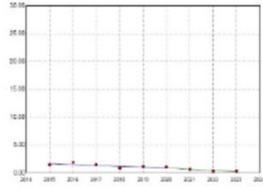
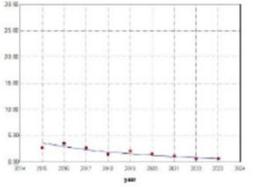
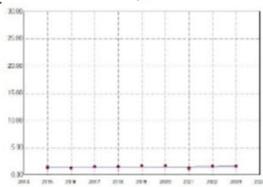
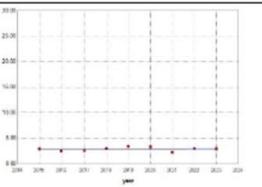
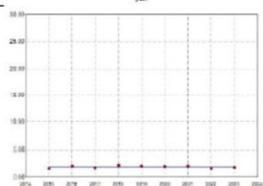
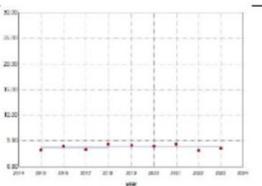
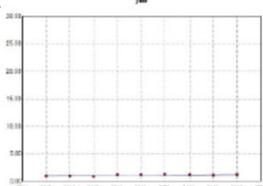
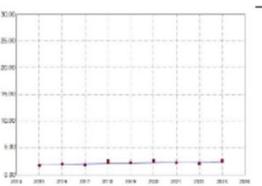
Prevalence<sup>+</sup> of *exclusive e-cigarette use* for adult participants in the US NHIS 2015 to 2023 combined and by different age groups and for males and females

Age Groups	Males and Females Combined	APC% (95% CI)	Males Only	APC% (95% CI)	Females Only	APC% (95% CI)
≥18 years		2015-2023 <b>18.8</b> (13.0 to 24.9)		2015-2023 <b>15.9</b> (8.9 to 23.3)		2015-2023 <b>22.8</b> (16.5 to 29.4)
18-24 years		2015-2023 <b>25.9</b> (16.3 to 36.3)		2015-2023 <b>17.7</b> (7.8 to 28.6)		2015-2019 <b>61.8</b> (25.5 to 176.7)  2019-2023 25.5 (-27.0 to 62.0)
25-34 years		2015-2023 <b>23.7</b> (19.7 to 27.9)		2015-2023 <b>20.2</b> (13.8 to 27.1)		2015-2023 <b>31.6</b> (21.7 to 42.3)
35-54 years		2015-2023 <b>15.2</b> (6.2 to 25.4)		2015-2023 <b>15.5</b> (5.7 to 26.6)		2015-2017 -13.8 (-29.0 to 8.1)  2017-2023 <b>23.5</b> (18.4 to 37.9)
≥55 years		2015-2023 <b>7.1</b> (2.8 to 11.7)		2015-2023 <b>6.6</b> (1.0 to 12.5)		2015-2023 <b>6.2</b> (2.2 to 10.6)

<sup>+</sup>Prevalence estimate based on weighted data; Note: **Bold** indicates statistically significant at the p<0.05 level



Prevalence<sup>+</sup> of *exclusive oral tobacco use*\* for adult participants in the US NHIS 2015 to 2023 combined and by different age groups and for males only\*\*

Age Groups	Males and Females Combined	APC% (95% CI)	Males Only	APC% (95% CI)
≥18 years		2015-2023 -0.4 (-3.6 to 3.0)		2015-2019 <b>3.9</b> (0.6 to 12.0)  2019-2023 <b>-4.6</b> (-11.7 to -1.5)
18-24 years		2015-2020 -11.0 (-17.8 to 12.6)  2020-2023 <b>-34.1</b> (-50.6 to -22.6)		2015-2023 <b>-19.5</b> (-26.6 to -11.6)
25-34 years		2015-2023 1.4 (-2.1 to 5.1)		2015-2023 0.5 (-0.5 to 6.3)
35-54 years		2015-2023 -0.0 (-5.0 to 5.4)		2015-2023 0.2 (-5.2 to 5.9)
≥55 years		2015-2023 2.8 (-1.3 to 7.1)		2015-2023 3.2 (-1.1 to 7.7)

<sup>+</sup>Prevalence estimates based on weighted data; <sup>\*\*</sup> Due to the low number of female users of oral tobacco products, prevalence rates for females could not be reliably computed Note: **Bold** indicates statistically significant at the p<0.05 level



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Prevalence<sup>+</sup> *dual cigarette and e-cigarette* for adult participants in the US NHIS 2015 to 2023 combined and by different age groups and for males and females

Age Groups	Males and Females Combined	APC% (95% CI)	Males Only	APC% (95% CI)	Females Only	APC% (95% CI)
≥18 years		2015-2020 <b>-9.5</b> (-20.6 to -4.3)  2020-2023 <b>17.2</b> (4.1 to 42.2)		2015-2021 -6.6 (-28.8 to 29.4)  2021-2023 28.9 (-6.3 to 61.2)		2015-2020 -10.6 (-31.5 to 0.1)  2020-2023 16.7 (-3.8 to 55.8)
18-24 years		2015-2023 0.1 (-4.5 to 5.0)		2015-2023 0.4 (-13.6 to 16.8)		2015-2018 <b>13.5</b> (0.4 to 46.7)  2018-2023 -7.3 (-26.2 to -1.0)
25-34 years		2015-2023 2.9 (-5.5 to 12.2)		2015-2023 3.1 (-4.3 to 11.2)		2015-2023 2.2 (-9.0 to 14.7)
35-54 years		2015-2020 <b>-10.5</b> (-25.2 to -3.6)  2020-2023 <b>22.3</b> (4.9 to 54.6)		2015-2021 <b>-8.8</b> (-18.6 to -3.9)  2021-2023 <b>42.9</b> (9.9 to 73.5)		2015-2017 <b>-29.4</b> (-42.8 to -2.8)  2017-2023 7.4 (-1.1 to 33.3)
≥55 years		2015-2020 <b>-19.8</b> (-34.1 to -12.3)  2020-2023 <b>23.1</b> (1.8 to 63.7)		2015-2020 <b>-24.3</b> (-48.9 to -11.9)  2020-2023 32.2 (-2.2 to 106.6)		2015-2018 <b>-25.1</b> (-46.9 to -5.8)  2018-2023 6.8 (-5.8 to 44.6)

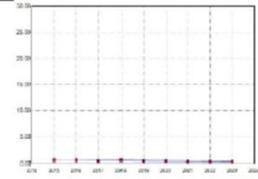
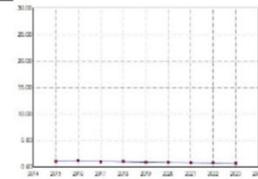
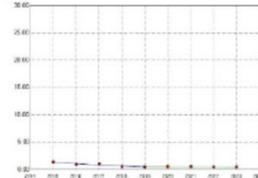
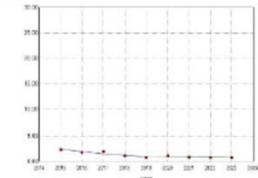
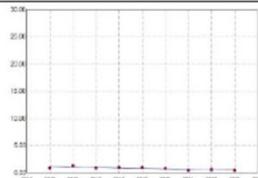
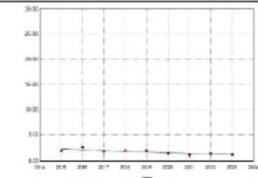
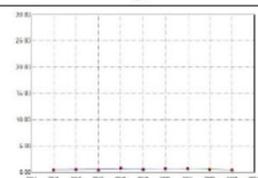
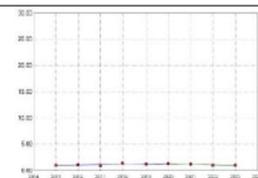
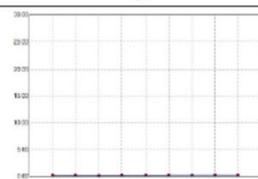
<sup>+</sup>Prevalence estimate based on weighted data; Note: **Bold** indicates statistically significant at the p<0.05 level



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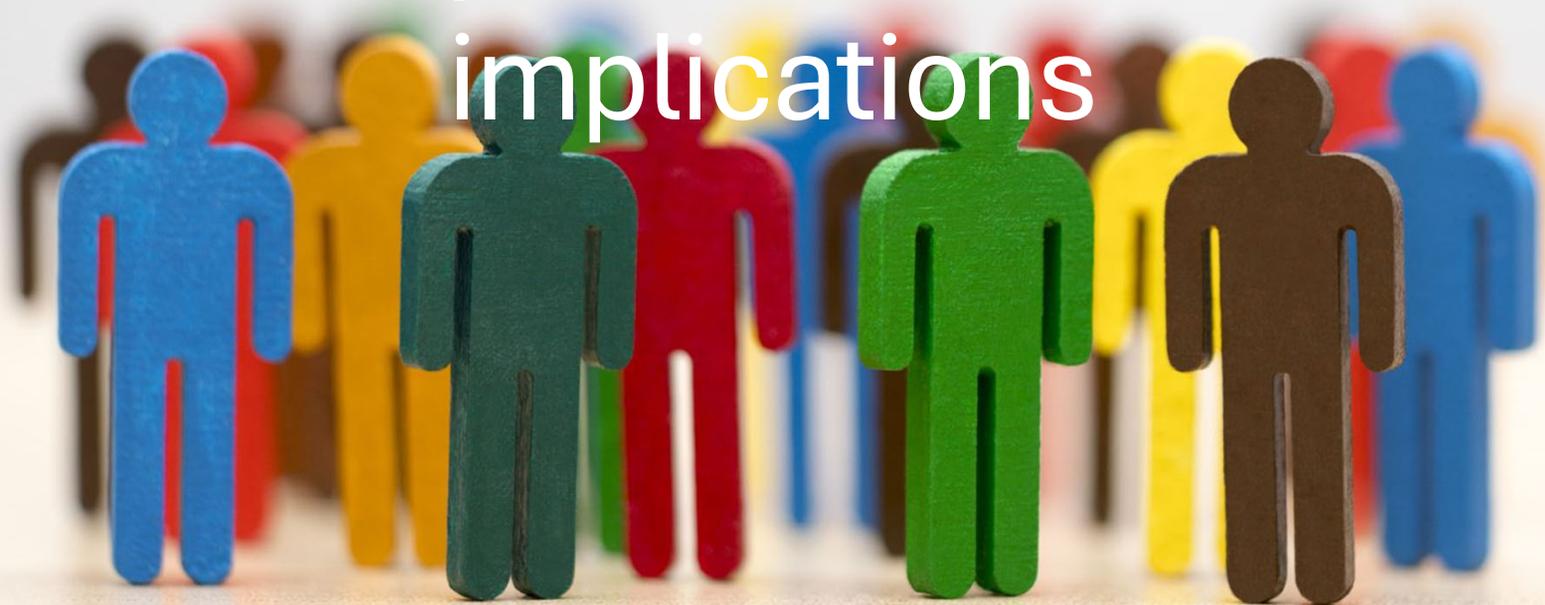


Prevalence<sup>+</sup> of dual cigarette and oral tobacco use\* participants in the US NHIS 2015 to 2023 combined and by different age groups and for males only\*\*

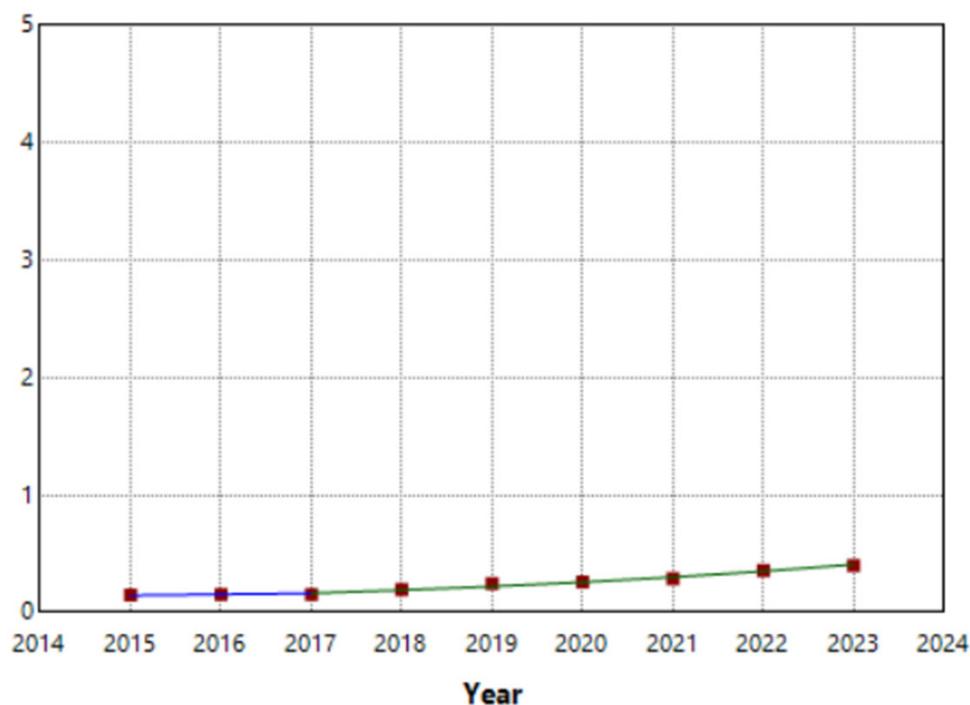
Age Groups	Males and Females Combined	APC% (95% CI)	Males Only	APC% (95% CI)
≥18 years		2015-2023 <b>-5.6</b> (-8.2 to -2.9)		2015-2019 <b>-5.9</b> (-9.0 to -2.8)
18-24 years		2015-2019 <b>-23.4</b> (-41.4 to -13.0)  2019-2023 <b>-1.8</b> (-13.7 to 28.4)		2015-2019 <b>-20.8</b> (-34.3 to -14.3)  2019-2023 <b>-3.8</b> (-11.0 to 16.3)
25-34 years		2015-2023 <b>-9.6</b> (-15.1 to -3.6)		2015-2023 <b>-8.9</b> (-14.9 to -2.4)
35-54 years		2015-2021 <b>-5.5</b> (-0.0 to 24.0)  2021-2023 <b>-17.2</b> (-29.5 to 0.5)		2015-2020 <b>5.8</b> (0.9 to 22.3)  2020-2023 <b>-9.6</b> (-23.4 to -0.9)
≥55 years		2015-2023 <b>2.3</b> (-5.8 to 11.3)		2015-2023 <b>-3.8</b> (-6.8 to -0.6)

\*Prevalence estimates based on weighted data; \*\*Due to the low number of female users of oral tobacco products, prevalence of dual cigarette and oral tobacco use for females could not be reliably computed; Note: **Bold** indicates statistically significant at the p<0.05 level

# Population health implications



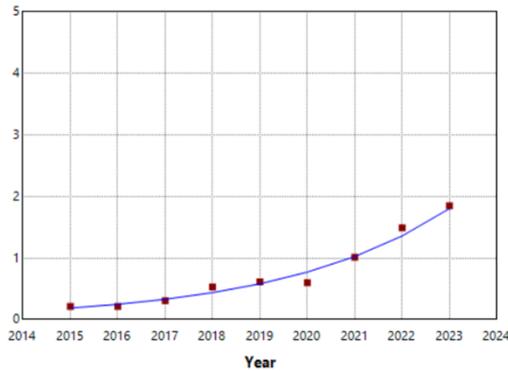
# Ratio of exclusive non-combusted tobacco prevalence to any combusted tobacco use prevalence (harm reduction index)



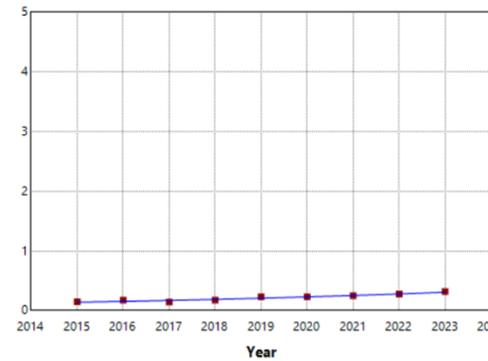
Age Group:  $\geq 18$  years  
Males and Females Combined  
Time Period: 2015-2017  
Average percentage change: 6.1  
95% Confidence interval (-0.3 to 14.4)

Time period: 2017-2023  
Average percentage change: 16.5%  
95% Confidence interval: (14.1 to 23.9)

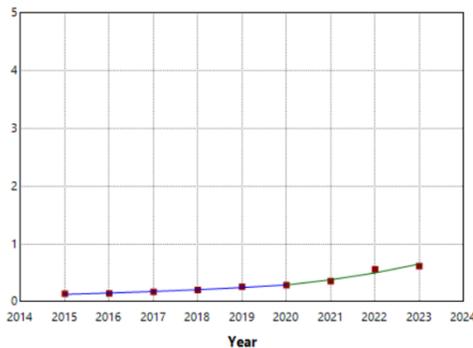
# Ratio of *exclusive* non-combusted tobacco prevalence to *any* combusted tobacco use prevalence (harm reduction index)



Age Group: 18-24 years  
 Males and Females Combined  
**Average percentage change: -32.8%**  
 95% Confidence interval:(26.0 to 39.8)

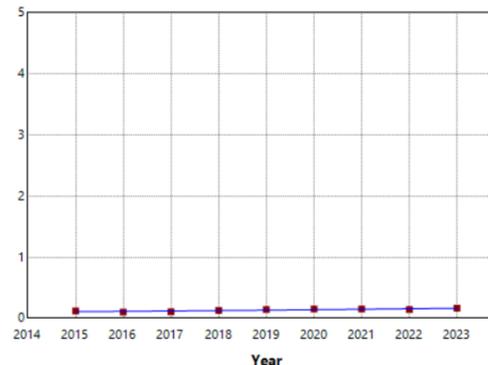


Age Group: 35-54 years  
 Males and Females Combined  
**Average percentage change: 10.3%**  
 95% Confidence interval: (7.6 to 13.1)



Age Group: 25-34 years  
 Males and Females Combined  
 Time Period: 2015-2020  
**Average percentage change: 17.7%**  
 95% Confidence interval:(4.4 to 23.9)

Time Period: 2020-2023  
**Average percentage change: 31.2%**  
 95% Confidence interval:(20.2 to 48.8)



Age Group: 55+ years  
 Males and Females Combined  
**Average percentage change: 5.4%**  
 95% Confidence interval: (1.6 to 9.2)

# Conclusions

- **Exclusive use of combustible tobacco** (mostly cigarettes), *is declining slowly* but remains the most prevalent pattern of tobacco use, especially in older adults.
- **Exclusive use of non-combustible tobacco** (mostly ECs) is *replacing combustible tobacco use*, especially among younger adults.
- The prevalence of *dual use is relatively low overall and stable* between 2015 to 2023.
- The main dual use pattern observed is cigarettes and e-cigarettes
- Between 2015 to 2023, *decreasing use of combusted tobacco products and increases in non-combusted tobacco* suggesting a potential net benefit to population health among current tobacco users