Clearing the Cloud: The Health Consequences of Youth Vaping

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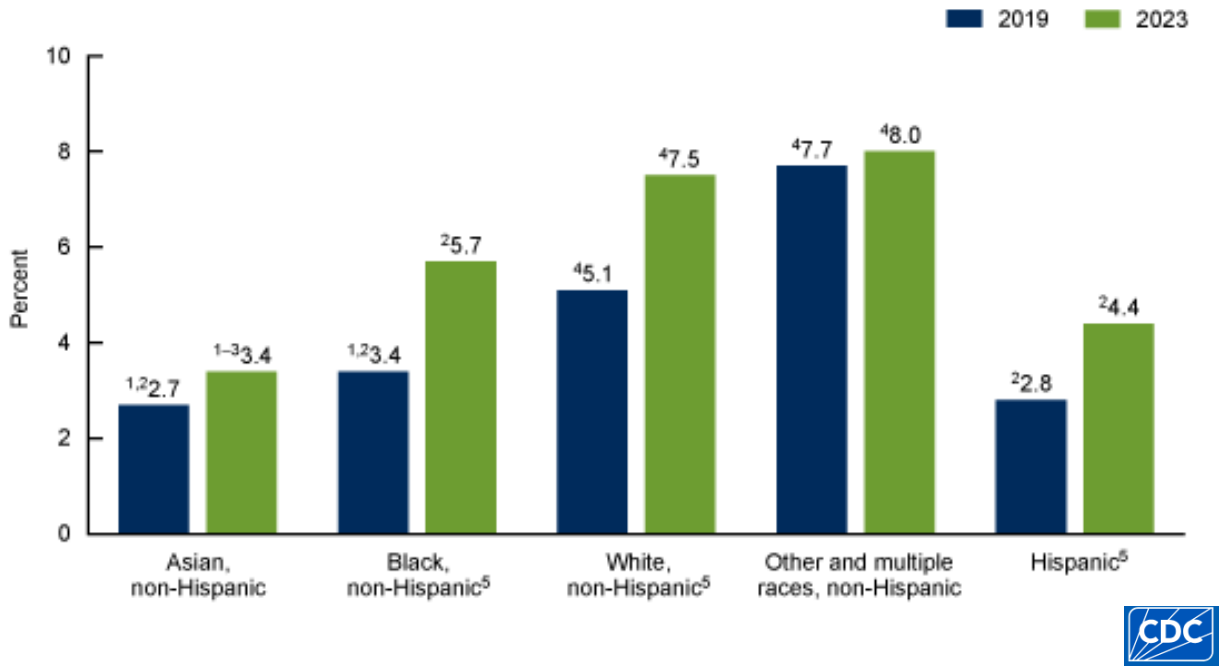
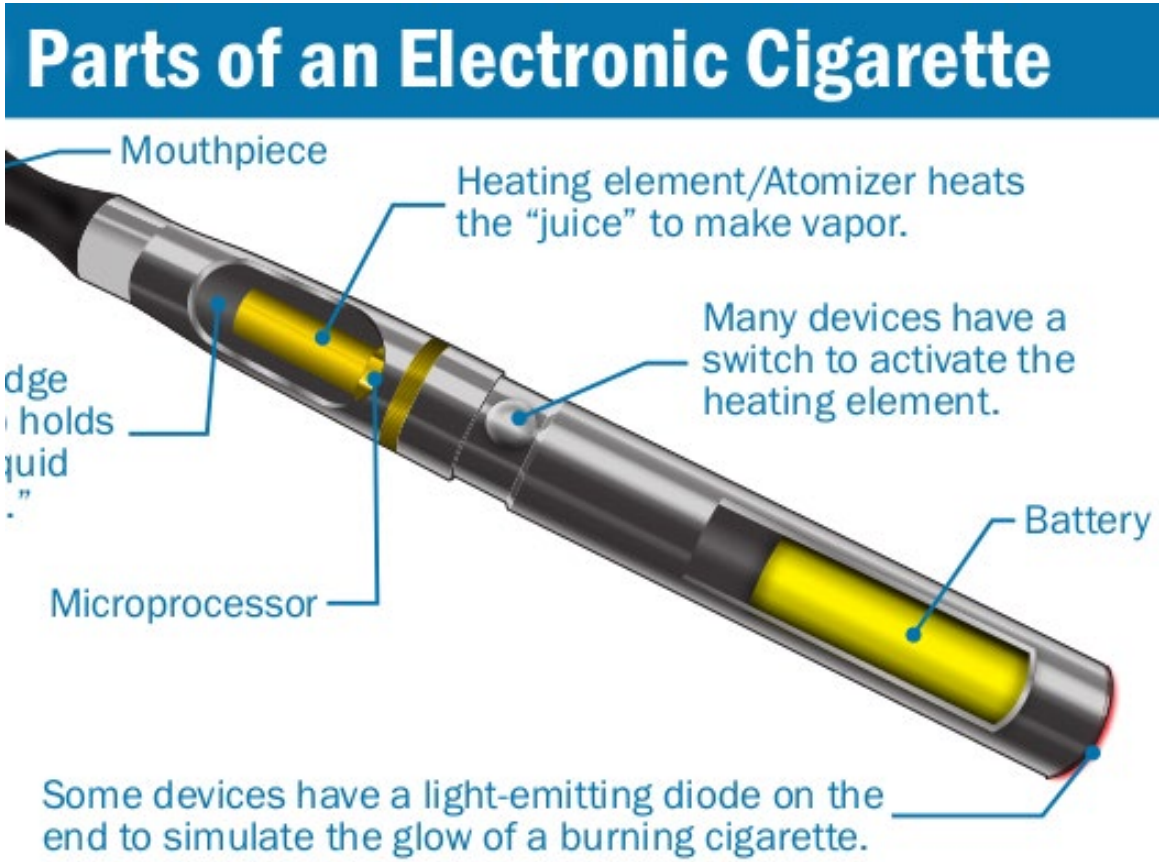
WHY THIS MATTERS

- E-cigarettes are the most used tobacco product among U.S. youth
- In 2023, 2.13 million middle and high school students reported current e-cigarette use
- 89.4% of youth e-cigarette users use flavored products
- 25.2% of current youth users vape daily
- Among youth who vape daily, unsuccessful quit attempts rose from 28% (2020) to 53% (2024)



WHAT IS IN AN E-CIGARETTE?

- Battery-powered device that heats a liquid ("e-liquid") to create an inhalable aerosol
- E-liquid base: propylene glycol (PG) and vegetable glycerin (VG)
- Nicotine (often in high concentrations — some pods deliver 59 mg/mL)
- Chemical flavorings (thousands of varieties)
- When heated, produces harmful byproducts:
  - Formaldehyde (carcinogen)
  - Acetaldehyde (carcinogen)
  - Acrolein (potent respiratory irritant)
  - Diacetyl (linked to "popcorn lung")
  - Toxic metals: lead, chromium, nickel
  - Glycidol (probable carcinogen)



U.S. Fire Administration
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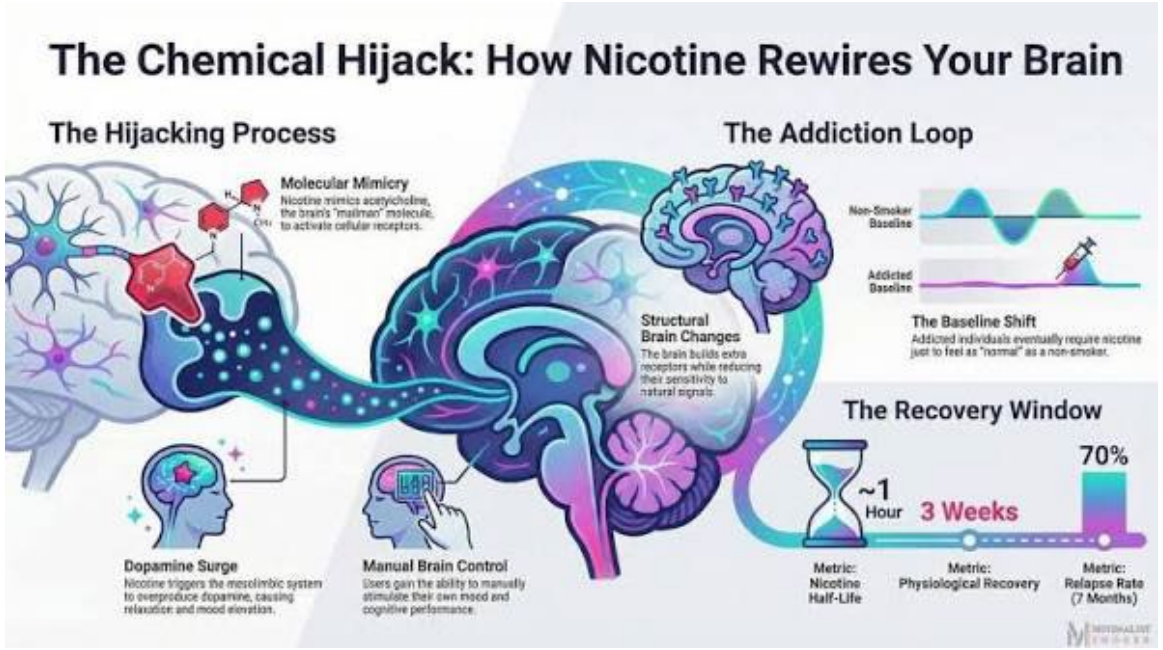
THE ADOLESCENT BRAIN AND NICOTINE

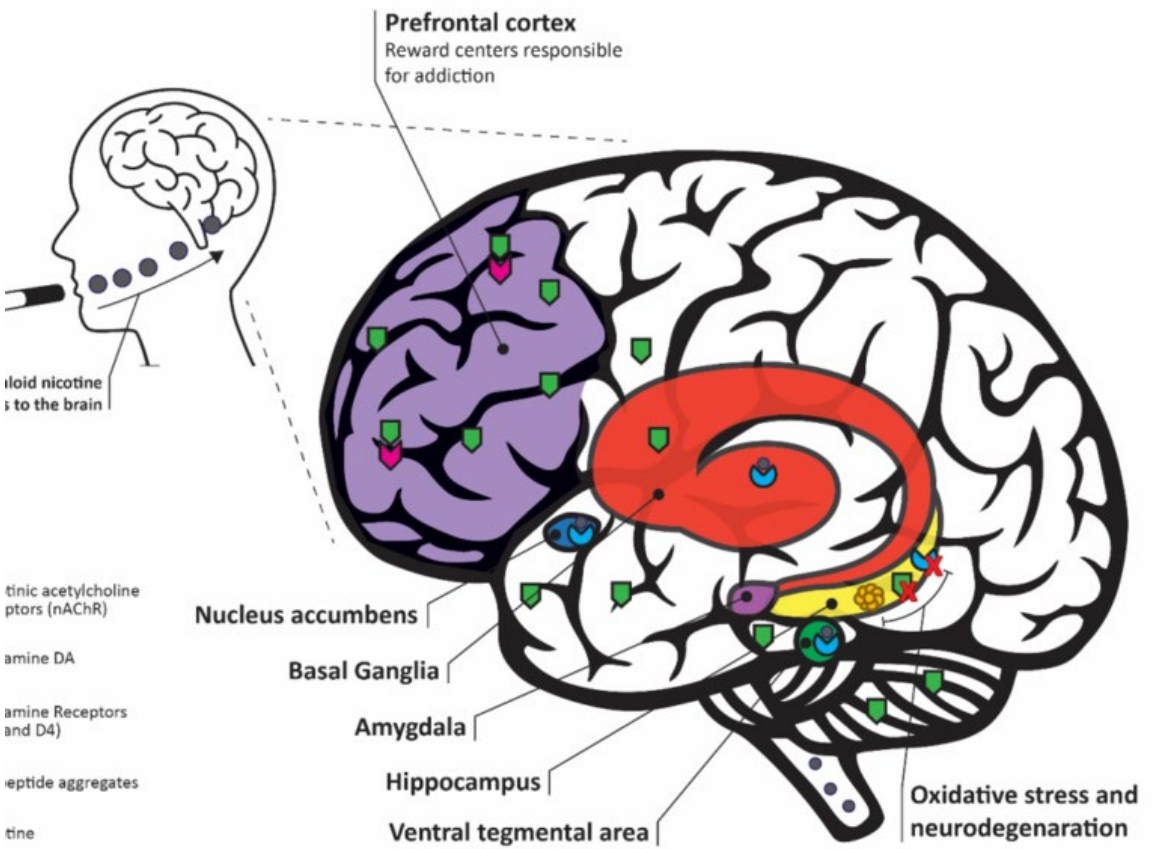
- The brain continues developing until approximately age 25
- Nicotine activates dopamine reward pathways, creating powerful reinforcement
- Adolescent exposure fundamentally alters the "set points" for addictive behaviors into adulthood
- Consequences of adolescent nicotine exposure:
  - Impaired attention and learning
  - Increased impulsivity
  - Greater susceptibility to addiction to other substances
  - Mood dysregulation



MINIMALIST SMOKER

DEPENDENCE DEVELOPS QUICKLY

- ~40% of adolescent e-cigarette users report at least one symptom of nicotine dependence
- Common dependence symptoms in youth:
  - Strong cravings to vape
  - Wanting to use within 30 minutes of waking
  - Feeling unable to quit despite wanting to
  - Irritability, anxiety, or restlessness when unable to vape
- By 2022, indicators of vaping dependence among youth were comparable to or exceeded those of cigarette dependence
- Earlier age of initiation and more frequent use predict more severe dependence

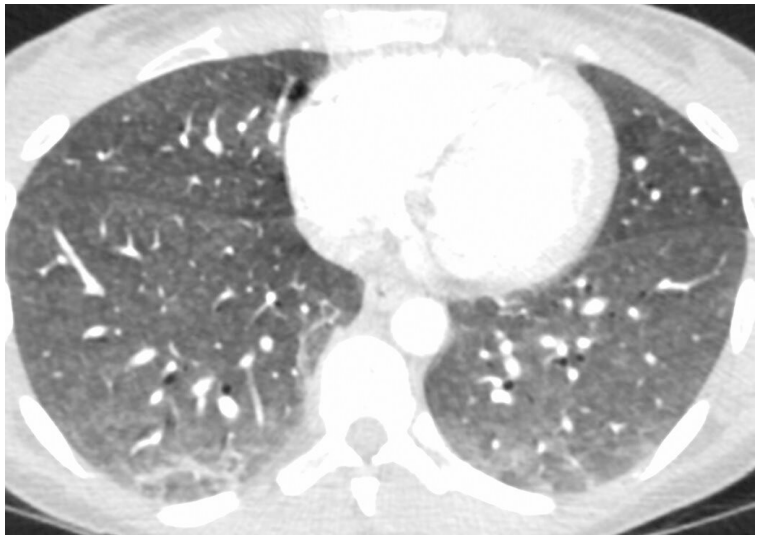


RESPIRATORY HEALTH EFFECTS

- Established Associations:
  - Asthma: increased risk of new diagnosis (OR 1.20–1.36) and exacerbation (OR 1.44)
  - Chronic cough, wheezing, shortness of breath
  - Bronchitis and pneumonia
  - Lung development continues into the early 20s — vaping may prevent adolescents from ever reaching full lung function potential
- EVALI (E-Cigarette or Vaping Product Use–Associated Lung Injury):
  - Over 2,800 cases and 68 deaths reported in the U.S. (2019–2020)
  - Strongly linked to THC-containing products and vitamin E acetate
  - Presents with shortness of breath, cough, fever, nausea/vomiting
  - 94% of cases required hospitalization; 36% required ICU admission
  - Can cause permanent lung scarring; rare cases required lung transplantation

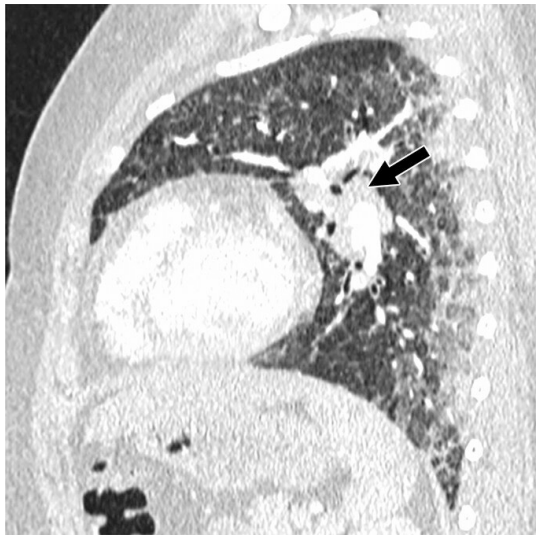
RADIOGRAPHIC FINDINGS

Hypersensitivity Pneumonitis



Acute Lung Injury and Eosinophilic Pneumonia

Lipoid Pneumonia



REAL CASES: WHEN VAPING SENDS KIDS TO THE HOSPITAL

My name is Anna Carey, and I am 16 years old. I was hospitalized at Cook Children's for five days because of vaping and dabbing.

I started vaping when I was a freshman in high school with a Vuse Vibe that I got from a senior. I switched to the Juul a few months later just because it was "cooler" than the vibe.

I got caught by my parents too many times to count my freshman year, but I never stopped vaping. The summer going into my sophomore year, I stopped because I had no one to buy pods for me. When school started back up in the fall, I started vaping again. This time, seniors would buy pods for me.

Around November of my sophomore year, I started to use THC carts, and I began selling pods and carts to my whole school.

I was known for vaping, and it became my entire reputation. We even had a talent show, and my friends and I were called "The Starter Pack" (which is what Juul calls their packages), and my shirt said "salesman."

Halfway through the year, I switched to Njoy because it was way cheaper than Juul. Nothing could make me stop. Not even the random pains in my chest when I would use my dab pen, which I mostly ignored.

I left school and became homeschooled, but now I could use my njoy all day. My siblings bought the pods for me because I would get so angry if I did not have pods, and the withdrawals were not worth quitting to me. I saw the news of people dying or getting hospitalized, and I still didn't care. Literally, nothing would make me stop. I would say things like, "I guess I'm going to vape more" or "I'm not going to stop until I'm hooked up."

Every penny would go toward vaping and dabbing. I had a system created in my head. I knew I needed $10 every four days because I would go through two njoy pods in about three to four days. I also needed $35 every two weeks for two carts because one THC cartridge would last me one week.

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Checkup Newsroom Fort Worth, Texas, December 10, 2019

About one month before I was hospitalized, I went to the doctors and got an X-ray on my lungs, and it came back clear. They gave me an inhaler and told me to stop vaping, but I didn't listen. The pain was insignificant to me since the X-ray came back clear, and I barely used the inhaler.

Then, one day, I was cleaning my room, and all of a sudden, a wave of exhaustion hit me. I was completely drained of all my energy and laid in bed for two days. I had the most awful pain when I breathed and moved, I honestly thought I broke a rib somehow. The day the pain started, I stopped using my THC carts and cut back on my vaping to about three hits a day just to feed my addiction. I had the worst aches of my life. We still don't know if that was from withdrawing or the disease, but the pains lasted a week and a half.

I completely lost my appetite and couldn't eat anything but a piece of fruit a day. About two days after the pain started, we decided to go to Cook Children's. We waited in the waiting room while I cried my eyes out because of the pain. They did an X-ray on my lungs and an EKG, and it all came back clear. They sent me home, just as I came, and I laid in bed for the rest of the week, just hoping that the pain would go away with time. Six days from when the pain started, I decided to go to a basketball game with my friend. We had to go up and down stairs where I had to take breaks every couple of minutes so I could catch my breath. It felt like I was running a marathon, even though I just went up a small hill.

The next day we decided to go to urgent care. Still, they couldn't find anything wrong with me, so they sent me to the local emergency room and did an X-ray where they found that I had pneumonia. They immediately sent me in an ambulance to Cook Children's, where they diagnosed me with chemical pneumonia. I was placed on oxygen and monitoring, and it was the worst pain I have ever felt in my entire life. I could not move without gasping for air, my chest constantly ached, and every time I breathed, a sharp pain went through my entire chest. I felt completely helpless.

The scariest part of this whole situation was how little everyone still knows about this disease or how dangerous vaping is for kids. The doctors didn't know if I would be OK or how much my lungs would heal or anything. The unknown was definitely not worth the vaping at all. I think I needed to be hospitalized to stop vaping, and I think there is a lot of other people who are the same way. It's hard for a news article to really
make a change with a teenager, and I think the only way to end this, is to end vaping.

I caused so many people to be addicted to this. Now I need to help them stop.

Earlier this summer, my 17-year-old patient Tryston just wasn't feeling like himself.

"I was tired all the time. My energy was low. I was losing some weight."

Then, things quickly turned downhill. He started having chills. He was feeling really exhausted all the time, was nauseous, and had some fevers.

When he started becoming short of breath and having some chest pain, he and his mother decided it was time to head to an urgent care clinic, where he was given antibiotics and flu medications.

In 24 hours, he felt worse. His breathing became more difficult. Something was definitely wrong.

He came to Cook Children's, and the doctors and nurses quickly realized what poor shape he was in. X-rays showed something that looked like pneumonia on both sides of his chest. But the specialists were confused, because it just wasn't obvious.

Within 48 hours however, what WAS obvious was that Tryston was getting worse.

I found myself holding my breath every time I opened the update – and audibly gasped the moment I realized that he was intubated.

And the tube stayed there for the next 10 days. Machines were keeping Tryston alive. He was in the ICU, where the sickest children in the hospital stay.

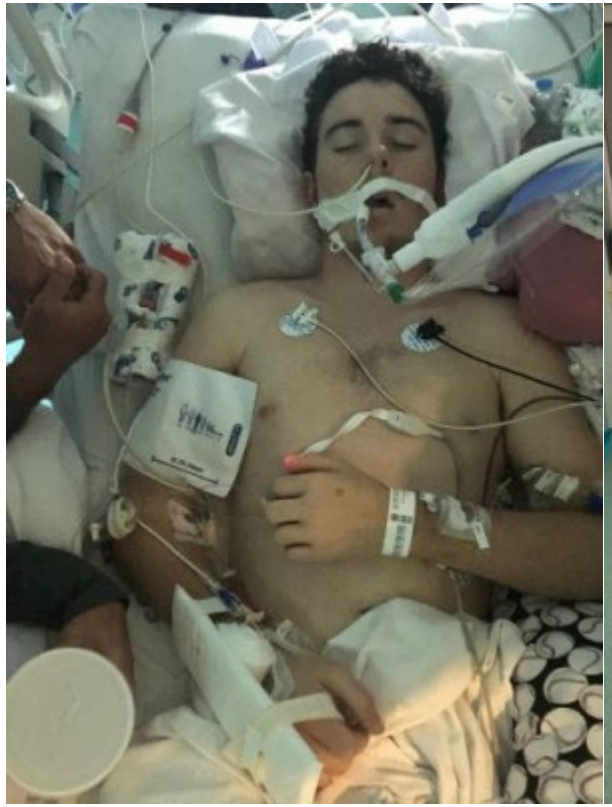
Was it an infection? No organism seemed to grow from cultures. Was it an autoimmune disease?
The rheumatologists didn't think so.

Even a lung biopsy – a piece of his lung which was cut out and examined under a microscope – didn't seem to hold any clear and obvious clue as to why he was so sick. His lungs just failed, and he was in something called respiratory distress.

He was put on numerous antibiotics and antifungal medications to see if they'd help. He was needing more and more oxygen. He even needed special high-frequency ventilations to keep his lungs open and working.

One thing that Tryston mentioned to the staff of Cook Children's before he got very ill is something I already knew, and had talked to him about the year prior.

Tryston liked to vape.



Tryston spent 18 days at Cook Children's.

He lost almost 30 pounds. He lostmuscle mass in his from being bedridden for almost three weeks.

A clear answer for why his lungs failed him was never found.

The general consensus was that his lungs were severely injured, and I believe his vaping habits had a lot to do with it.

Tryston is a great kid with a great heart. He made a mistake, one that LOTS of kids are making, because they assume
e-cigarettes are "healthier" than regular cigarettes.

Checkup Newsroom Fort Worth, Texas, August 20, 2019

Case 4 — "He had a seizure after vaping“:

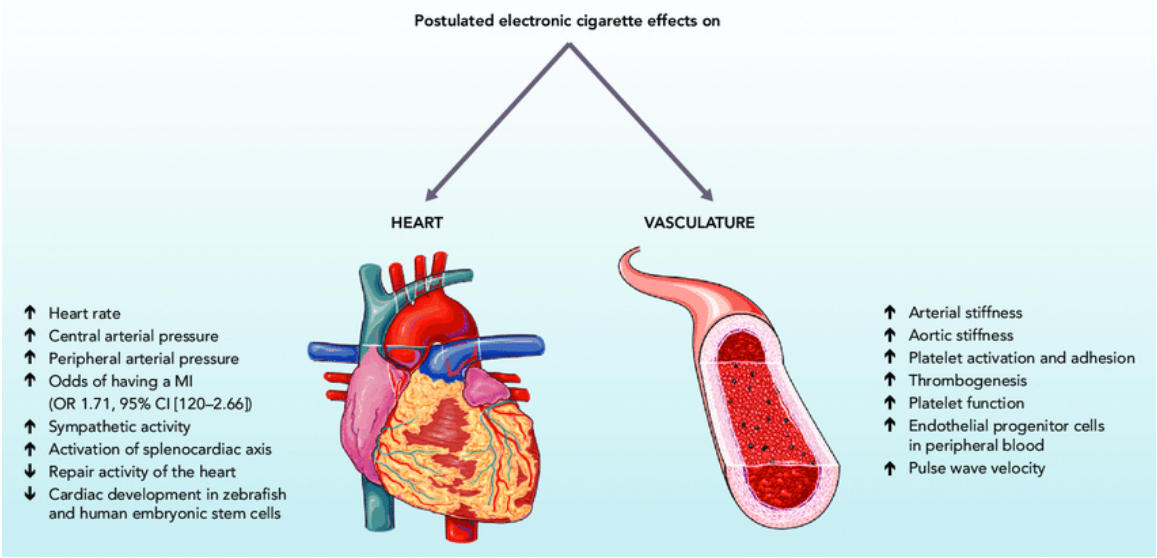
The FDA received 122 reports of seizures and neurological events in e-cigarette users, with a median age of 20 years and 67% occurring in youth and young adults aged 14–24. In 62% of cases, the seizure occurred within 30 minutes of vaping. Many of these young people had no prior seizure history. They arrived at emergency departments confused, disoriented, and frightened. The high nicotine concentrations in modern e-cigarettes — especially nicotine salt formulations — can deliver a massive nicotine dose that overwhelms the developing nervous system.

Case 5 — "The battery exploded in his pocket":

From 2015 to 2019, an estimated 3,369 emergency department visits resulted from e-cigarette explosion and burn injuries nationally. Additionally, an estimated 1,550 children under age 5 were treated in emergency departments for ingesting e-cigarette liquids in 2018–2019 alone. These injuries include severe burns to the face, hands, and thighs from battery malfunctions, as well as nicotine poisoning in toddlers who access unsecured e-liquid bottles.

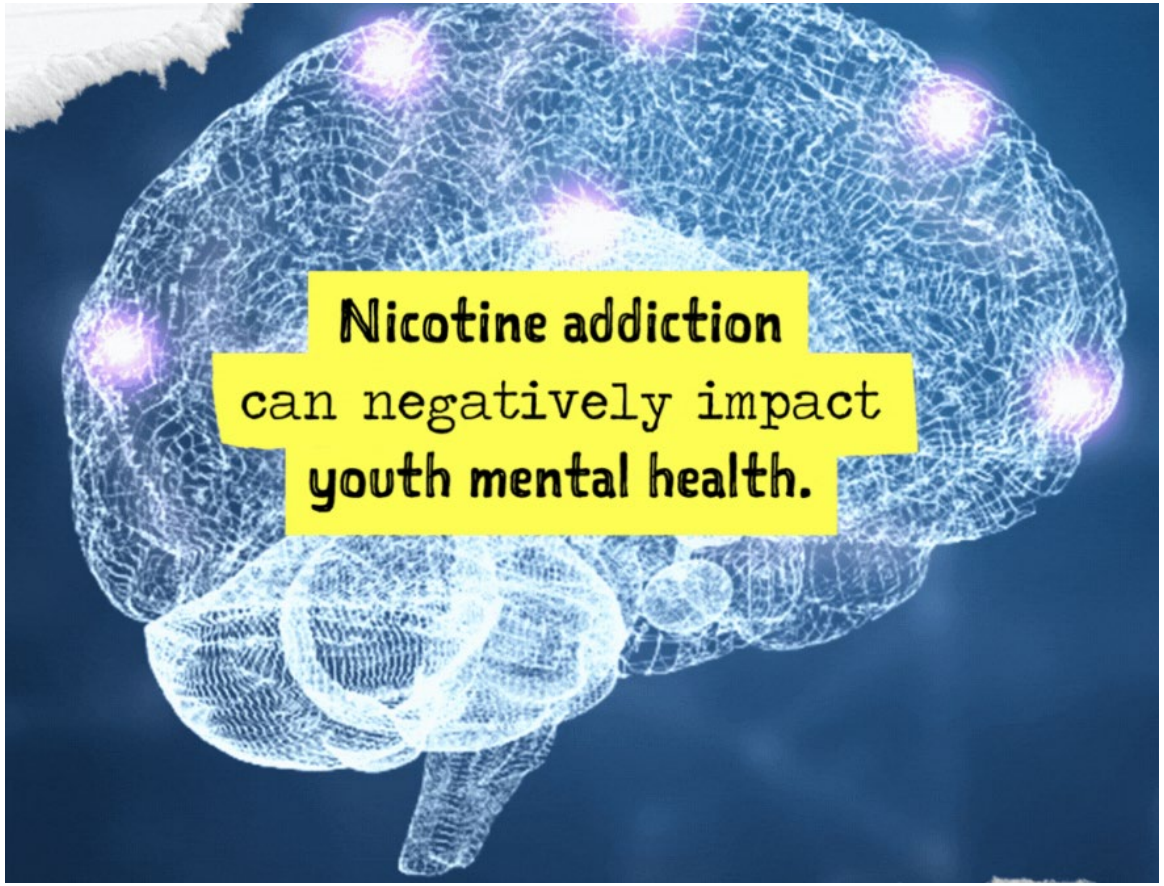
CARDIOVASCULAR HEALTH EFFECTS

- Increased arterial stiffness and blood pressure
- Endothelial dysfunction (impaired blood vessel function)
- Elevated heart rate and sympathetic nervous system activation
- Biomarkers of oxidative stress and systemic inflammation
- Animal models show cardiac fibrosis, decreased heart function, and atherosclerosis with long-term exposure
- These changes mirror early cardiovascular damage seen in cigarette smokers and may lead to heart disease and stroke in adulthood



MENTAL HEALTH CONNECTIONS

- Youth who currently vape are twice as likely to report moderate-to-severe depression and anxiety symptoms (42.1% vs. 21.0% of non-users)
- Associations documented with:
  - Depression and depressive symptoms
  - Anxiety
  - Suicidal ideation and attempts
  - PTSD symptoms
  - Sleep disturbances
- Bidirectional relationship: mental health problems increase risk of vaping, and vaping may worsen mental health
- 41.8% of youth with depression/anxiety symptoms cited "feeling anxious, stressed, or depressed" as a reason for first trying e-cigarettes



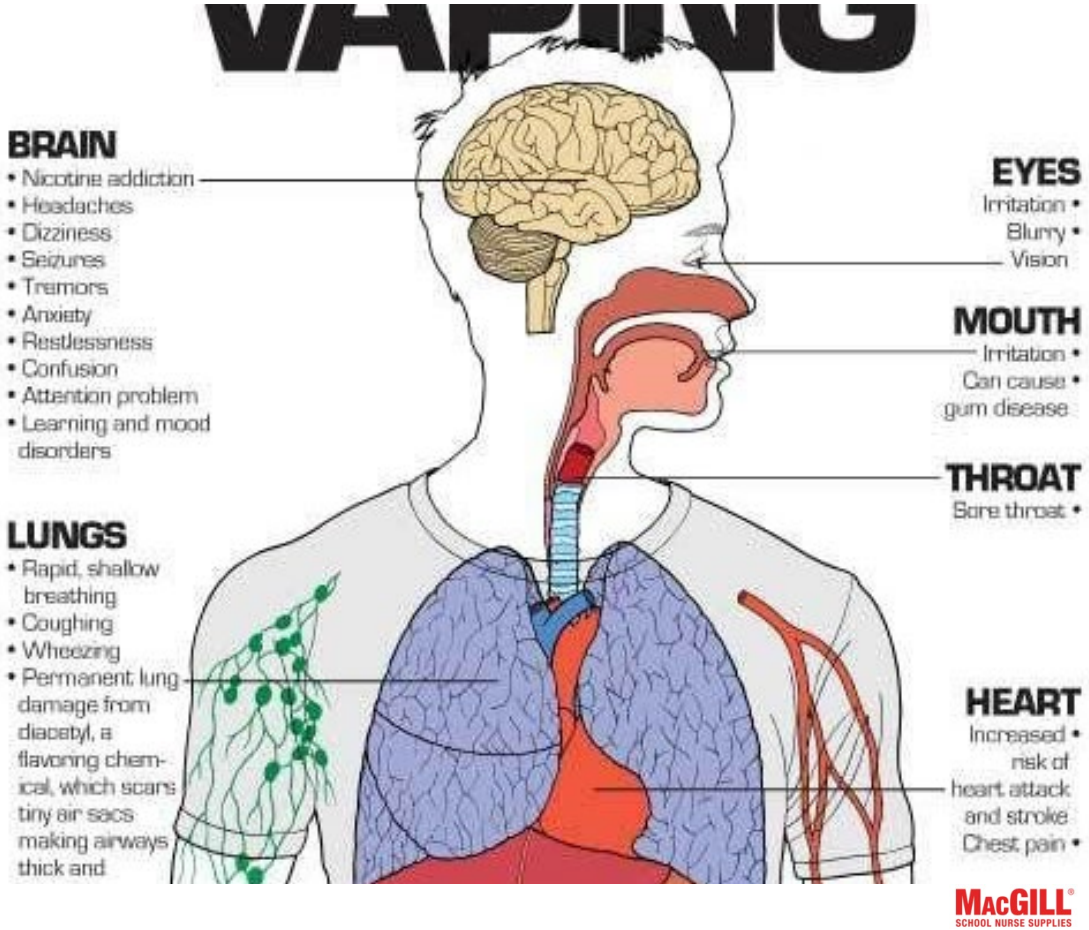
GATEWAY TO OTHER SUBSTANCE USE

- Vaping is consistently associated with subsequent initiation of combustible cigarette smoking (most studies ~3x increased risk)
- Strong associations with other substance use:
  - Marijuana use: OR 2.72–6.04
  - Alcohol use: OR 4.50–6.67
  - Binge drinking: OR 4.51–6.73
- Daily vaping prevalence increased more rapidly in rural youth (16% → 42%) than urban youth (16% → 18%) from 2020–2024
- Youth with co-occurring substance use have more severe nicotine dependence

NBC News

OTHER HEALTH EFFECTS

- Oral health: gum disease, tooth decay, oral mucosal lesions
- Dizziness, headaches, and migraines
- Nausea
- Lower total sperm counts (reproductive health concern)
- Explosion and burn injuries from device malfunction
- Genotoxicity: e-cigarette aerosol base constituents can damage DNA in oral cells

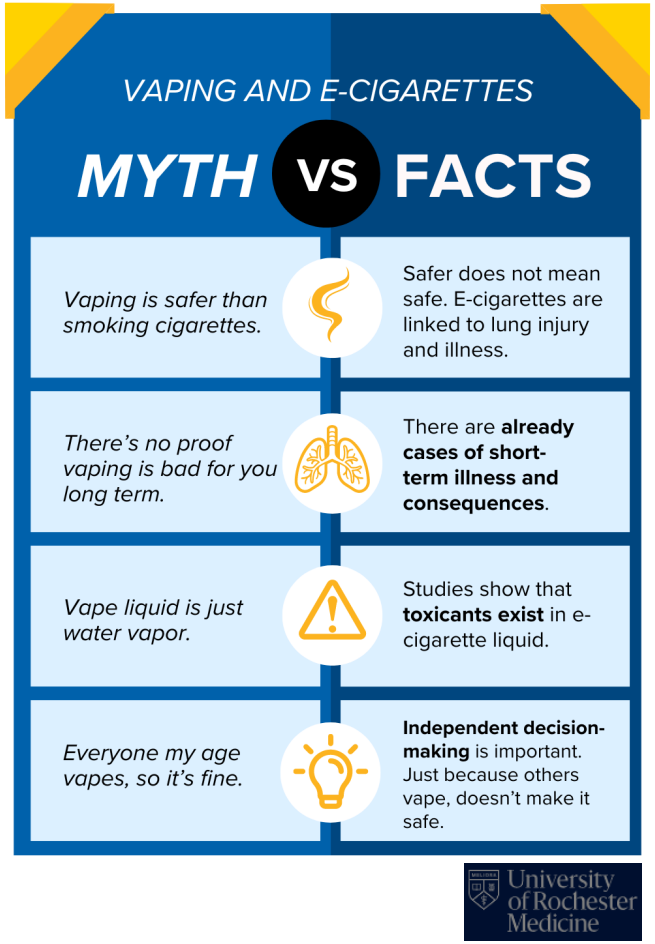


RED FLAGS FOR VAPING: SIGNS TO WATCH FOR

- Unfamiliar devices (USB-like, pen-shaped, or disposable devices)
- Sweet or fruity smells that dissipate quickly
- Increased thirst or dry mouth ("vaper's tongue")
- Frequent nosebleeds
- New or worsening cough, wheezing
- Increased irritability, anxiety, or difficulty concentrating (withdrawal)
- Declining academic performance
- Secretive behavior around phone/social media (ordering supplies)
- Caffeine-like jitteriness

TALKING TO YOUTH ABOUT VAPING

- Use motivational interviewing techniques — avoid lecturing or shaming
- Ask open-ended questions: "What do you know about vaping?" "What do your friends think about it?"
- Validate their experience while providing accurate health information
- Focus on immediate, relatable consequences (skin, teeth, athletic performance, addiction, cost) rather than distant risks
- Normalize the difficulty of quitting — nicotine addiction is a medical condition, not a moral failing
- The 5As Framework: Ask, Advise, Assess, Assist, Arrange follow-up



OUR ROLE AS PROFESSIONALS

- For School Counselors:
  - Screen for vaping during routine check-ins
  - Integrate vaping education into health curricula
  - Create non-punitive pathways for students to seek help
  - Connect students to cessation resources
- For Social Workers:
  - Assess vaping as part of comprehensive substance use and mental health screening
  - Address the bidirectional relationship between vaping and mental health
  - Advocate for tobacco-free policies in homes and community settings
- For Substance Recovery Professionals:
  - Include nicotine/vaping in treatment plans — do not overlook it as "less harmful"
  - Recognize that nicotine dependence can undermine recovery from other substances
  - Address vaping in group and individual therapy settings
- For Community Partners:
  - Support tobacco-free environments (schools, parks, public spaces)
  - Advocate for policies restricting youth access and marketing
  - Fund and promote evidence-based prevention programs

KEY TAKEAWAYS

- Youth vaping is a serious public health issue — not a harmless trend
- E-cigarette aerosol contains carcinogens, toxicants, and highly addictive nicotine
- Vaping harms the lungs, heart, brain, and mental health of developing adolescents
- ~40% of adolescent vapers show signs of nicotine dependence; by 2022, vaping dependence rivaled cigarette dependence
- Vaping is strongly linked to subsequent cigarette smoking, marijuana use, and alcohol use
- Mental health and vaping are deeply interconnected — screen for both
- Real teenagers end up in ICUs, on ventilators, and in surgery because of vaping — these are not theoretical risks
- Evidence-based cessation tools exist
- Every professional who works with youth has a role in prevention and intervention

RESPONDING TO THE RISKS OF YOUTH VAPING

Thank You

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