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Cannabis, Vaping, and Adolescent Health

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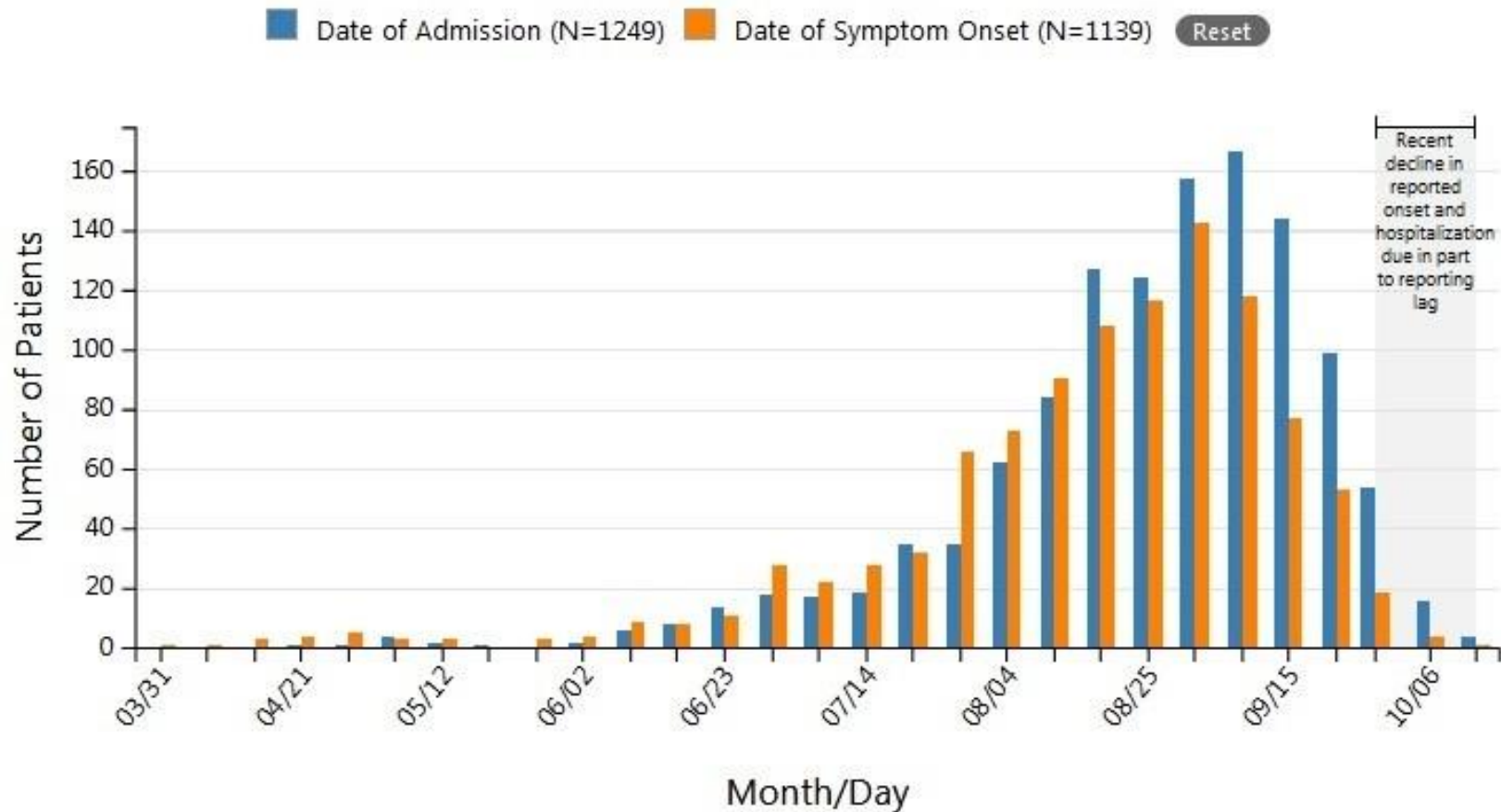
Disclaimers

- I am not an expert. I am a general pediatrician and a health services researcher
- I will not be discussing two very important caveats:
 - E-cigarettes as a smoking cessation tool for adults
 - Medicinal indications for cannabis
- This is about otherwise healthy teens who use e-cigarettes and cannabis recreationally

Vaping Outbreak Numbers

- As of Oct 22, 2019 (per the CDC):
 - 1604 cases of e-cigarette/vaping associated lung injury (EVALI)
 - CDC: first report Mar 2019, peak Sep 2019
 - Median age of injury: 23 years; range: 13-75 years; **79% <35 years, 36% <21 years**
 - 34 deaths in 24 states
 - Median age of death: 49 years; range: 17-75 years
 - **78% reported using THC-containing products** (31% reported exclusive THC)
 - 58% reported nicotine-containing products (10% reported exclusive nicotine)

Dates of symptom onset and hospital admission for patients with lung injury associated with e-cigarette use, or vaping — United States, March 31–October 19, 2019



But This Is Not Entirely New

- Injuries consistent with EVALI first described **at least 8 years ago**
 - First case reported in 2011 (McCauley L et al., Chest. 2012; 141(4): 110-113)
 - First adolescent case reported in 2016 (Sommerfeld CG et al., Pediatrics. 2018; 141(6): e20163927)
 - Initially believed to be lipoid pneumonia (inflammation caused by inhalation of oils)
- More recently, EVALI becoming recognized as more consistent with **chemical burn**
 - 95% of patients present with cough, chest pain, or shortness of breath; most have systemic signs of inflammation; about half have hypoxia (Siegel DA et al., MMWR. 2019; 68: 919-927)
 - Chest CT (“ground-glass opacities”) and pathology consistent with hypersensitivity pneumonitis

And the Warning Signs Were There

- Adolescent vaping prevalence is **skyrocketing**
 - Past 30-day use among 12th graders: **11% in 2017, 25% in 2019** (Miech R et al., N Engl J Med. 2019; 381: 1490-1491)
- Nicotine is **highly addictive**, especially earlier in life
 - Among adolescents who do not smoke cigarettes, those who use e-cigarettes have **4 times the odds** of smoking cigarettes 6 months later (Barrington-Trimis JL et al., Pediatrics. 2018; 142(6): e20180486)
 - Among adolescents who are experimenting with cigarettes, those who use e-cigarettes have **2 times the odds** of becoming established smokers 1 year later (Chaffee BW et al., Pediatrics. 2018; 141(4): e20173594)

E-Cigarettes Behave Like a Gateway Drug

- Between e-cigarettes and cigarettes, use and addiction seem to move mostly in one direction only
 - Although e-cigarette use predicts future cigarette use, **cigarette use does not seem to predict future e-cigarette use** (Bold KW et al., Pediatrics. 2018; 141(1): e20171832)
- For e-cigarette users, the subsequent drug of choice is **cannabis**
 - 40% of adolescents who have used e-cigarettes in the past 30 days have also used cannabis in their e-cigarettes, versus 6% of adolescents who have not used e-cigarettes in the past 30 days (Trivers KF, JAMA Pediatr. 2018; 172(11): 1097-1099)

And for Adolescents, Cannabis Is Really, Really Bad

- Comprehensive review sponsored by NIH (Volkow ND et al., N Engl J Med. 2014. 370: 2219-27)
- Overall, 9% of people who experiment with cannabis will become addicted
 - Percentage **doubles** for adolescents
 - Adolescents are **2-4 times** as likely as adults to become addicted
- THC is both the addictive AND psychoactive ingredient in cannabis
 - Average THC concentrations in marijuana and sinsemilla **tripled** between 1995 (4%) and 2012 (12%)
 - Today, THC concentrations in synthetic oils and edibles often exceed **80%**

Table 1. Adverse Effects of Short-Term Use and Long-Term or Heavy Use of Marijuana.

Effects of short-term use

Impaired short-term memory, making it difficult to learn and to retain information

Impaired motor coordination, interfering with driving skills and increasing the risk of injuries

Altered judgment, increasing the risk of sexual behaviors that facilitate the transmission of sexually transmitted diseases

In high doses, paranoia and psychosis

Effects of long-term or heavy use

Addiction (in about 9% of users overall, 17% of those who begin use in adolescence, and 25 to 50% of those who are daily users)*

Altered brain development*

Poor educational outcome, with increased likelihood of dropping out of school*

Cognitive impairment, with lower IQ among those who were frequent users during adolescence*

Diminished life satisfaction and achievement (determined on the basis of subjective and objective measures as compared with such ratings in the general population)*

Symptoms of chronic bronchitis

Increased risk of chronic psychosis disorders (including schizophrenia) in persons with a predisposition to such disorders

* The effect is strongly associated with initial marijuana use early in adolescence.

Table 2. Level of Confidence in the Evidence for Adverse Effects of Marijuana on Health and Well-Being.

Effect	Overall Level of Confidence*
Addiction to marijuana and other substances	High
Abnormal brain development	Medium
Progression to use of other drugs	Medium
Schizophrenia	Medium
Depression or anxiety	Medium
Diminished lifetime achievement	High
Motor vehicle accidents	High
Symptoms of chronic bronchitis	High
Lung cancer	Low

* The indicated overall level of confidence in the association between marijuana use and the listed effects represents an attempt to rank the strength of the current evidence, especially with regard to heavy or long-term use and use that starts in adolescence.

Summary: A Perfect Storm

- At this very moment, about 4 million middle and high school students currently vape
- About 1 million of these vapers will become cigarette smokers
 - These smokers will lose about 10 million potential life years (10 years per smoker)
- About 1.5 million vapers will begin using cannabis products
 - About 250,000 of these cannabis users will become addicted, with higher long-term risk of poor educational outcomes, school dropout, cognitive impairment, and lower IQ
- The 2019 “vaping outbreak” is a problem, but the real problem has the potential to be much bigger