Initiation of Traditional Cigarette Smoking after E-Cigarette Use Among Tobacco-Naïve Young Adults

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• Robert Hoffman, MD
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Disclosures

• None
What is an E-Cigarette?

LED lights up when the smoker draws on the cigarette

Sensor detects when smoker takes a drag

Heater vaporises nicotine

BATTERY controls heater and light

MICROPROCESSOR

CARTRIDGE holds nicotine dissolved in propylene glycol

SOURCE: SAXHLE, VERSPAN
E-Liquid

- Propylene glycol
- Glycerin
- Flavorings
- Nicotine
4-pack Cherry Crush Disposables

Cherry Crush is in disposables! But now it’s better than ever: Totally reformulated juice gives a more tangy burst of cherry flavor. A better battery allows you to vape even longer. And, our improved vapor delivery system gives you a smooth, full-flavor experience unlike anything you’ve ever had from blu. The Cherry Crush Disposable is sure to satisfy.

Availability: In Stock

$39.95

QTY

1

Add to Cart

Cherry Crush Disposables (Nicotine content approximately 17–24mg per disposable)

- Ingredients: Nicotine, Propylene Glycol and Vegetable Glycerin, Natural and Artificial Flavors, Distilled Water.
PLUS+ Xpress Kit

- Simple to use
- 2 Classic Tobacco blu Tanks™ (500+ puffs per Tank!)
- 1 PLUS™ rechargeable battery (lasts 2x as long as blu Rechargeable)
- 1 USB Charger
- Pack not included

Availability: In Stock

$14.99

QTY

[1] Add to Cart

Nicotine Concentration: (2.4% nicotine per tank)
- Ingredients: Nicotine, Propylene Glycol and Vegetable Glycerin, Natural and Artificial Flavors, Distilled Water.

The people have spoken. Read reviews of the blu PLUS+ Kit.

View Testimonials
“Mid-Size” Generation

- Refill with e-juice
- eGo
- $5-15
- USB charger
E Liquid E Juice Large 20/30 ML Bottle Choice Flavors For Vaporizers

BUY 2 GET 1 FREE. MINIMUM 3 ORDER. EBAY WILL LOWER THE PRICE OF ALL 3 ITEMS TO MAKE ONE OF THE THREE FREE. USE “ADD TO CART” BUTTON FOR EASY ORDERING. OUR PLEDGE: YOUR COMPLETE ...

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$3.99
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Shop
Prevalence of ENDS use

- Among U.S. high school students
  - Increased nearly 800% between 2011 and 2014
  - More prevalent than cigarettes
    - 13.4% vs. 9.2%

Arrazola, 2015
# Toxicants in Vapor

<table>
<thead>
<tr>
<th>Toxicant</th>
<th>Conventional vs. E-Cigarette Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formaldehyde</td>
<td>9</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>130</td>
</tr>
<tr>
<td>Acrolein</td>
<td>4</td>
</tr>
<tr>
<td>Toluene</td>
<td>23</td>
</tr>
<tr>
<td>NNN</td>
<td>145</td>
</tr>
<tr>
<td>NNK</td>
<td>30</td>
</tr>
<tr>
<td>Cadmium</td>
<td>16</td>
</tr>
<tr>
<td>Nickel</td>
<td>15</td>
</tr>
</tbody>
</table>

Goniewicz et al., *Tobacco Control*, 2013
Harm Reduction Argument

• If these devices replace cigarettes, harm could be a fraction of what it is today
• Analogous to methadone for heroin addicts
  – Still get drug
  – Don’t get associated toxins
On the Other Hand ...

- Could be a perfect “starter cigarette”
- May lead to habituation in nicotine-naïve individuals
- Three longitudinal studies have shown a longitudinal association
  - Local (Los Angeles, Hawaii); none nationally representative
  - Focus on youth, but looking at young adults may be particularly valuable

Moore, 2014; Schraufnagel, 2015
Purpose

• Longitudinally follow a nationally-representative sample of non-smoking young adults
• Assess association between baseline e-cigarette use and progression to cigarette smoking 18 months later
Setting

- Nationally-representative sample of participants with help from GfK
- Recruited via random digit dialing (both landline and cell phones) and address-based sampling
- Sampling frame 97% of U.S.
- Wave 1: March 2013
- Wave 2: October 2014
Population & Procedures

- 18-30 years old at baseline
- Never taken a puff of a cigarette at baseline
- IRB approved
- $20 equivalent for completion at each wave
Independent Variable

- Whether participants had ever used an e-cigarette at baseline
Dependent Variable

- Initiation of traditional cigarette smoking by follow-up
Covariates

- Age
- Sex
- Race/ethnicity
- Education level
- Relationship status
- Living situation
- Self-esteem
- Household income
- Sensation seeking
- Rebelliousness
Analyses

• Logistic regression
• Survey weights took into consideration over/under-coverage and loss to follow up
• Primary analyses controlled for all covariates
• Sensitivity analyses
  – Raw data without survey weights
  – Only covariates with association with outcome P<.15
  – Covariates as continuous instead of categorical
Sample

- Wave 1: N = 1506
- Wave 2: N = 915 (60.8%)
- No significant differences between responders and non-responders in terms of sociodemographics
  - Age ($P= .38$)
  - Sex ($P= .36$)
  - Race ($P= .20$)
## Sample

<table>
<thead>
<tr>
<th></th>
<th>Unweighted</th>
<th>Weighted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>61.6%</td>
<td>50.3%</td>
</tr>
<tr>
<td>White</td>
<td>64.8%</td>
<td>55.2%</td>
</tr>
<tr>
<td>Black</td>
<td>10.9%</td>
<td>14.6%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>14.2%</td>
<td>19.7%</td>
</tr>
<tr>
<td>Age, median (IQR)</td>
<td>23 (20-26)</td>
<td>23 (20-27)</td>
</tr>
</tbody>
</table>
Baseline E-cigarette Use

- Unweighted: $16 / 915 = 1.8\%$
- Weighted: $801,010 / 32,040,393 = 2.5\%$
Uptake of Traditional Smoking (Non-Weighted)

- E-cigarette users: 6/16 (37.5%)
- Non-e-cigarette users: 81/899 (9.0%)

$P < .001$
Uptake of Traditional Smoking (Weighted)

- E-cigarette users: 47.7%
- Non-e-cigarette users: 10.2%

$P = .001$
<table>
<thead>
<tr>
<th>E-cigarette Use at Baseline</th>
<th>Initiation of Cigarette Smoking AOR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>1 [REF]</td>
</tr>
<tr>
<td>Yes</td>
<td>6.8 (1.7-28.3)</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
</tr>
<tr>
<td>18-20</td>
<td>1 [REF]</td>
</tr>
<tr>
<td>21-23</td>
<td>0.9 (0.4-2.0)</td>
</tr>
<tr>
<td>24-26</td>
<td>0.7 (0.2-2.4)</td>
</tr>
<tr>
<td>27-30</td>
<td>0.3 (0.1-0.9)</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>Initiation of Cigarette Smoking AOR (95% CI)</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>White</td>
<td>1 [REF]</td>
</tr>
<tr>
<td>Black</td>
<td>1.4 (0.4-4.2)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>3.1 (1.3-7.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rebelliousness</th>
<th>Initiation of Cigarette Smoking AOR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>1 [REF]</td>
</tr>
<tr>
<td>Medium</td>
<td>1.3 (0.5-3.0)</td>
</tr>
<tr>
<td>High</td>
<td>4.4 (1.8-10.9)</td>
</tr>
</tbody>
</table>
All Non-Significant

- Sex
- Relationship Status
- Living Situation
- Household Income
- Education Level
- Self-Esteem
- Sensation Seeking
Additional Analyses

• All same
Summary

• Only a small percentage of never smokers had experimented with e-cigarettes
• But that initial e-cigarette use was significantly associated with transition to cigarettes
Low Number of Initial E-cigarette Users

• However, this is increasing according to CDC data
• May be valuable to repeat
• Wide CIs, but robust in sensitivity analyses
Potential Value of E-Cigarettes

• Anecdotal and focus group evidence
  – Physical sensations
  – Vaping community/identity/“hobby”

• Specific populations
  – Schizophrenics
  – “Nothing else works”
Concern 1: Gateway?

• May bring in new users
• Provides nicotine in highly acceptable, youth-oriented form
Concern 2: Benefit even for intended audience?

- May not actually help many smokers quit
- Remain dual users and not actually lower toxicant load substantially
- May just keep cycle of addiction to nicotine going
- Allows people to cope with anti-smoking regulations
Concern 3: Dialing back public health?

- Renormalizing nicotine use
- Re-introducing powerful images and cues
Tobacco Industry

- Lorillard (Blu)
- Reynolds American (Vuse)
- Altria (MarkTen)
Summary

• ENDS do seem to provide a gateway, at least for some
• Continue surveillance
• Continue tracking trajectories
  – Gateway in
  – Gateway out
Thank You!

bprimack@pitt.edu

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Center for Research on Media, Technology, and Health

@CRMTH_Pitt
Concern 4: Toxicity?

- High variability because of lack of regulation
- Some studies show increased toxins *(NEJM 2015)*
- “Popcorn lung” (bronchiolitis obliterans)
- Nicotine
how much nicotine is in a pack of menthol light cigs? I'm trying to figure out what mg of nicotine I need in my juice, I don't want to take in more then I was with analogs. If the bottle says 24mg of nicotine, is that in the entire bottle or every drop?

Cigs range from .7mg to 1.5mg per cig. Would need a brand name to give you the exacts...but doesn't really matter, the absorption rate for vaping is slower then for smoking. There really isn't a you smoked xyz..you need 2.5mls of 18mg liquid. It just doesn't convert that way.

eliquid is given in ml's...there are 24mg in each ml of eliquid....or 2.4% nicotine. (or 16mg per ml,...1.6% nic ect ect ect)
Nicotine Levels

- Extra strong: 24-36 mg/mL
- Full flavored: 16-18 mg/mL
- Light: 10-12 mg/mL
- Ultra light: 6-8 mg/mL
- Zero-nicotine: 0 mg/mL (sort of)
Age Certification

Intended for sale to adults 18 years or older. If you are not legally able to purchase tobacco products in the state where you live, please do not enter this site.

I'M OVER 18, I WANT TO LOGIN
What’s Your Flavor?

BLU EMPLOYEES REVEAL THEIR FAVORITE FLAVOR
Cigalike Brands

- Njoy
- E-Lites
- Ever Smoke
- SkyCig
- V2
- Pure
- Green Smoke
- White Cloud

- Blu
- E-Tron
- Fling
- Krave
- Logic
- Misitic
- OneJoy
- Pro Smoke
$15.99 on Amazon
Mid-Size Brands

- Apollo
- Aqua Vapor
- Desire
- Joyetech
- Panda

- Kik Sticks
- Sharp Smoker
- Totally Wicked
- Vision
Amounts of Liquid

- Average liquid per day: 3-4 mL
- Average nicotine: 18 mg/mL
- Average daily dose of nicotine: 54-72 mg
  - But only about 10-40% absorbed
  - Resulting in 5-25 mg of nicotine
- Each cigarette delivers about 1 mg nicotine (20 mg per pack)
- Lethal dose for humans generally accepted as 30-60 mg
Ask For One Of Our 14+ Flavors

- Tobacco Flavor
- Wrangler Flavor
- Sands Flavor
- Mint Flavor
- Mango Flavor
- President Flavor
- Vanilla Flavor
- Coffee Flavor
- Chocolate Flavor
- Apple Flavor
- Strawberry Flavor
- Mojito Flavor
- Cherry Flavor