



# Nicotine Dependence and the Truth Behind Vaping

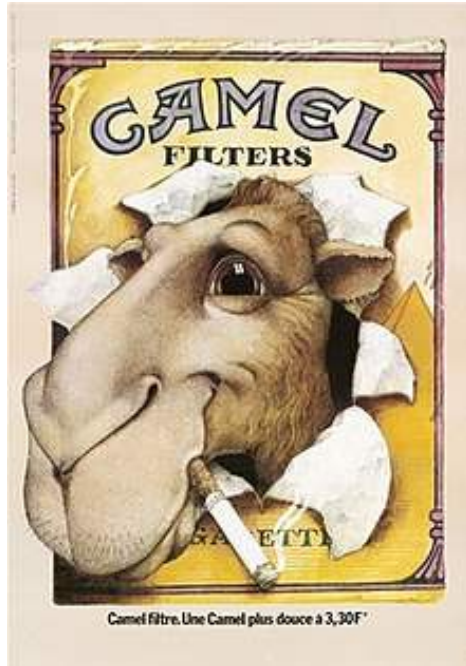
Alyssa Dittner

# Objective:

---

- History and Evolution of Marketing
- Nicotine Dependence
- Composition of Vape Juice
- Impact of Nicotine on Adolescents
- Vaping vs. Nicotine Replacement Therapy (NRT)

# History of Smoking and Marketing



## 19th Century

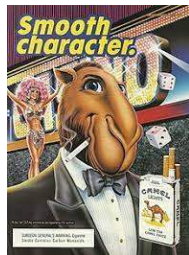
- Rise of cigar and Cigarette production, make it accessible and affordable
- Early marketing with targeted the wealthy

## 20<sup>th</sup> Century

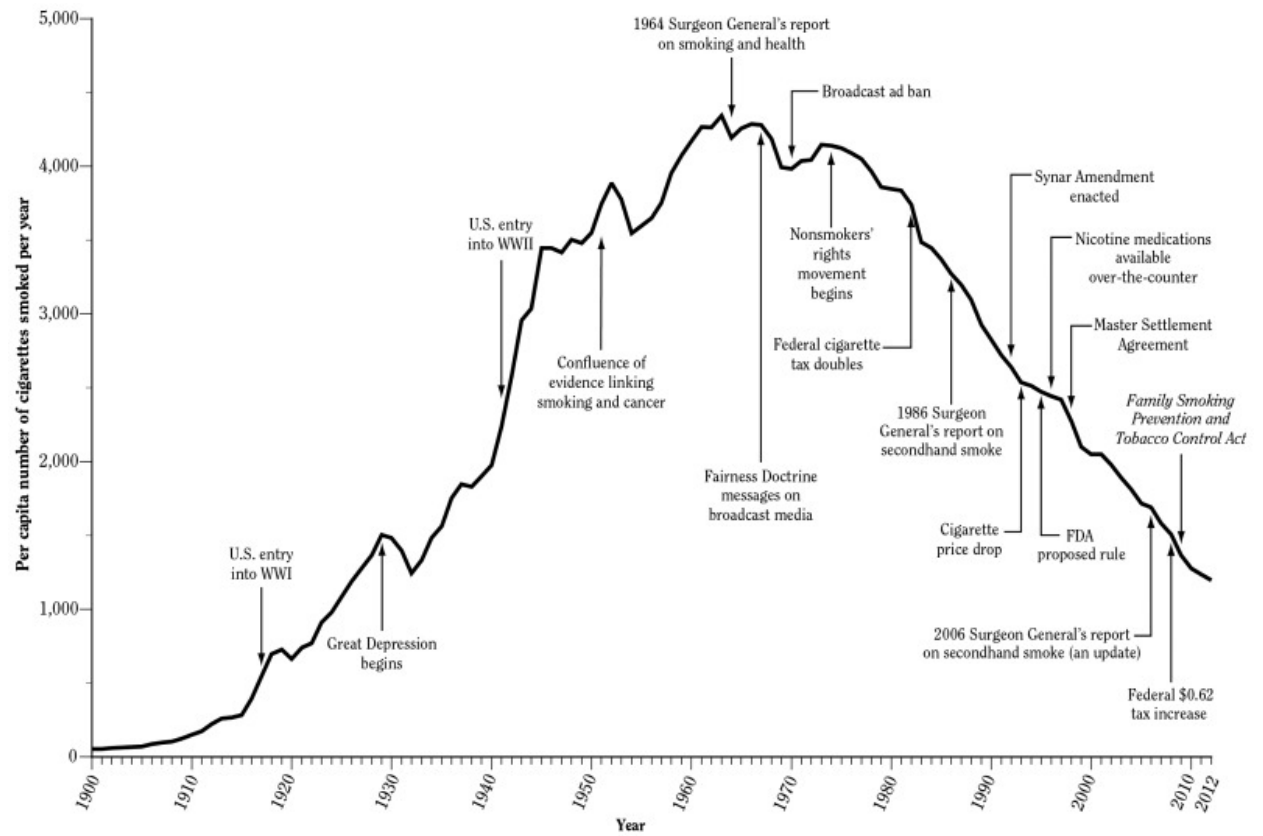
- Golden age of smoking- extensive advertising using celebrity endorsements and health claims.
- 1950-60s: Link between smoking and health issues recognized; regulation on ads start
- 1964 first surgeon Generals report led to mandatory health warnings

## Late 20<sup>th</sup> Century to Present

- Advertising Bans- stricter regulations through TV and radio ads ban
- Shift to Lifestyle Marketing- targeting lower income demographics and using imagery of glamour
- 2003 E-cigarettes and vaping developed by Hon Lik in China and introduced to the US in 2007



# Tobacco Consumption Responding to Events



# Electronic nicotine Delivery systems (ENDS)

## First Generation: "Cig-a-like"

- Designed to look like traditional cigarettes.
- Aimed to help smokers transition by offering a familiar form and promoting harm reduction.

## Second Generation: "Vape Pen"

- Introduced refillable e-liquid tanks.
- Allowed customization with different e-liquids, nicotine levels, and flavors.

## Third Generation: "Personal Vaporizer"

- Featured larger tanks and digital controls.
- Enabled voltage adjustments, allowing users to control nicotine delivery and vapor production.



# What is in Vape Pens? Nicotine

- **Increased Heart Rate and Blood Pressure:**
  - Raises heart rate and blood pressure; stresses the cardiovascular system.
- **Respiratory Effects:**
  - Irritates airways and lungs; can lead to respiratory issues and reduced lung function.
- **Circulation Impact:**
  - Constricts blood vessels; decreases blood flow and oxygen delivery, contributing to cardiovascular diseases.
- **Reproductive Health Risks:**
  - Exposure during pregnancy can cause complications, such as low birth weight and premature birth.

## Long-Term Consequences

- **Cardiovascular Disease:** 2–4-time higher chance of heart attack or stroke
- **Respiratory Disorders:** 75% of COPD diagnosis are attributed to smoking. Risk of lung cancer is 15-30 times more likely
- **Mental Health Issues:**
  - Greater risk of anxiety 30-50% and 2-3 times more likely to experience depression.

# What Causes Nicotine Dependence?

Inhaled nicotine enters the lungs its rapidly absorbed into the blood stream

8-10 Seconds for nicotine to reach the brain  
and 5 minutes to reach maximal levels

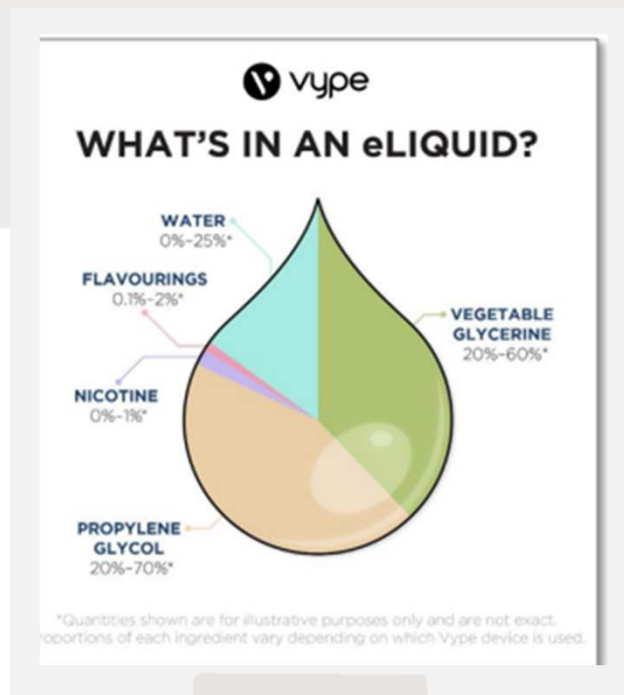
Nicotine absorbed through a mucosal lining  
takes 30 minutes to reach maximal levels

Binds to nicotine acetylcholine receptors (nAChRs) on the surface of neurons.  
Chain reaction occurs – resulting in the release of neurotransmitters dopamine,  
norepinephrine, and serotonin

This reaction trains the brain and body to expect that sensation

Chronic exposure to nicotine causes desensitization and upregulation of  
nAChRs. Increasing tolerance to nicotine and withdrawal symptoms at the sign  
of depletion.

# What is in Vape Pens? Carriers



- **Composition of E-liquids:**
  - Contain various concentrations of liquid nicotine dissolved in carrier oils like propylene glycol (PG) and vegetable glycerin (VG), along with flavorings and sweeteners.
- **Safety of PG and VG:**
  - Classified by the FDA as “generally recognized as safe” for ingestion but not intended for repeated inhalation as hot aerosols.
  - European Chemical Agency advises avoiding inhalation of PG vapors or high concentrations of aerosols, as they may irritate the upper respiratory tract.
  - International Chemical Safety Program warns against inhaling mist and vapor and recommends using ventilation.
- **Uses of Propylene Glycol (PG):**
  - Approved for use in food products (ice cream, sweeteners, soda) and found in cosmetics, antifreeze, and industrial applications.
  - Used in fog machines for theater, leading to reports of acute cough, dry throat, and decreased lung function in regularly exposed individuals.
- **Vegetable Glycerin (VG):**
  - Derived from soybeans or produced synthetically; found in laxatives, cough syrup, toothpaste, mouthwash, shaving creams, and soap.
- **Health Concerns:**
  - **2012 Study:** Reported cases of lipoid pneumonia due to glycerin-based oils.
  - **2019 Study:** Exposed mice to e-cigarettes containing PG/VG and found fat globules in lungs, impaired immune systems, and increased infection vulnerability.

# Chemical Changes and Harmful Byproducts

---

- Vape pen temperatures 200°C to 250°C (392°F to 482°F)
- Vegetable Glycerin Starts to break down 290°C (554°F) and vaporizes around 160-180°C (320-356°F). However, prolonged exposure to high temperatures can cause thermal degradation.
- Propylene Glycol Begins to decompose above 200°C (392°F)

## Formaldehyde

- **Health Risks:**
  - Linked to the development and exacerbation of asthma.
  - Classified as a human carcinogen.
  - Affects multiple organ systems.
  - May lead to neurological symptoms, such as headaches and cognitive difficulties.

## Acrolein

- **Health Risks**
  - Induces inflammation in lung tissues, worsening respiratory conditions such as asthma.
  - Contributes to chronic bronchitis and other lung diseases.
  - Can cause neurological symptoms, including headaches and dizziness.
  - While not classified as a carcinogen, acrolein can cause DNA damage, potentially increasing cancer risk.

# Vape Flavors: Diacetyl and Menthol

- **Diacetyl:**
  - Used in flavors like vanilla, maple, and custard.
  - Linked to "popcorn lung" after its use in a Missouri popcorn plant, resulting in 15 deaths and long-term health issues among workers.
  - **Bronchiolitis Obliterans:** Causes inflammation and scarring in small airways, leading to permanent narrowing and symptoms like coughing, shortness of breath, and fatigue. Life expectancy post-diagnosis can be around 6 years.
- **Menthol:**
  - Creates toxic microparticles and leads to shallower breaths and reduced lung function in users.
  - Acts as a catalyst, making it harder for users to quit and appealing to new users.



# Federal Intervention

---

[View your state regulations HERE](#)

- 1. Age Restrictions:** While federal law prohibits sales of tobacco products, including e-cigarettes, to anyone under 21, some states and localities have implemented stricter age limits.
- 2. Flavor Bans:** Some states and cities have enacted bans on flavored tobacco products, including e-liquids, to address youth vaping. However, these bans are not uniform across the country.
- 3. Product Regulation:** Certain states may have additional regulations regarding the sale, marketing, and distribution of vaping products. For example, some states require additional testing or labeling requirements for e-liquids.
- 4. Taxation:** States have different tax rates on tobacco products and may impose specific taxes on e-cigarettes, impacting their retail prices and consumption.
- 5. Advertising Restrictions:** States may have varying restrictions on how vaping products can be advertised, especially concerning marketing to minors.
- 6. Licensing and Permitting:** Some states require retailers to obtain specific licenses or permits to sell nicotine products, and the requirements can differ widely.
- 7. Public Use Restrictions:** Regulations about where vaping is allowed (e.g., indoor vs. outdoor spaces) vary by state and local jurisdiction.

# Law Suites

---

## 1. Juul Labs

- **California Lawsuit (2019)**: Sued for deceptive marketing targeting youth, misleading safety claims, and minimizing addiction risks.
- **Miami-Dade County (2021)**: Filed a suit seeking compensation for health care costs related to youth vaping illnesses.

## 2. New York Lawsuit

- **Attorney General (2020)**: Sued multiple vaping companies for targeting minors and not disclosing health risks.

## 3. Illinois Lawsuit

- **Public Health (2021)**: Filed against several companies for contributing to a public health crisis through marketing flavored e-cigarettes to minors.

## 4. Federal Lawsuits

- **Multistate Action (2021)**: A coalition of state attorneys general sued vaping manufacturers for practices that fueled the youth vaping epidemic.

## 5. Class Action Lawsuits

- Filed by individuals and families claiming vaping companies failed to warn about health risks associated with their products.

## 6. Health Care Costs

- Lawsuits pursued by states and municipalities to hold vaping companies accountable for healthcare costs related to vaping-related illnesses.

# Impact of Youth Vaping

---

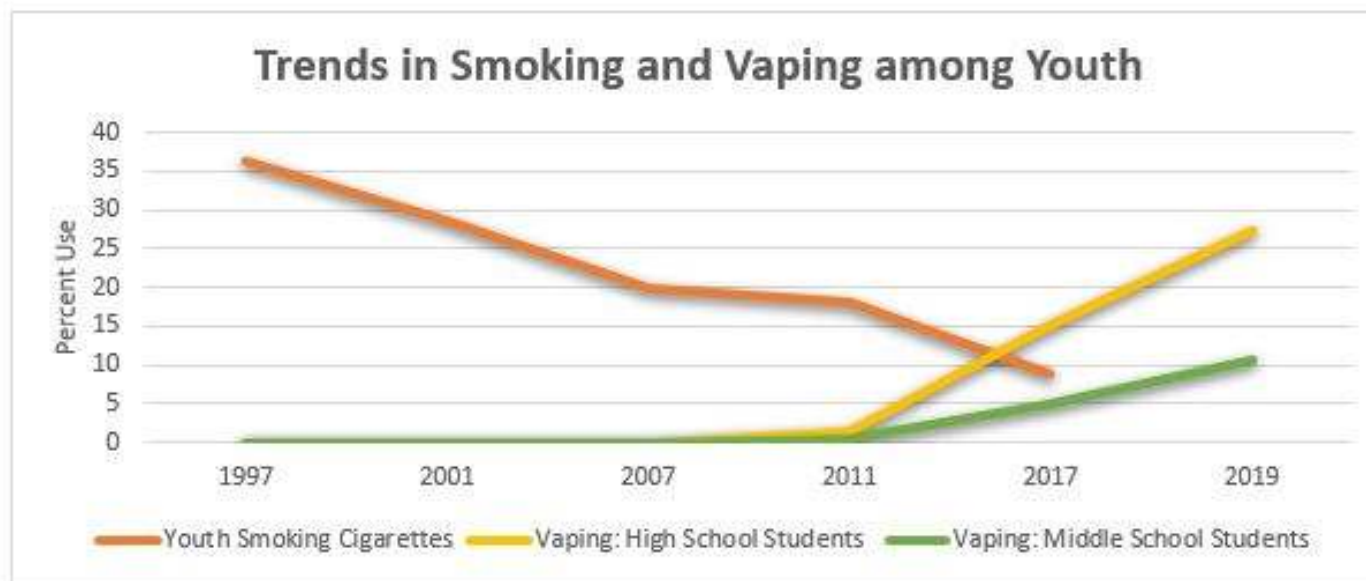
## CDC Statistics (2024)

- E-cigarettes remain the most commonly used nicotine product among youth, with a decline in users from 2023.
  - **1.63 million (5.9%)** students currently use e-cigarettes (compared to **2.1 million** in 2023).
    - **410,000 (3.5%)** middle school students.
    - **1.21 million (7.8%)** high school students.
- **63.9%** of current users want to quit.
- **67.4%** of current users have tried to quit in the past year.
- Over **1 in 3 U.S. high school (36.6%)** and middle school (38.9%) students who use tobacco products use more than one type.

## Impact on Adolescent Brain Development

- Decision-making and impulse control mature around age 25.
- **Nicotine exposure** during adolescence increases the risk of addiction and depression.
- Alters brain activity related to attention, learning, mood regulation, and memory, potentially leading to developmental deficiencies.
- Linked to increased anxiety, irritability, and impulsivity.

# Trends in Youth



Source: [www.lung.org](http://www.lung.org)

# Why Vaping is Not Safer than Smoking

---

- Health Risks of Chemicals
- Unknown Long-Term Effects
- Respiratory Issues
- Addictive Potential
- Psychological Effects
- Dule Use
- Regulatory Gaps

# E-cigarette vs Nicotine Replacement Therapy (NRT) for Smoking Cessation

## E-Cigarettes

- Harm reduction is the primary strategy employed by e-cigarette companies to promote their products as safer alternatives to traditional smoking.
- A study conducted from 2017 to 2019 evaluated the effectiveness of e-cigarettes as aids for smoking cessation. The findings indicated that individuals who used e-cigarettes to quit were more likely to revert to traditional cigarettes or maintain nicotine dependence through dual use.
- In a clinical case report from 2016, a 24-year-old who had attempted to quit smoking three times using abstinence methods was ultimately unable to quit until he began using e-cigarettes. However, he found that he could not stop using e-cigarettes until he utilized Nicotine Replacement Therapy (NRT).

## NRT

- NRT has been around since 1970
- Gum, patches, inhalers, sprays and lozenges. Paired with behavioral health counseling
- Steady release of nicotine to alleviate the sudden plummet and withdrawal symptoms
- These nicotine delivery methods do not come with social rituals and are not habit forming
- NRT is received in an effective, safer, and less addictive way. Allowing a tolerance to wean
- NRT is typically recommended for a minimum duration of 8 to 12 weeks

# How to Quit Smoking?

20% Physical, 80% Psychological

## Physical Dependence

- **Withdrawal Symptoms:**
  - Low dopamine: Decreased motivation and enjoyment.
  - Low norepinephrine: Foggy-headedness and poor concentration.
  - Low serotonin: Poor emotional regulation and agitation.
- **Critical Period:**
  - Lasts about 2-3 weeks.

## Psychological Addiction

- **Emotional Triggers:** Smoking linked to feelings of sadness, stress, and specific activities (e.g., driving, eating).
- **Ideal Time to Quit:** Life changes (like moving) can help disconnect established smoking habits
- **Critical Period:**
  - Lasts about 3-12 months.

## 5 A's of Smoking Cessation

Ask

What do you smoke?  
How much do you smoke?  
How long have you smoked?

Advise

Discuss harmful effects and  
urge patient to quit

Assess

Willingness to Quit

Assist

Help create best plan for  
quitting

Arrange

Follow up  
If quitting, within 1  
week of quit date

 @AmbCareRx

# Take Aways

- **CDC Statistics:** Approximately **64% of smokers** are likely to die from a smoking-related illness.
- Nicotine is highly addictive, leading to serious health issues, including heart failure, respiratory disorders, gastrointestinal problems, and reproductive complications.
- Smokers often self-regulate their intake by taking deeper puffs or smoking more frequently to satisfy cravings.
- The aerosol produced by e-cigarettes is not merely water vapor; it contains nicotine and other harmful chemicals. According to the 2016 U.S. Surgeon General's report, this aerosol can include ultrafine particles, flavoring agents like diacetyl, benzene (found in car exhaust), and heavy metals, the health effects of which are not fully known.



Questions

# Citation

- Products, C. for T. (2022, December 20). *Results from the annual National Youth Tobacco Survey (NYTS)*. U.S. Food and Drug Administration. Retrieved March 21, 2023, from [https://www.fda.gov/tobacco-products/youth-and-tobacco/results-annual-national-youth-tobacco-survey#:~:text=2022%20Findings%20on%20Youth%20E%2DCigarette%20Use,-In%20October%202022&text=In%202022%2C%20about%201%20in,\(past%2030%2Dday\).&text=14.1%25%20\(2.14%20million\)%20of,reported%20current%20e%2Dcigarette%20use.](https://www.fda.gov/tobacco-products/youth-and-tobacco/results-annual-national-youth-tobacco-survey#:~:text=2022%20Findings%20on%20Youth%20E%2DCigarette%20Use,-In%20October%202022&text=In%202022%2C%20about%201%20in,(past%2030%2Dday).&text=14.1%25%20(2.14%20million)%20of,reported%20current%20e%2Dcigarette%20use.)
- Study: <https://tobaccocontrol.bmj.com/content/early/2022/01/11/tobaccocontrol-2021-056901>
- <https://www.hopkinsmedicine.org/health/wellness-and-prevention/5-truths-you-need-to-know-about-vaping#:~:text=1%3A%20Vaping%20is%20less%20harmful,many%20of%20which%20are%20toxic>
- <https://truthinitiative.org/research-resources/emerging-tobacco-products/nicotine-use-and-stress>
- <https://www.nytimes.com/2007/05/06/us/06butter.html>
- <https://www.crossrivertherapy.com/vaping-statistics#number-of-vapers-by-country>