E-Cigarette Use Transitions: a Case Study from Waves 1 & 2 of the PATH Study

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Disclosure

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- The presenter has not received any industry funding.
- No off-label medication use will be discussed.
Case Study

- Descriptive case study: beginning to assess the natural history of e-cigarette use behavior, and its relation to cigarette smoking
- E-cigarette and cigarette use transitions from W1-W2 of the PATH Study
  - Initiation
  - Switching
- Transitions are descriptive; will not provide definitive answers re: ENDS

Please Note:

- Due to time constraints, not presenting transitions in other tobacco use
- Data is descriptive and all estimates are preliminary
  - E-cigarette/ENDS product environment has been evolving during this time
THE POPULATION ASSESSMENT OF TOBACCO AND HEALTH (PATH) STUDY
The PATH Study Methodology

**Longitudinal** cohort design

**Nationally representative sample** of U.S. civilian, non-institutionalized population ages 12 years and older

**Four-stage, stratified probability** sample design

**Up to two adults** and **up to two youths** (12-17 years) enrolled per household; a “shadow sample” of youth ages 9 to 11 years was selected for use as a refresher sample

**Data collection: W1:** September 2013 to December 2014

**W2:** October 2014 to October 2015

**W1 sample size:** 32,320 adults 18+ years; 13,651 youth 12-17 years

**W2 sample size:** 34,559 adults (of which 2,239 were aged-up adults) and 13,967 youth (of which 2,555 were aged-up youth)

**W1 weighted response rates:** household screener was 54.0%. Among screened households, W1 weighted response rate: 74.0% adults and 78.4% youth

**W2 weighted response rates** among sampled youth and adults in Wave 2 were 83.2% and 87.3% respectively

**Population and replicate weights** were created that adjusted for the complex study design and nonresponse at Waves 1 and 2
### Wave 1 (2013-2014): Introduction to E-cigarette measures

*The next questions are about **electronic cigarettes**, often called **e-cigarettes**. E-cigarettes look like regular cigarettes, but are battery-powered and produce vapor instead of smoke. Some common brands include NJOY, Blu and Smoking Everywhere.*

### Wave 2 (2014-2015): Introduction to E-cigarette/ENDS measures

*The next questions are about **electronic nicotine products**, such as e-cigarettes, e-cigars, e-hookahs, e-pipes, vape pens, hookah pens, and personal vaporizers. These products are battery-powered, use nicotine fluid rather than tobacco leaves, and produce vapor instead of smoke. Some common brands include Fin, NJOY, Blu, e-Go and Vuse.*
ENDS Products Updated at Waves 2, 3, 4

E-cigarettes

E-cigs

E-pipes

E-hookahs

Electronic Nicotine Products
(other than E-cigarettes)
WAVE 1 TO WAVE 2 TRANSITIONS: E-CIGARETTE USE IN THE PATH STUDY

Exploring initiation among never users:

- What proportion of young people initiate tobacco use in a given year?
- To what extent are young people initiating with e-cigarettes compared with traditional cigarettes?
**Tobacco Use Transitions: Never Users**

- **Wave 1**
  - Never Tobacco Use

- **Wave 2**
  - Past 30 Day Any Tobacco Use
  - Past 30 Day Cigarette Smoking
  - Past 30 Day E-Cigarette Use

**Never User** – Never used a tobacco product in wave 1

**Any tobacco use** – use of any tobacco product (not limited to cigarettes or e-cigarettes)

**Initiation** among youth and young adults defined as those reporting never using a tobacco product at W1 and reporting past 30 day use of a product at W2. W2 transitions to cigarette smoking and e-cigarette use do not necessarily represent exclusive use of such products.
Tobacco use initiation among never tobacco users, the PATH Study W1 to W2

- 5.3% of youth and 8.1% of young adults initiated any tobacco use between Waves 1 & 2.

- Slightly more W1 youth never users initiated with e-cigarettes compared with cigarettes, while the opposite was true for young adults.

Wave 1 Never Tobacco Users

- W2 any tobacco use: 5.3% youth, 8.1% young adults
- W2 e-cigarette use: 2.2% youth, 2.1% young adults
- W2 cigarette use: 1.6% youth, 3.2% young adults

W1 never tobacco users are defined as those who reported never having used a tobacco product (even 1-2 times) at W1. Initiation among never tobacco users was defined as W1 never use to W2 past 30 day use of the specified product for youth and young adults. Any tobacco use is defined as use of any tobacco product (not limited to cigarettes or e-cigarettes). Users include both exclusive and polytobacco users. Youth are defined as respondents aged 12-17 years at W1, young adults are defined as respondents aged 18-24 years at W1.
## Products used among Any New Current Users at Wave 2

<table>
<thead>
<tr>
<th>Product at Wave 2</th>
<th>Youth</th>
<th>Young adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarettes</td>
<td>31%</td>
<td>39%</td>
</tr>
<tr>
<td>E-cigarettes</td>
<td>43%</td>
<td>26%</td>
</tr>
<tr>
<td>Cigars</td>
<td>23%</td>
<td>26%</td>
</tr>
<tr>
<td>Hookah</td>
<td>26%</td>
<td>44%</td>
</tr>
<tr>
<td>Smokeless</td>
<td>10%</td>
<td>#</td>
</tr>
<tr>
<td>Pipe</td>
<td>#</td>
<td>#</td>
</tr>
</tbody>
</table>

**Any New Current Use:** Any past 30-day use of each product at W2 among W1 never tobacco users who initiated any tobacco use by W2.

#: estimate suppressed because statistically unreliable; based on a sample size of less than 50, or the coefficient of variation of the estimate is larger than 30 percent.
Tobacco use initiation among never tobacco users: summary

- 8.1% of young adults aged 18-24 years at W1 and 5.3% of youth aged 12-17 years at W1 initiated any tobacco use between W1 and W2.

- Slightly more W1 youth initiated with e-cigarettes compared with cigarettes, while the opposite was true for young adults.

- Among W1-W2 new tobacco users, new current use of e-cigarettes was most prevalent for youth, and new current use of hookah was most prevalent for young adults.
Transitions among Youth and Young Adults:
- To what extent do youth/young adult users at Wave 1 sustain use at Wave 2?
- Do transition patterns differ by W1 use profiles?
Over half of youth and young adult W1 e-cigarette users did not report past 30 day e-cigarette use at W2

20-30% of youth and young adult W1 cigarette smokers did not report past 30 day smoking at W2

For each product, past 30-day use at each wave defined as having used the product at least once in the past 30 days. Discontinuance is defined as a respondent reporting 1) W1 past 30 day use of a particular product and 2) no past 30 day use of that product in W2. Users may continue using other tobacco products. Youth are defined as respondents aged 12-17 years at Wave 1; Young Adults are defined as respondents aged 18-24 years at Wave 1.
What happens to Wave 1 Past 30 Day Users at Wave 2?

W1 to W2 transitions focused on past 30 day e-cigarette and cigarette use status, not accounting for use of other tobacco products (including cigars, smokeless tobacco, hookah, etc.) nor whether respondents are exclusive product users or polytobacco users. Transitions to other tobacco use are not displayed.
Tobacco Use Transitions, the PATH Study, W1-W2

<table>
<thead>
<tr>
<th>W1 Past 30 Day Use Status</th>
<th>Youth W2 Past 30 Day Use</th>
<th>Young Adult W2 Past 30 Day Use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Any cigarette use</td>
<td>No cigarette use, E-cigarette use</td>
</tr>
<tr>
<td>Cigarette use, no E-cigarette use</td>
<td>69.9% (ecig+cig=29.1%)</td>
<td>4.8%</td>
</tr>
<tr>
<td>Cigarette use and E-cigarette use</td>
<td>70.5% (ecig+cig=43.1%)</td>
<td>11.0%</td>
</tr>
<tr>
<td>No cigarette use, E-cigarette use</td>
<td>29.2% (ecig+cig=16.6%)</td>
<td>20.2%</td>
</tr>
</tbody>
</table>

*For each product, past 30-day use at each wave defined as having used the product at least once in the past 30 days. Respondents could also be using other tobacco products besides cigarettes and e-cigarettes at W1 & W2. The % transitioning to other tobacco products is not shown. Youth are defined as respondents aged 12-17 years at Wave 1. Young Adults are defined as respondents aged 18-24 years at Wave 1.
The majority of past 30 day cigarette smokers at W1 continued smoking at W2, irrespective of whether they were also using e-cigarettes at W1.

Past 30 day e-cigarette-only users were more likely to report not using tobacco in W2, compared with prior two groups.

Nearly 30% of W1 youth and young adult past 30 day e-cigarette (no cigarette) users transitioned to cigarette smoking by W2. Need to explore prior cigarette smoking history among this population....
At W1, 45% of youth past 30 day e-cigarette users were also current smokers.

24% of youth baseline e-cigarette users had no history of cigarette smoking.
W1-W2 transitions among youth W1 past 30 day e-cigarette users, by smoking status

*Indicates suppression of estimate with RSE>30% or denominator<50. For each product, past 30-day use at each wave defined as having used the product at least once in the past 30 days. Respondents could be using other tobacco products at W1. Youth are defined as respondents aged 12-17 years at W1.

* Indicates suppression of estimate with RSE>30% or denominator<50.
W1-W2 transitions among W1 youth past 30 day e-cigarette users, accounting for smoking status: summary

- Over half of never cigarette smokers transitioned from W1 e-cigarette use to no tobacco use at W2

- Most W1-W2 cigarette smoking transitions were concentrated among W1 past 30 day youth e-cigarette users with prior cigarette smoking history
  - Few W1 never smoking e-cigarette users transitioned to cigarette smoking (estimates were suppressed)

- More work is needed to understand if these patterns hold over time, and to explore what factors are driving observed transition patterns (e.g., risk factors for tobacco use).
WAVE 1 TO WAVE 2 TRANSITIONS: E-CIGARETTE USE IN THE PATH STUDY

Transitions among Wave 1 Adult Smokers:
- Do transition patterns differ by W1 use profiles?
What happens to Wave 1 Past 30 Day Adult Cigarette Smokers at Wave 2?

W1 to W2 transitions focused on past 30 day e-cigarette and cigarette use status, not accounting for use of other tobacco products (including cigars, smokeless tobacco, hookah, etc.) nor whether respondents are exclusive product users or polytobacco users. Transitions to other tobacco use are not displayed.
Transitions among adult cigarette smokers, PATH Study W1 to W2

<table>
<thead>
<tr>
<th>W1 Past 30 day use status</th>
<th>Age group</th>
<th>W2 any cigarette smoking</th>
<th>W2 e-cigarette, no cigarette use</th>
<th>W2 no tobacco use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarette (no e-cigarette) smokers</td>
<td>Age 18-24</td>
<td>78.7%</td>
<td>3.4%</td>
<td>13.1%</td>
</tr>
<tr>
<td></td>
<td>Age 25+</td>
<td>88.7%</td>
<td>1.2%</td>
<td>8.8%</td>
</tr>
<tr>
<td>Cigarette + e-cigarette users</td>
<td>Age 18-24</td>
<td>83.3%</td>
<td>5.3%</td>
<td>8.3%</td>
</tr>
<tr>
<td></td>
<td>Age 25+</td>
<td>89.1%</td>
<td>4.7%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>

For each product, past 30-day use at each wave is defined as having used the product at least once in the past 30 days. Respondents could also be using other tobacco products besides cigarettes and e-cigarettes. Adults are defined as respondents aged 18+ years at Wave 1.
Majority of past 30 day cigarette smokers at W1 continued smoking at W2, irrespective of whether they were also using e-cigarettes at W1
- % reporting no smoking at W2 were similar between groups

Approximately 5% of both young and older adults who reported W1 use of both cigarette and e-cigarettes completely transitioned to e-cigarette use by W2, compared to 1-3% of W1 smokers who didn’t use e-cigarettes

Slightly higher proportions of younger and older adult cigarette-only smokers transitioned to no tobacco use at W2, compared to dual cigarette and e-cigarette users.

More work is needed to understand what is driving these observed patterns (e.g., level of dependence) and account for differences in device type
WAVE 1 TO WAVE 2 TRANSITIONS: E-CIGARETTE USE IN THE PATH STUDY

Summary and Challenges
Summary: tobacco use transitions, PATH Study W1 to W2

- **W1 Never users:** E-cigarettes are popular with new W2 youth users
- **Across all W1 users:** Majority of past 30 day cigarette smokers at W1 continued smoking at W2, irrespective of whether they were also using e-cigarettes at W1
- **W1 Youth and Young Adult Users:** Substantial discontinuance observed among cigarettes smokers, but even greater discontinuance among e-cigarette users
- **W1 Youth Users:** Most W1 to W2 transitions to cigarette smoking among W1 e-cigarette users were observed among youth with prior cigarette smoking experience
- **W1 Adult Cigarette Smokers:** No significant difference in the % reporting no smoking at W2 between W1 cigarette only and dual cigarette and e-cigarette users
Limitations of our descriptive case-study approach:

- Descriptive transitions presented do not account for changes in frequency or days of use.

- Results from univariate analyses - meant to describe the natural history of e-cigarette and cigarette use transitions. Multivariate modeling needed to further examine the impact of e-cigarette use on other tobacco use behaviors.
  - Concerns regarding self-selection (particularly dependence levels among adults, risk profiles among youth) are not addressed.

- Future analyses should consider ENDS device type.

- Other product use (cigar smoking, hookah, smokeless) not addressed.
Challenges interpreting early transition data from the PATH Study

- E-cigarette/ENDS use measures have changed in effort to capture use of evolving products
  - Language consumers use to describe their products may evolve with a changing marketplace and may differ among sub-populations; may affect self-identification of use status in the PATH Study

- Transitions observed during the early years of the PATH Study might reflect use of “first generation” e-cigarette products
  - E-cigarette devices are evolving while participants are under study follow-up
  - If later generation devices differ in nicotine delivery, product appeal and/or satisfaction level, different behavioral patterns may emerge over time
Thank You

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