



ASAM REVIEW COURSE 2023

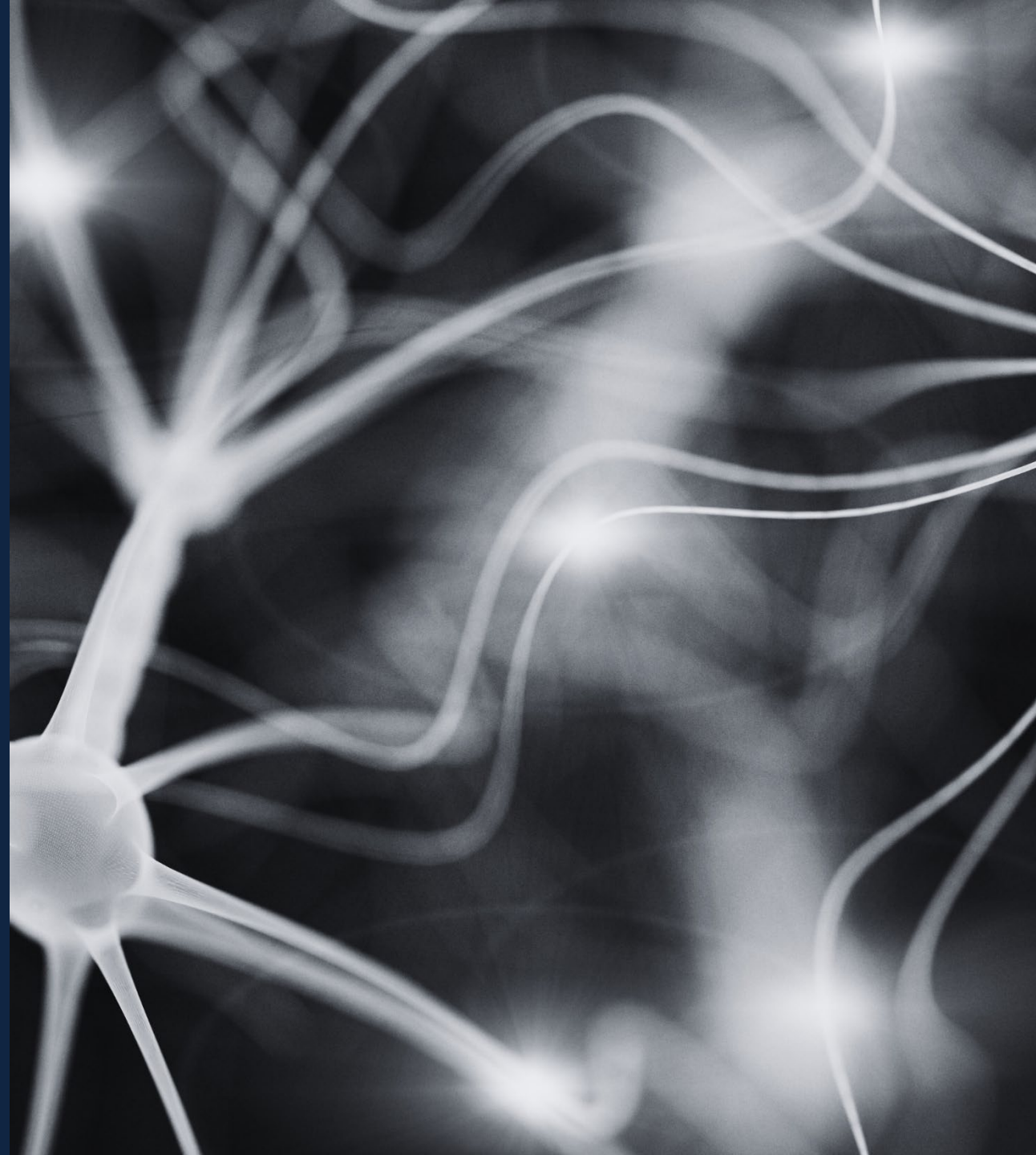
Epidemiology: Core Concepts and Applications

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Financial Disclosure

Jeffrey J. DeVido, MD, MTS

- Equity shareholder: Altria/Philip Morris/Merck

The opinions expressed in this talk are mine and they do not represent the opinions of my employing institutions or those with whom I am professionally affiliated.

Learning Objectives

Review the dimensions of epidemiology covered in the ABPM exam: 1) basic trends, and 2) epidemiologic concepts.

Establish different approaches for (re)learning epidemiology as necessary for ongoing professional acumen as well as (unfortunately) those things needed to regurgitate on an exam.

Demonstrate epidemiologic concepts in action through 2 different common addiction epidemiological questions.

Guide participants towards resources for ongoing review of epidemiologic data

Presentation Outline

- Consider ways of thinking about and learning about epidemiology
- Cheat sheets vs. enduring learning patterns
- Highlight some important epidemiological trends AND how to find them yourselves...
- Follow two common questions in addiction medicine as a springboard for reviewing key concepts in epidemiology

Two Ways to Think about Epidemiology

- What do I need to know for the test?
- What might I need to know professionally?

The ABPM Exam and Epi

Addiction Medicine 2019 Examination Blueprint

Core Content Areas

Core Content Areas

25%	01 – Definitions
	02 – Genetics
	03 – Pharmacokinetic and Pharmacodynamic Principles
	04 – Pathophysiology
	05 – Neurobiology of Addiction
20%	06 – Epidemiological Concepts
	07 – Epidemiological Trends of Substance Use Disorders
	08 – Prevention
40%	09 – Screening, Assessment, and Brief Intervention
	10 – Management of Addiction Treatment
	11 – Management of Inpatient and Outpatient Intoxication and Withdrawal
	12 – Pharmacologic Interventions for Addictions
	13 – Behavioral Interventions
	14 – Co-Occurring and Medical Disorders among Patients with Alcohol and Other Drug Use and Addiction
	15 – Co-Occurring Psychiatric Disorders among Patients with Alcohol and Other Drug Use and Addiction
	16 – Pain and Addiction
15%	17 – Ethical, Legal and Liability Issues in Addiction Practice

Addiction		Target Percentage
01	Alcohol	15-20%
02	Sedatives	7-10%
03	Stimulants	7-10%
04	Opioids	10-15%
05	Cannabinoids	7-10%
06	Nicotine	15-20%
07	Hallucinogens	.5-3%
08	Dissociatives	.5-3%
09	Inhalants	.5-3%
10	Anabolic steroids	.5-3%
11	Other substances	1-3%
12	Nonsubstance addiction	1-3%
13	General/All substances combined	1-5%

For the Test Strategy:

Some assumptions:

- All of you have had some rudimentary epidemiology/biostatistics
- Most of you have seen these concepts multiple times
- For the most part, you don't use these concepts as much as they come up on tests
- You scribble some notes on a cheat sheet to remind yourself as you're studying
- When you've been taught these concepts before, it has been shoveled to you in large amounts in short lectures

For the Test Strategy:



<http://www.bishopmikelowry.com/wp-content/uploads/2013/03/drinking-from-the-firehose.jpg>

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https://www.amazon.com/First-USMLE-Step-2021-Thirty/dp/126046752X/ref=asc_df_126046752X/?tag=hyprod-20&linkCode=df0&hvadid=459537678676&hvpos=&hvnetw=g&hvrnd=12792418851990343229&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmld=&hvlocint=&hvlocphy=9032089&hvtargid=pla-1113406220592&psc=1

So...



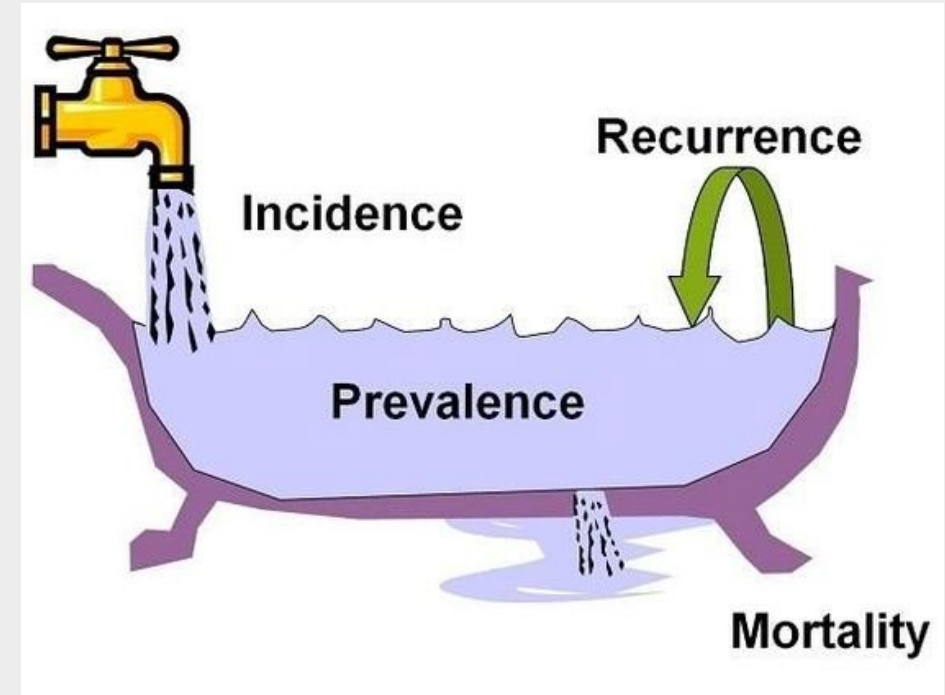
<https://memegenerator.net/instance/26662134/med-student-meerkat-stay-on-your-toes>

Let's Do A Quick Matching Exercise:


- Incidence
 - Prevalence
 - #of existing cases/Total #of people (at a point in time)
 - Rate: #new cases/#people at risk (during a specified time period)
- 

Incidence:

- Represents the RISK of a disease: new cases coming into a population in time
- Have to see people longitudinally (in time) so these data are harder to find for SUDs—**PROSPECTIVE** studies
 - Example: follow-ups on Epidemiologic Catchment Area study (1980s)
 - Highest incidence in youngest population (18-29 y/o)

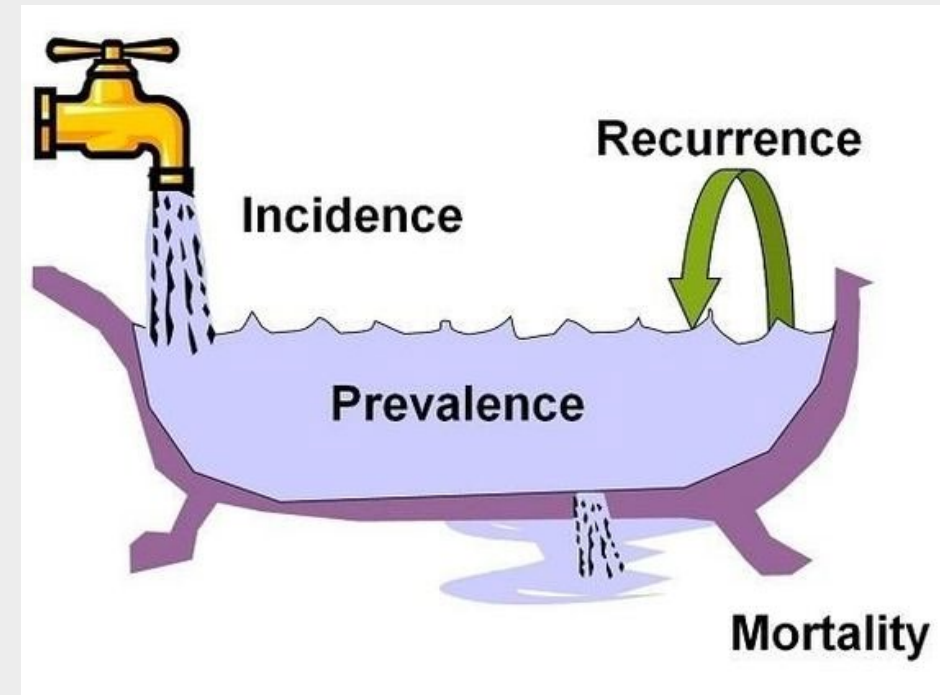


Let's Start with A Quick Matching Exercise:

- Incidence
 - Prevalence
 - #of existing cases/Total #of people (at a point in time)
 - Rate: #new cases/#people at risk (during a specified time period)
- 

Prevalence:

- Represents the *public health burden* of a disease at a particular time
- CROSS SECTIONAL SURVEYS
 - Example: annual National Survey on Drug Use and Health (NSDUH)
 - Tobacco products, alcohol, illicit drugs



Let's Start With Some Useful Basics:

Primary Prevention

Interventions designed to prevent the onset or future incidence of a specific problem

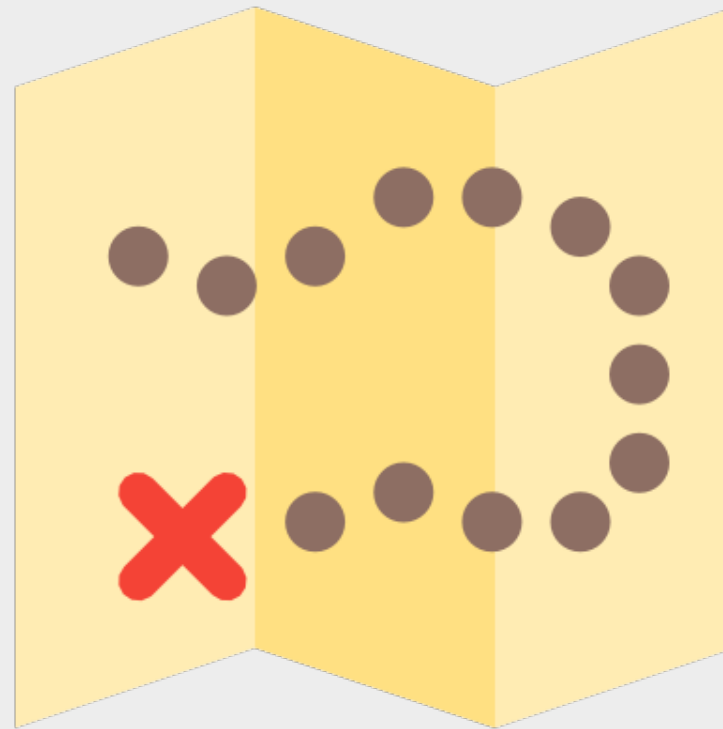
Secondary Prevention

An early intervention that decreases the prevalence of a specific problem

Tertiary Prevention

Treatment designed to improve quality of life and reduce the symptoms after a disease or disorder has developed
Does not reduce incidence or prevalence

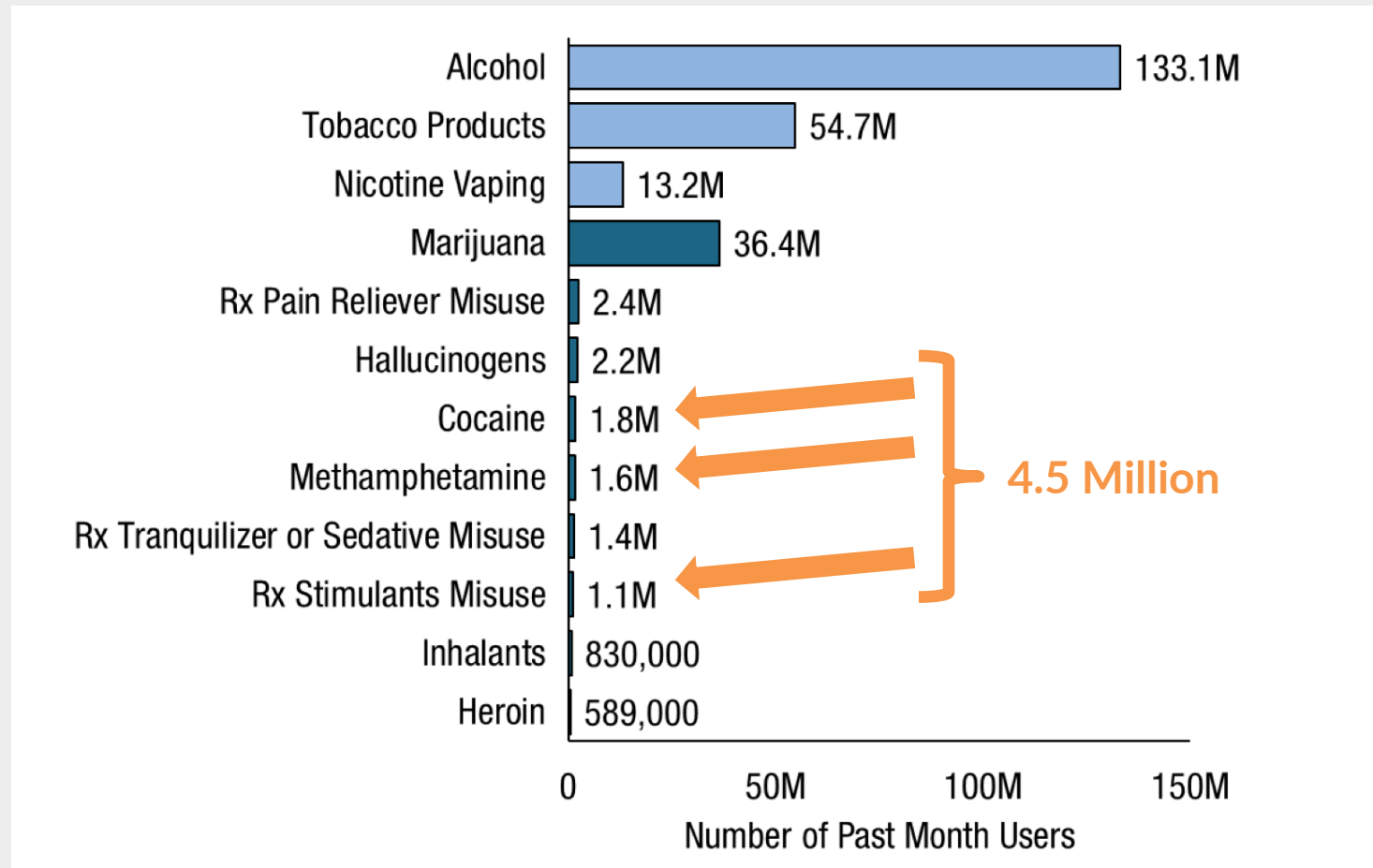
Let's take a quick tour of some prevalence data and important trends to help us put the story together:



First: Big Picture



2021 NSDUH Prevalence: Past Month General Substance Use and Nicotine Vaping: Among People Aged 12 or Older; 2021

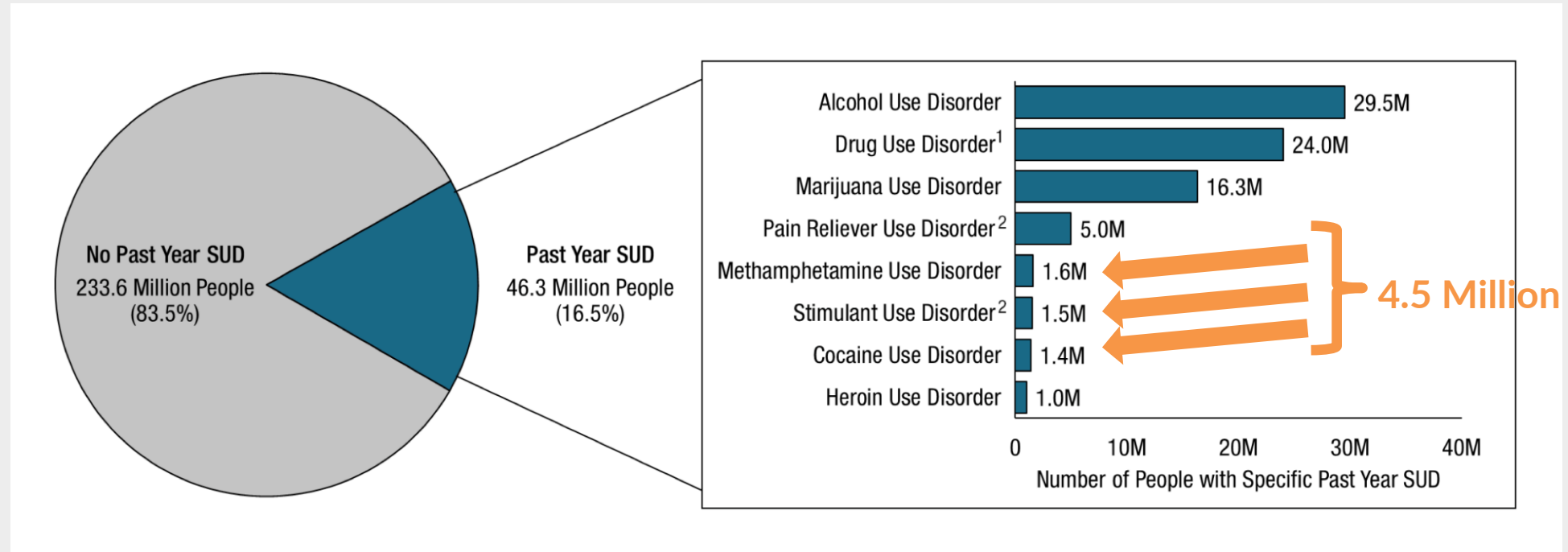


Rx = prescription.

Note: General Substance Use includes any illicit drug, alcohol, and tobacco product use. Tobacco products are defined as cigarettes, smokeless tobacco, cigars, and pipe tobacco.

Note: The estimated numbers of current users of different substances are not mutually exclusive because people could have used more than one type of substance in the past month.

People Aged 12 or Older with a Past Year Substance Use Disorder (SUD); 2021



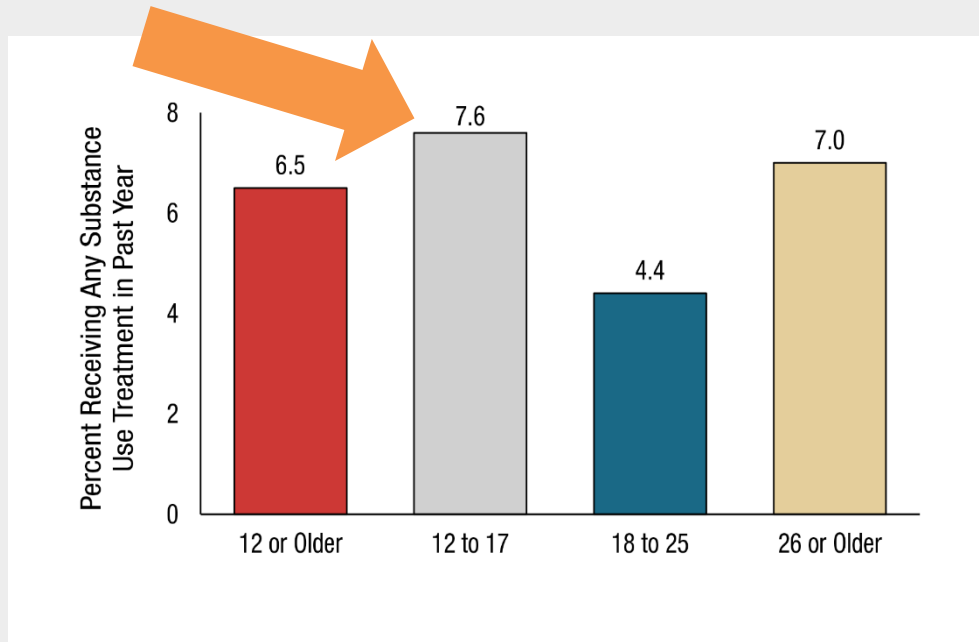
Note: The estimated numbers of people with substance use disorders are not mutually exclusive because people could have use disorders for more than one substance.

¹ Includes data from all past year users of marijuana, cocaine, heroin, hallucinogens, inhalants, methamphetamine, and prescription psychotherapeutic drugs (i.e., pain relievers, tranquilizers, stimulants, or sedatives).

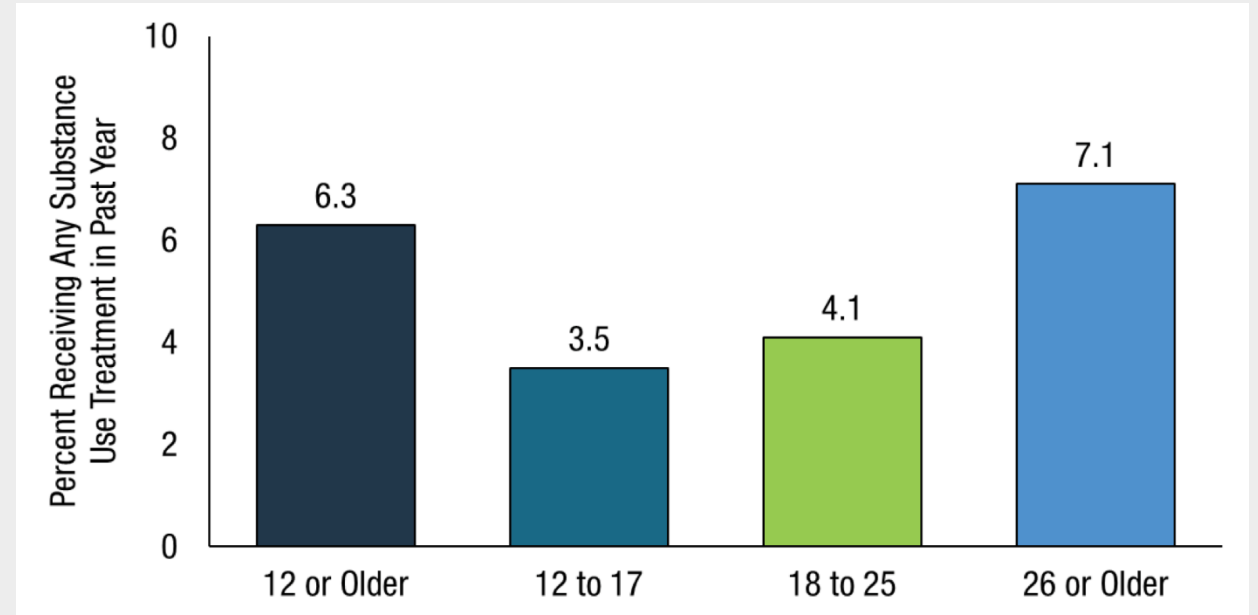
² Includes data from all past year users of the specific prescription drug.

But do people get treatment?

2020

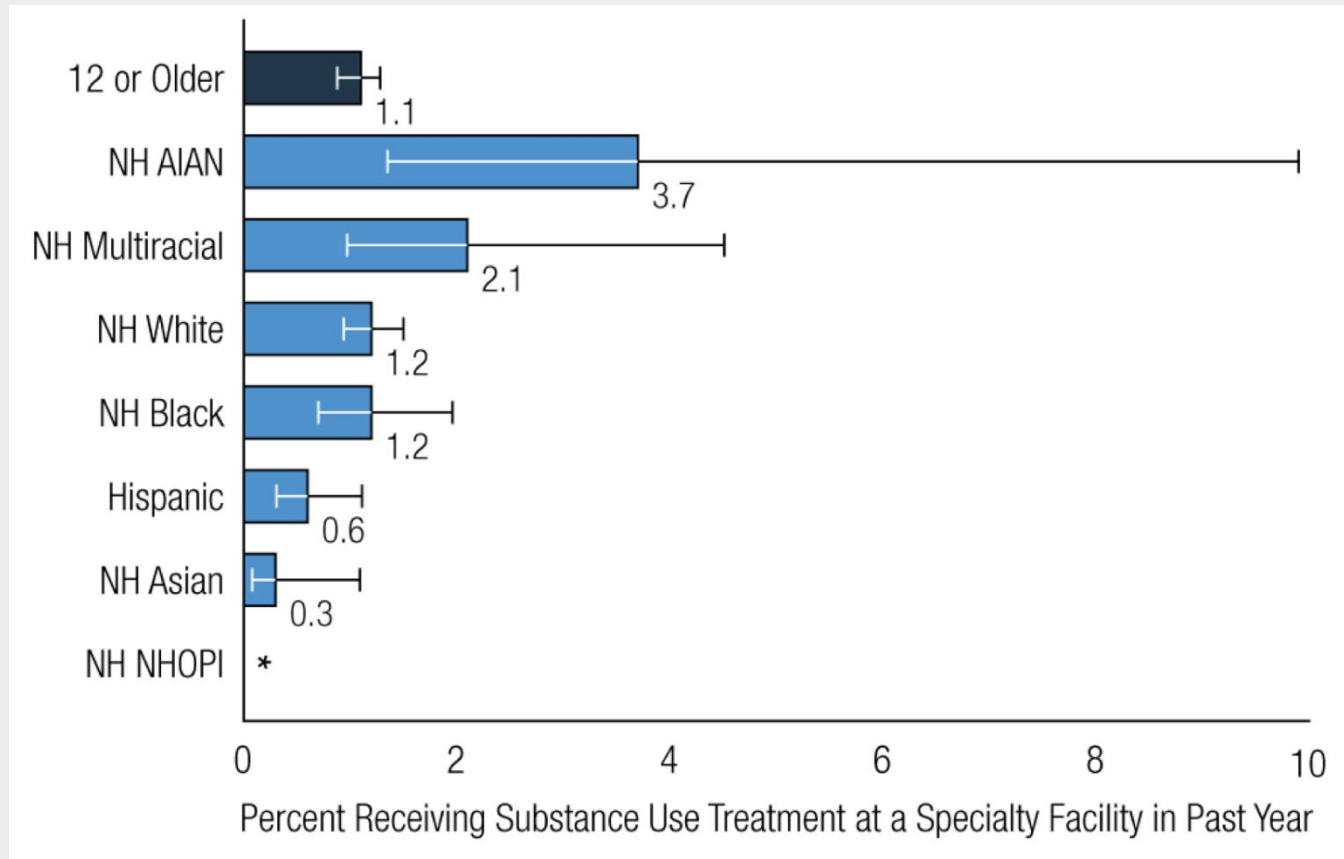


2021



But do people get treatment?

2021

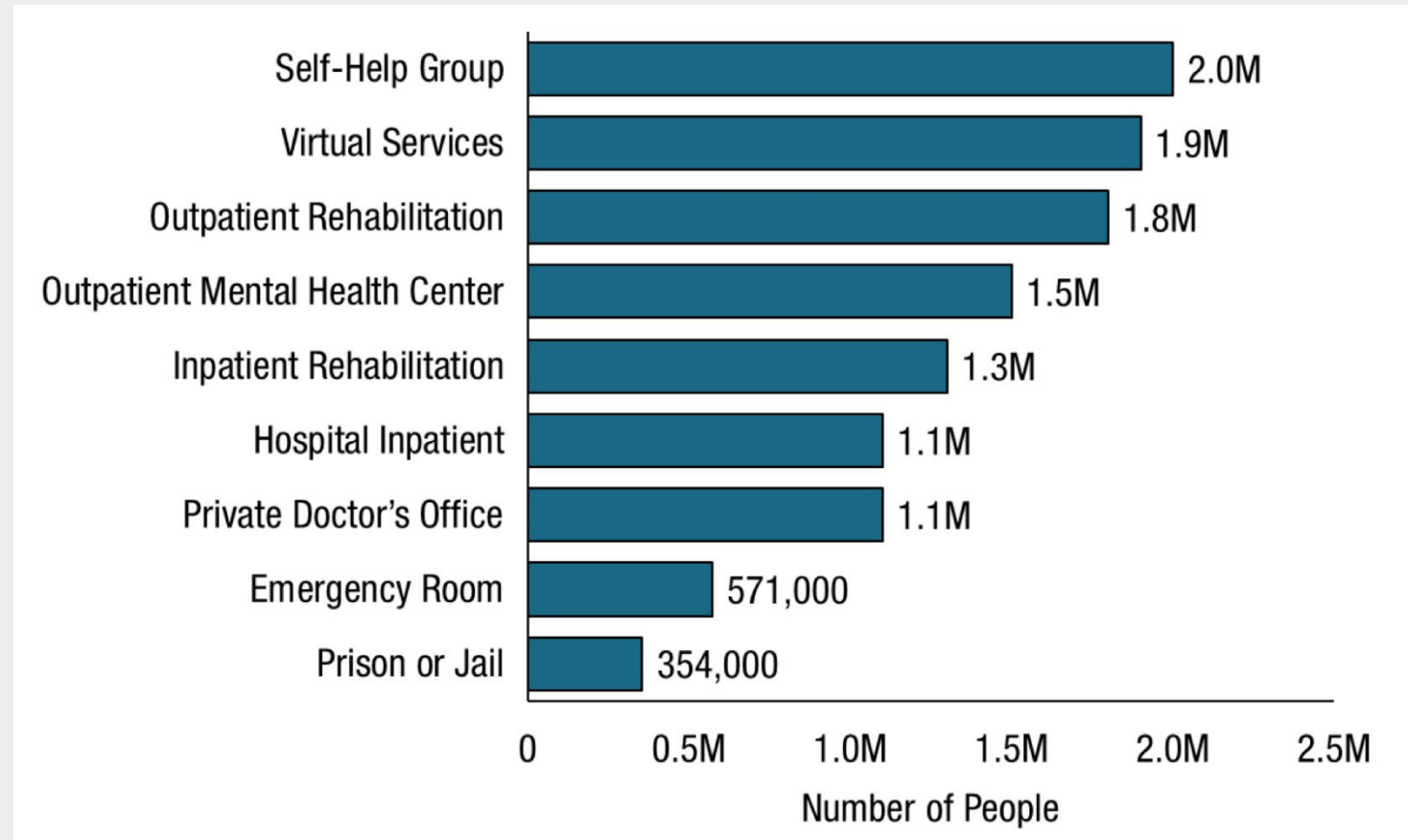


* Low precision; no estimate reported.

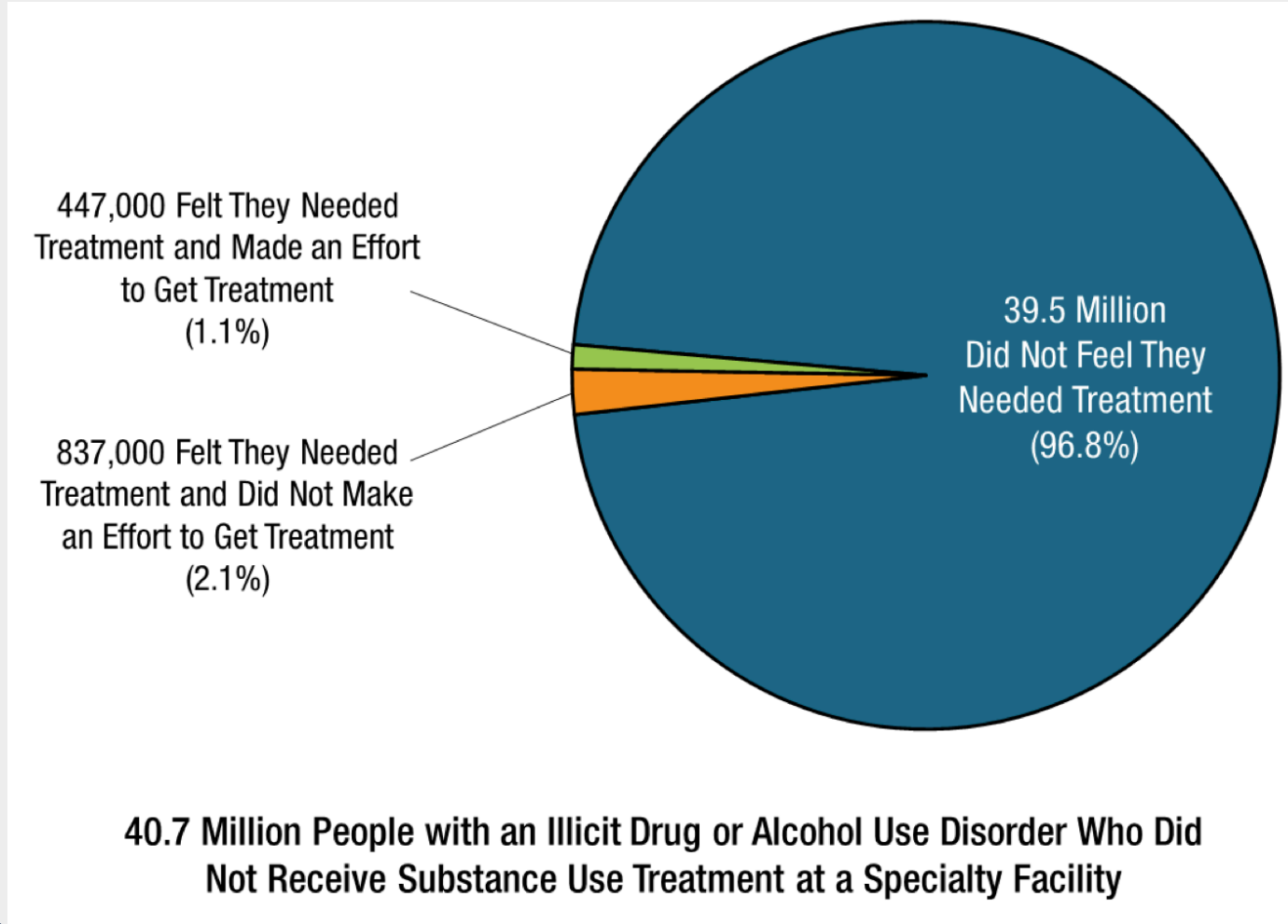
AIAN = American Indian or Alaska Native; Black = Black or African American; Hispanic = Hispanic or Latino; NH = Not Hispanic or Latino; NHOPI = Native Hawaiian or Other Pacific Islander.

Note: Error bars were calculated as 99 percent confidence intervals. Wider error bars indicate less precise estimates. Large apparent differences between groups may not be statistically significant.

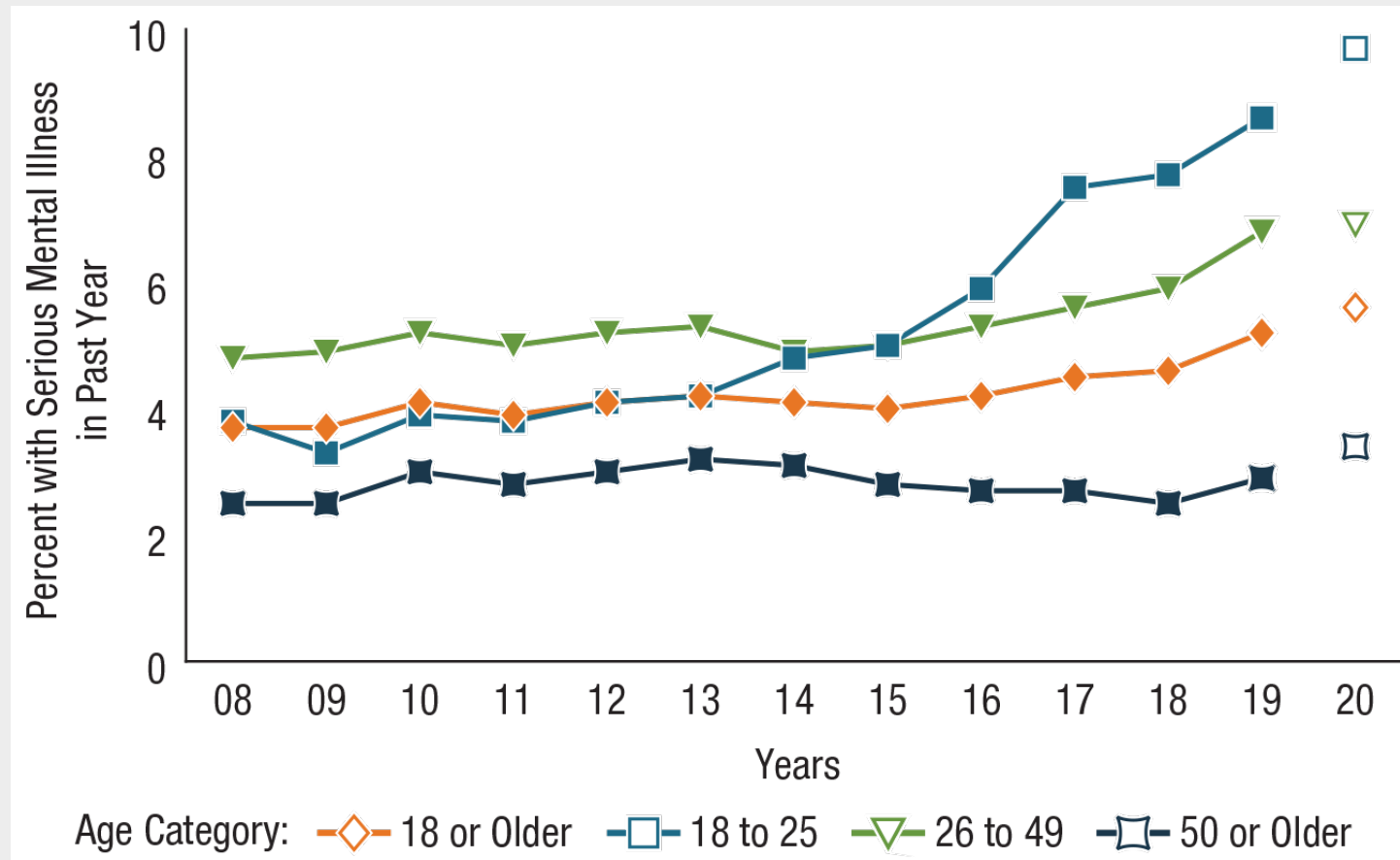
For the people who do get “treatment” where do people get it?



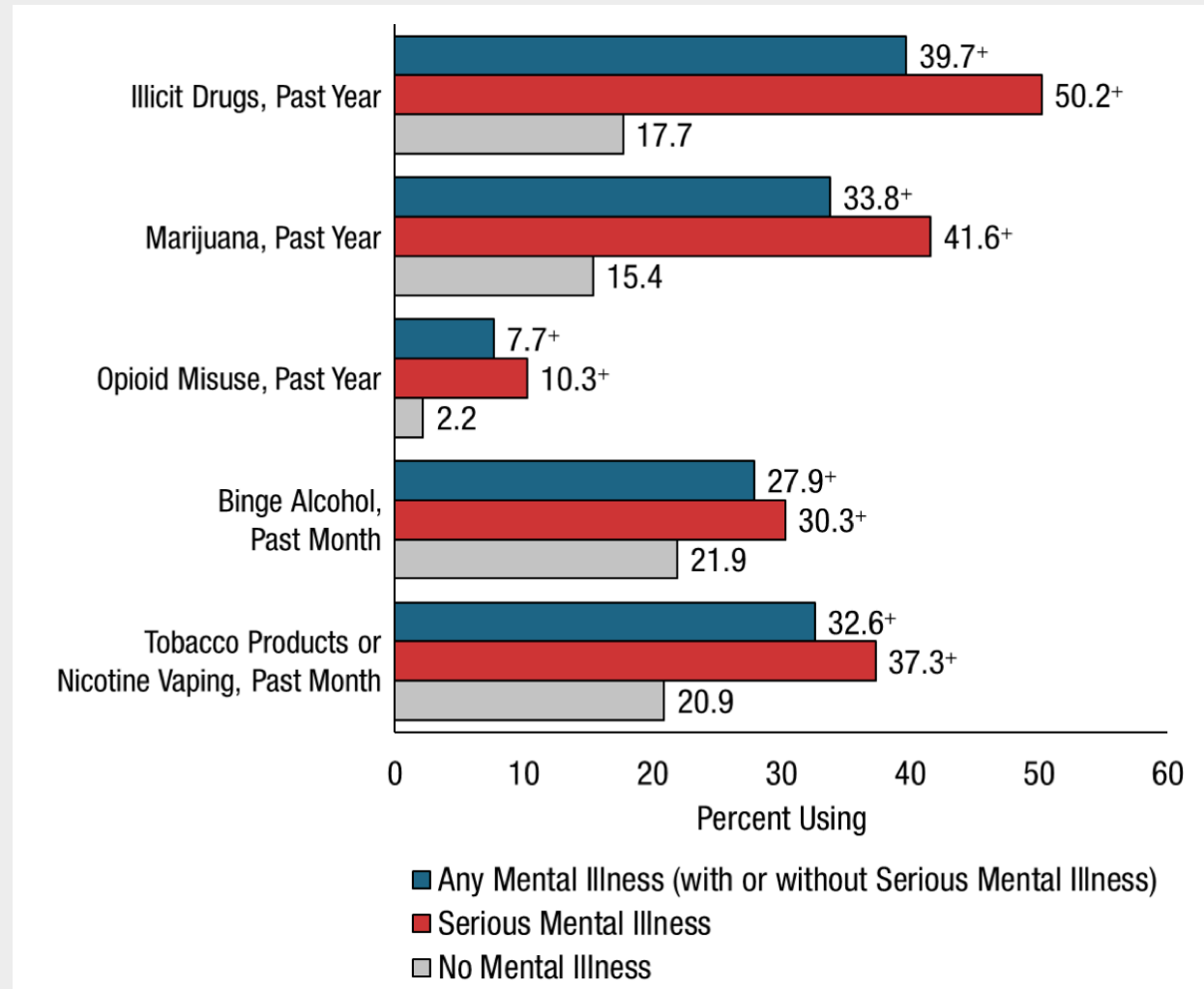
Perceived NEED for treatment (2020)



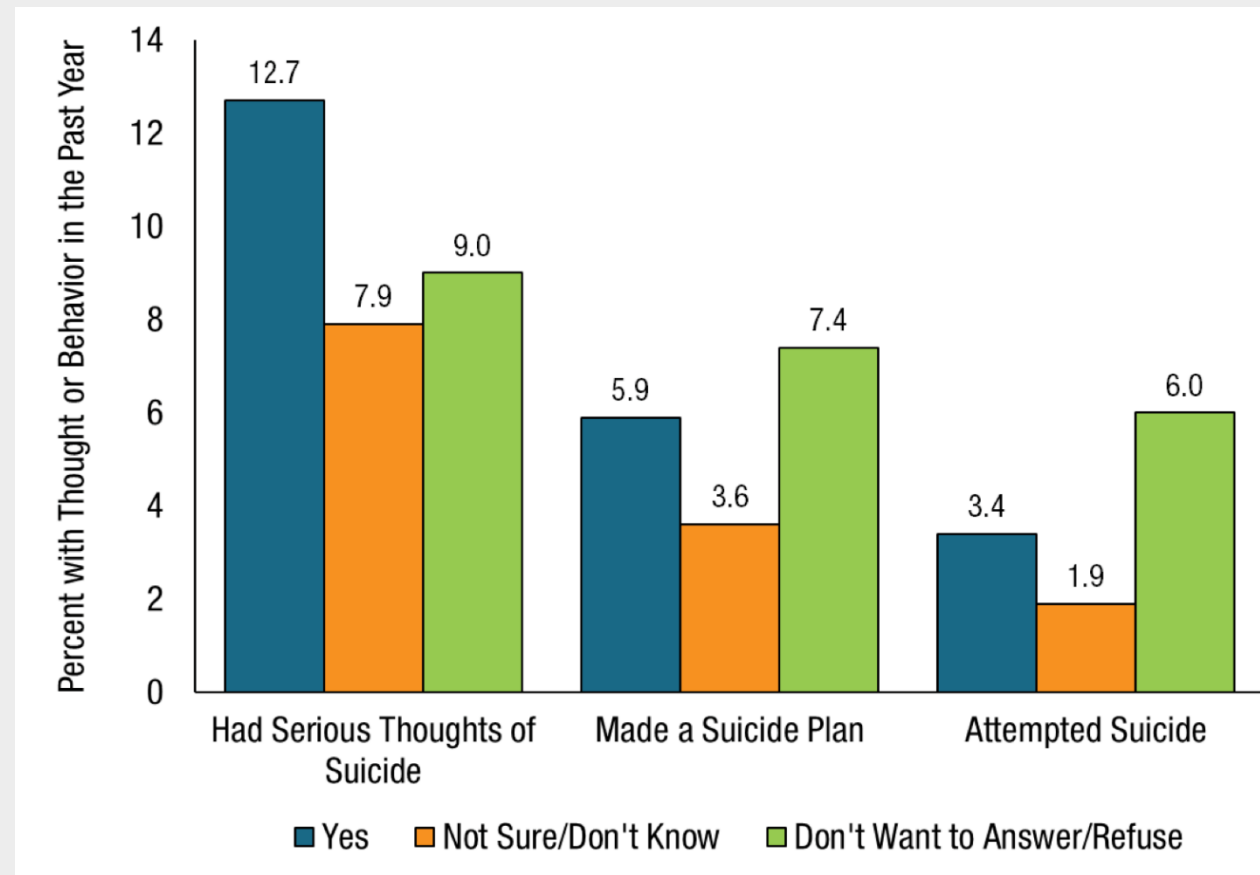
Serious Mental Illness in the Past Year: Among Adults Aged 18 or Older; 2008-2020



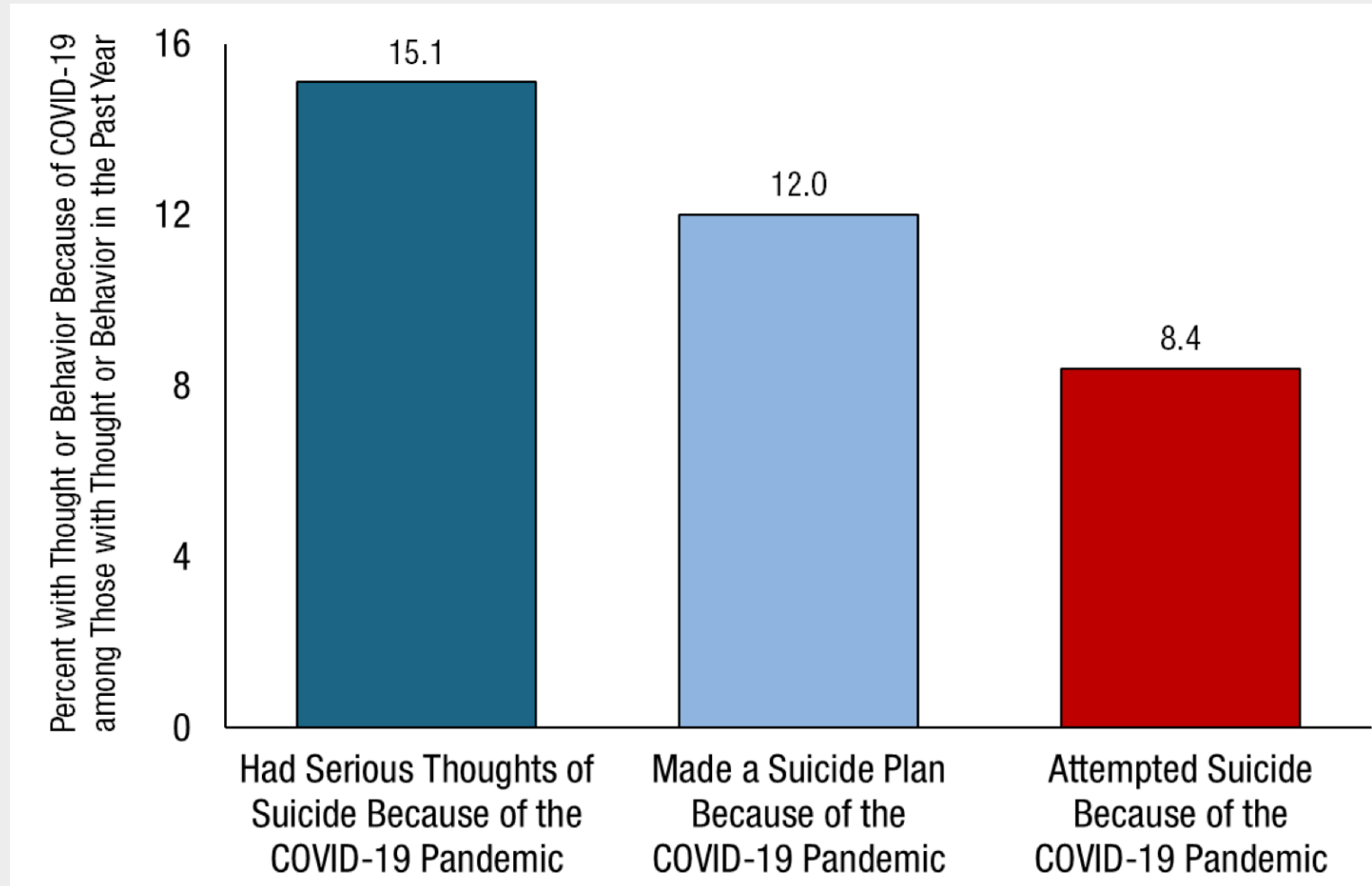
Substance Use: Among Adults Aged 18 or Older; by Mental Illness Status, 2021



Had Serious Thoughts of Suicide, Made a Suicide Plan, or Attempted Suicide in the Past Year: Among Youths Aged 12 to 17; 2021



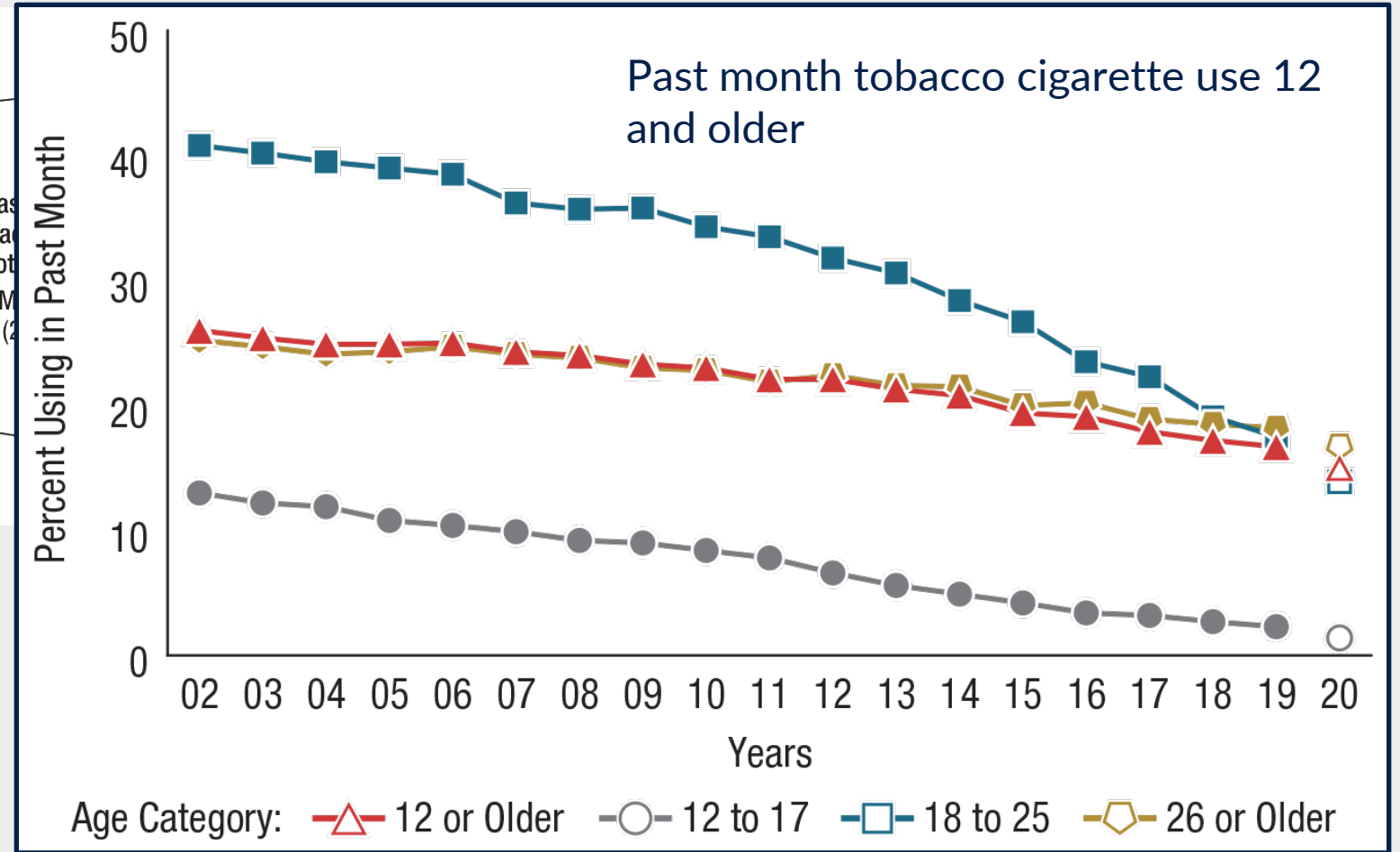
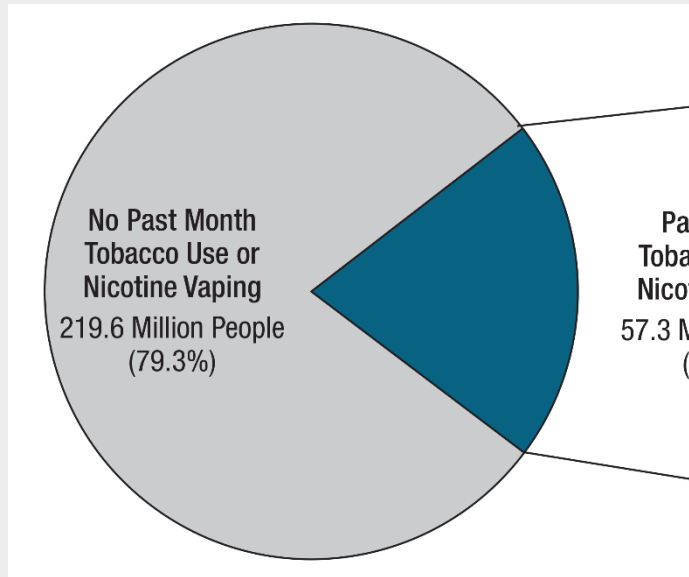
Suicidal thinking as a function of pandemic; 12-17 youth: 2021



Second: Looking a little closer by substance



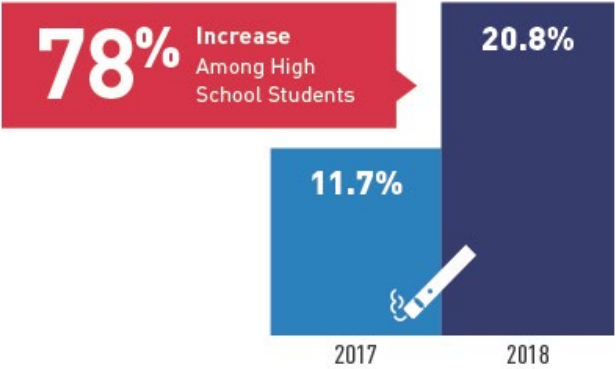
Tobacco, 2020



E-Cigarettes

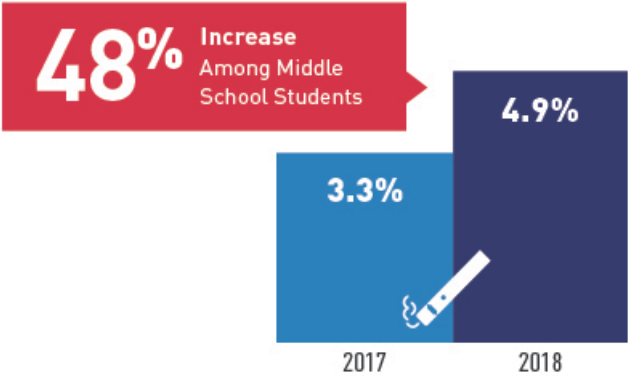
E-cigarette Use among High School Students

SURGE IN YOUTH CURRENT E-CIGARETTE USE



E-cigarette Use Among Middle School Students

SURGE IN YOUTH CURRENT E-CIGARETTE USE

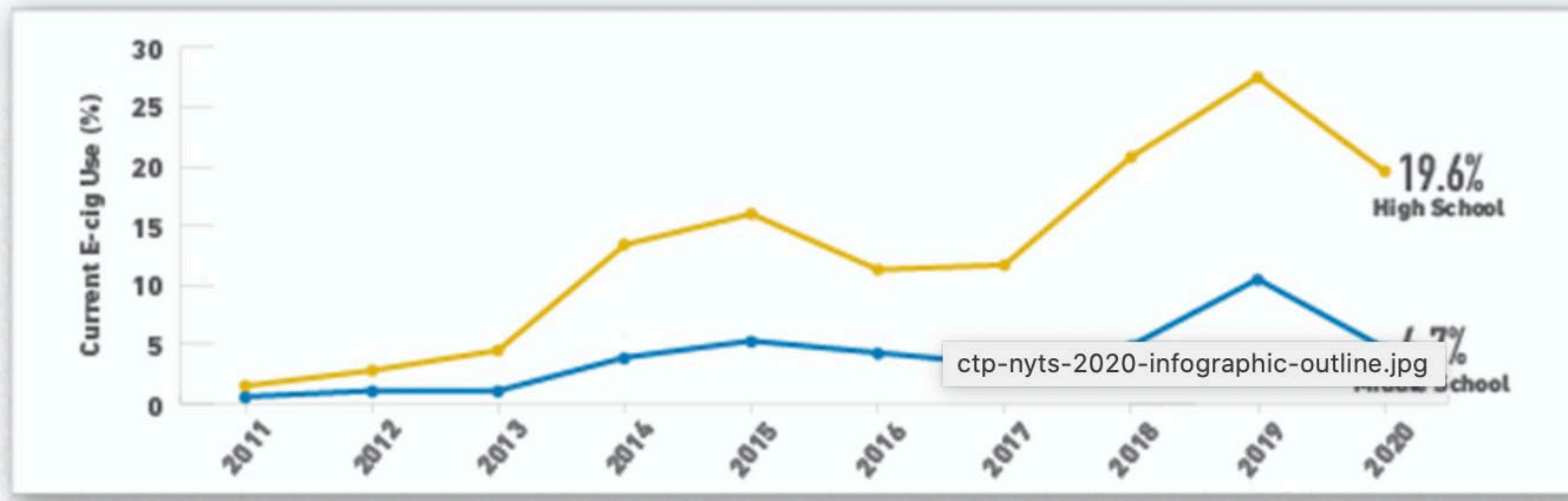


But(t):

2020 National Youth Tobacco Survey

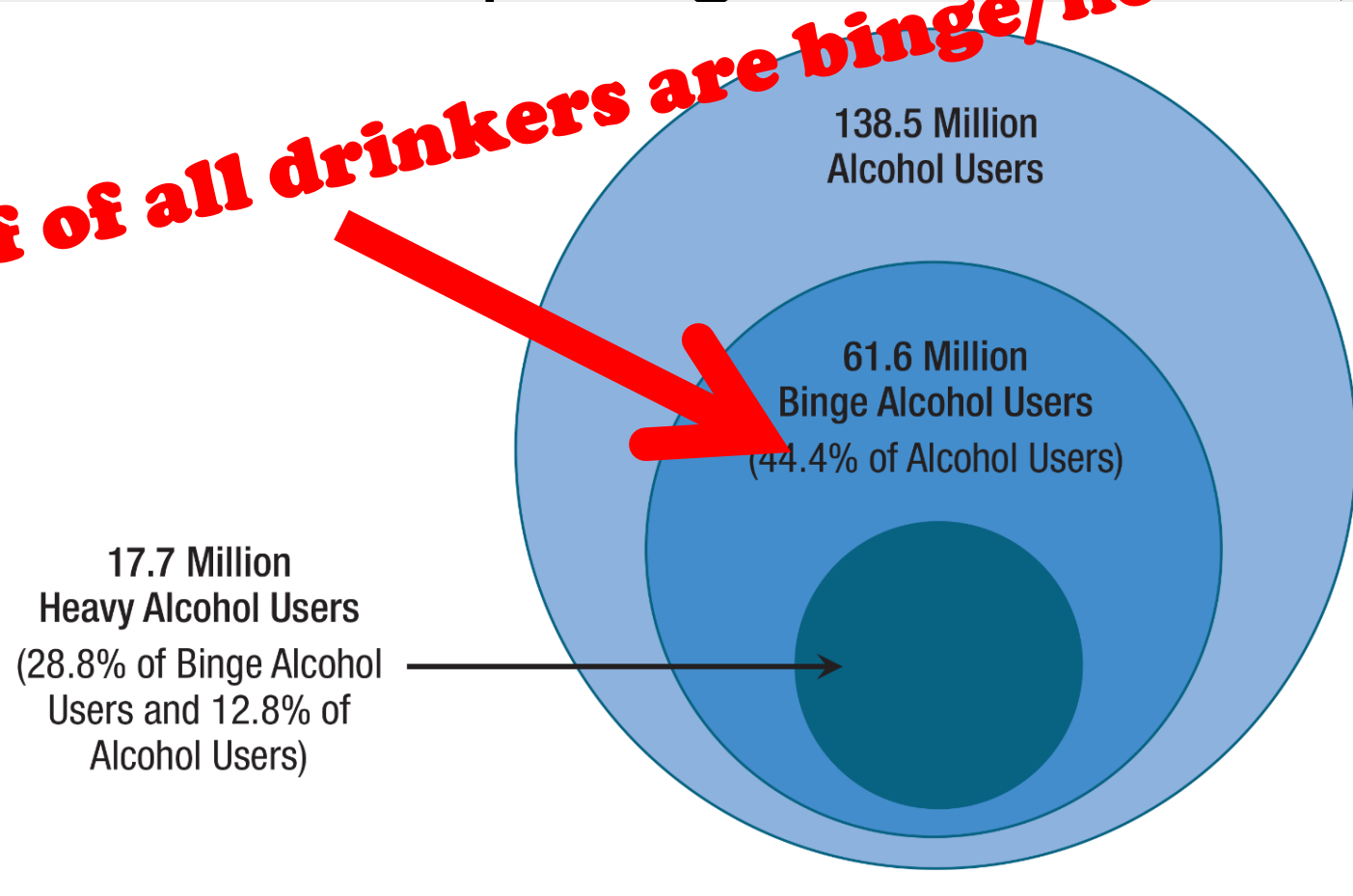
Findings show a sharp decline in youth e-cigarette use with **1.8 Million** fewer users since last year

However, due to **alarming increases** since 2011, the number of current youth e-cig users remains **concerningly high: 3.6 Million**



Current, Binge, and Heavy Alcohol Use: Among People Aged 12 or Older, 2020

> Half of all drinkers are binge/heavy drinkers



73.4% of all SUDs in US are Alcohol (may be overlap)

Note: Binge Alcohol Use is defined as drinking five or more drinks (for males) or four or more drinks (for females) on the same occasion on at least 1 day in the past 30 days. Heavy Alcohol Use is defined as binge drinking on the same occasion on 5 or more days in the past 30 days; all heavy alcohol users are also binge alcohol users.

Alcohol deaths increase dramatically during pandemic, especially for younger adults: Research

Deaths were up 25% according to a recent study.

By **Eli Cahan**

May 10, 2022, 3:19 AM • 6 min read

Fig

BLOG

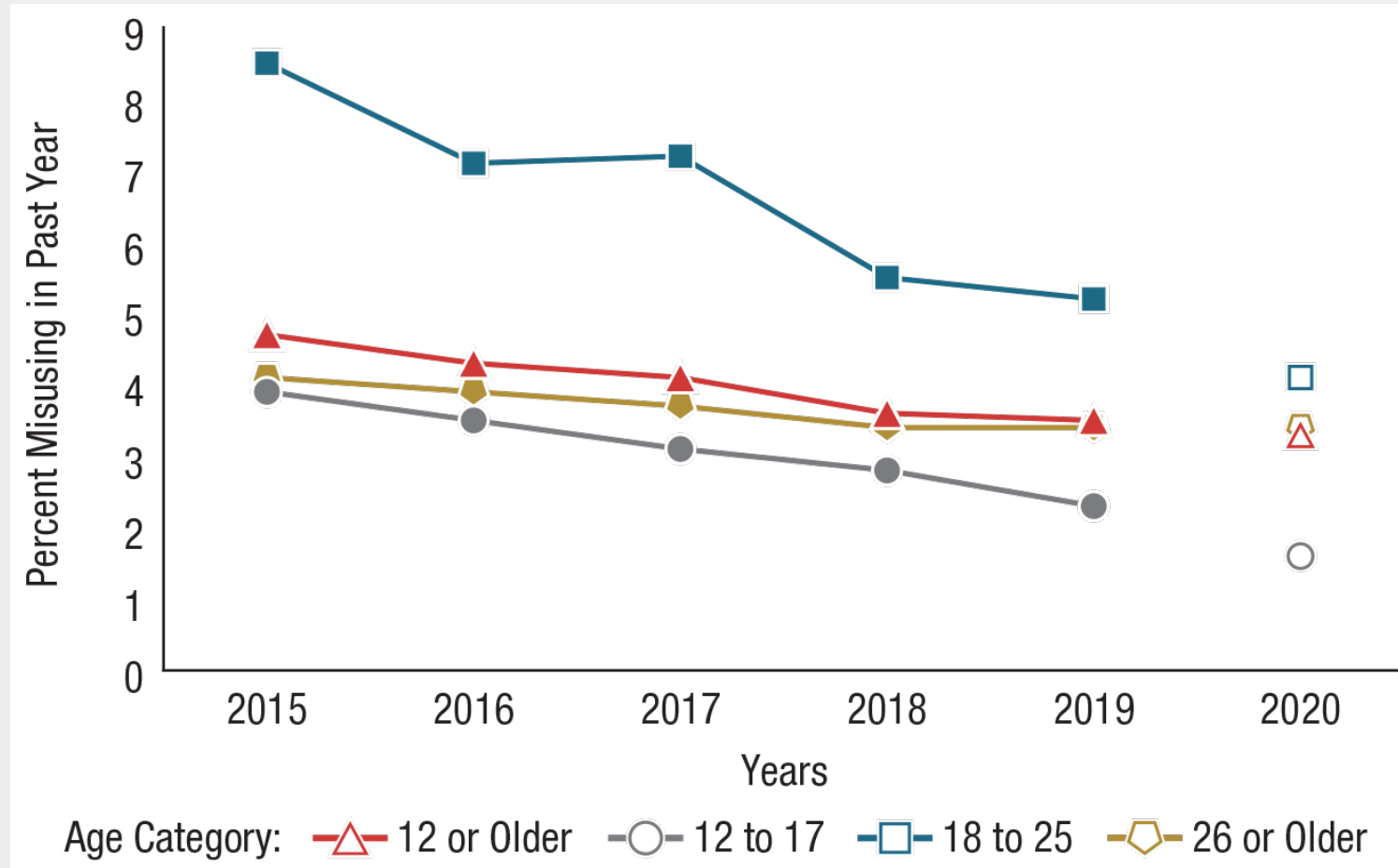
**Behind the Numbers:
Alcohol is Killing More
People Than the
Opioid Epidemic. Why
Aren't We Talking
About It?**

<https://abcnews.go.com/Health/alcohol-deaths-increase-dramatically-pandemic-younger-adults-research/story?id=84496498>

<https://www.caron.org/blog/alcohol-is-killing-more-people-than-the-opioid-epidemic>

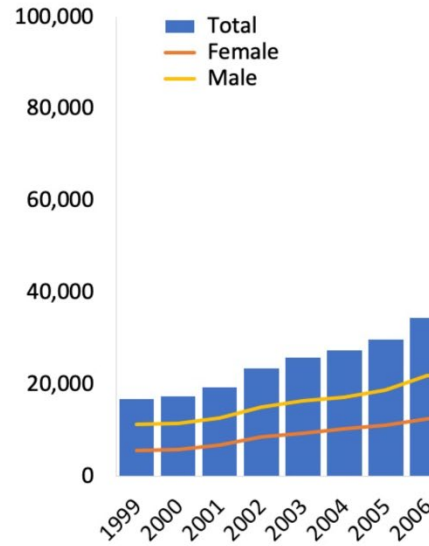


Past Year Prescription Pain Reliever Misuse: Among People Aged 12 or Older; 2015-2020



Yet...

**Figure 1. National Drug-Involved Overdose Deaths*
Number Among All Ages, by Gender, 1999-2019**



*Includes deaths with underlying causes of unintentional drug poisoning (X85), or drug poisoning of undetermined intent (X86). Source: Centers for Disease Control and Prevention, National WONDER Online Database, released 12/2020.

Society

The Guardian

Number of fentanyl-filled pills seized by US law enforcement up 4,850%

A study found that more than 2m counterfeit pills were confiscated in the last quarter of 2021 alone

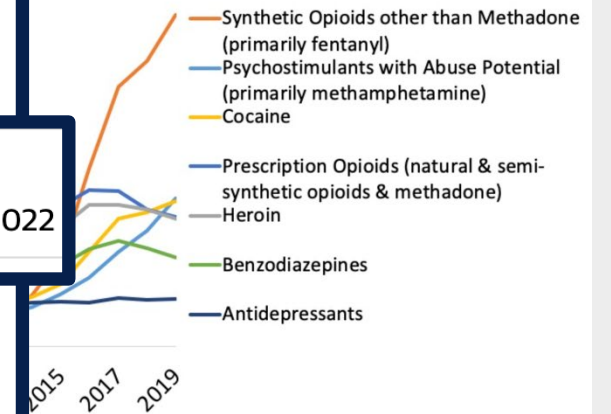


Erin McCormick

12:00 UTC Thursday, 31 March 2022

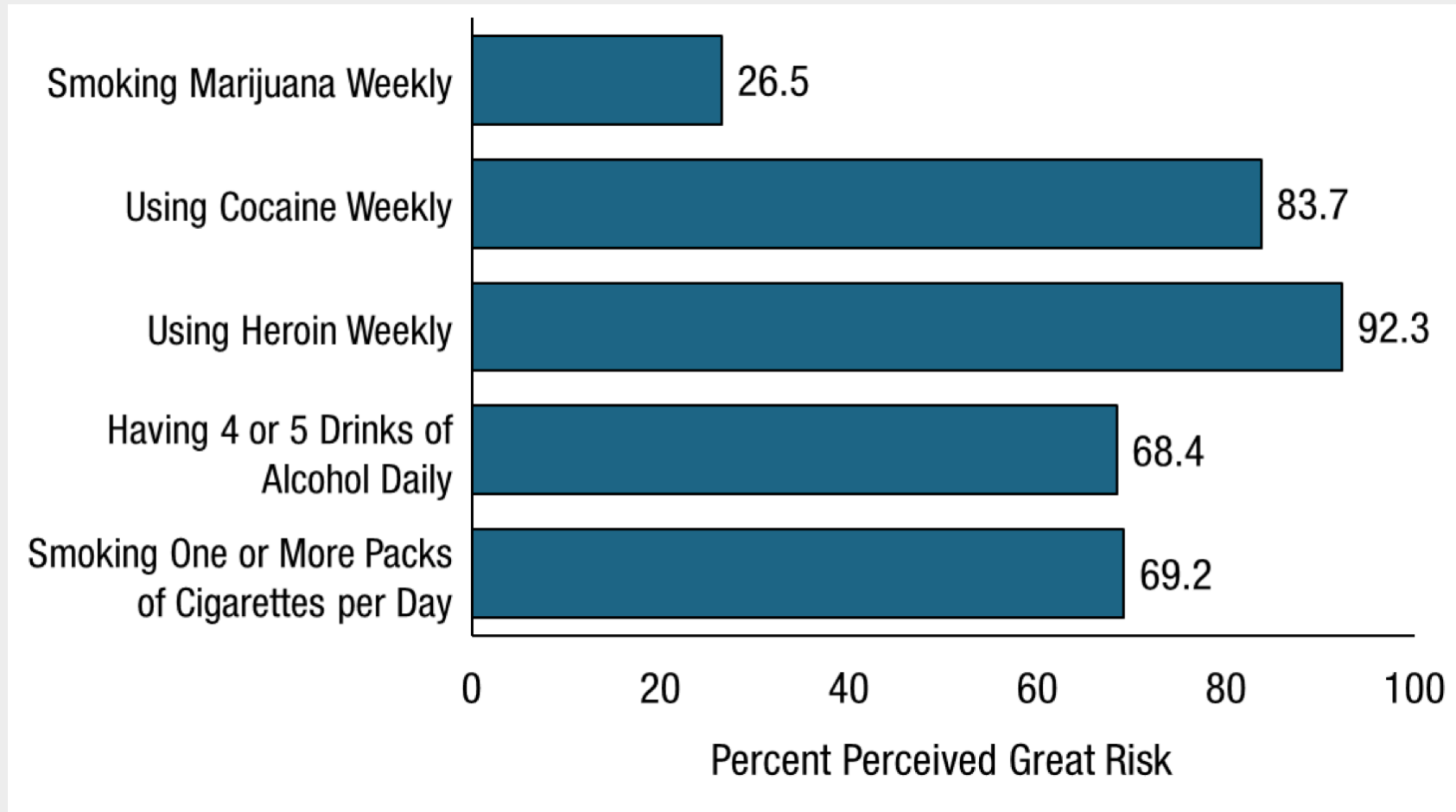
<https://www.theguardian.com/society/2022/mar/31/fentanyl-overdose-us-law-enforcement>

**Involved Overdose Deaths*,
All Ages, 1999-2019**



Source: Centers for Disease Control and Prevention, National Center for Health Statistics. Multiple Cause of Death 1999-2019 on CDC WONDER Online Database, released 12/2020.

Perceived Great Risk from Substance Use: Among People Aged 12 or Older; 2021



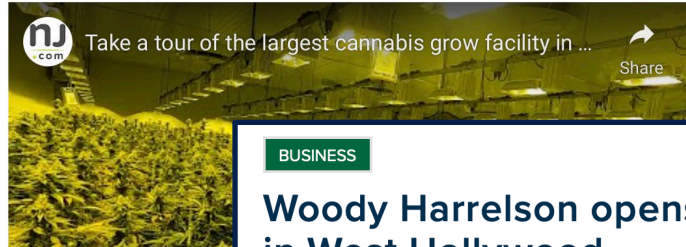
You can become a judge in High Times' "Cannabis Cup" and pick your favorite product!

by Mason Carroll | Friday, May 13th 2022



A beginner's guide to weed: How to choose the right strain for you

Updated: Apr. 15, 2022, 11:51 a.m. | Published: Apr. 15, 2022, 9:02 a.m.



Advertisement



BUSINESS

Woody Harrelson opens The Woods cannabis dispensary in West Hollywood

BY SUSAN CARPENTER | WEST HOLLYWOOD
PUBLISHED 5:00 PM PT MAY. 13, 2022

WEST HOLLYWOOD, Calif. — With a waft of marijuana swirling around him and an adoring crowd of fans, Woody Harrelson cut the ribbon on his new cannabis dispensary in West Hollywood Friday. Part retail, part lounge and 100% dedicated to selling the best marijuana grown under the California sun, The Woods opened for business Friday.

"Hopefully we've added more beauty and more good times here," Harrelson told an eclectic group that had packed onto the sidewalk on Santa Monica Blvd. moments before The Woods opened its doors. "Hopefully we can help make the West Hollywood citizens a little bit higher."

<https://www.hollywoodreporter.com/lifestyle/lifestyle-news/woody-harrelson-opens-cannabis-dispensary-the-woods-west-hollywood->

HEALTH NEWS



FDA Warns Companies to Stop Making False Claims for THC and CBD Products



Written by [Julia Ries](#) on May 13, 2022 — [Fact checked](#) by Jennifer Chesak

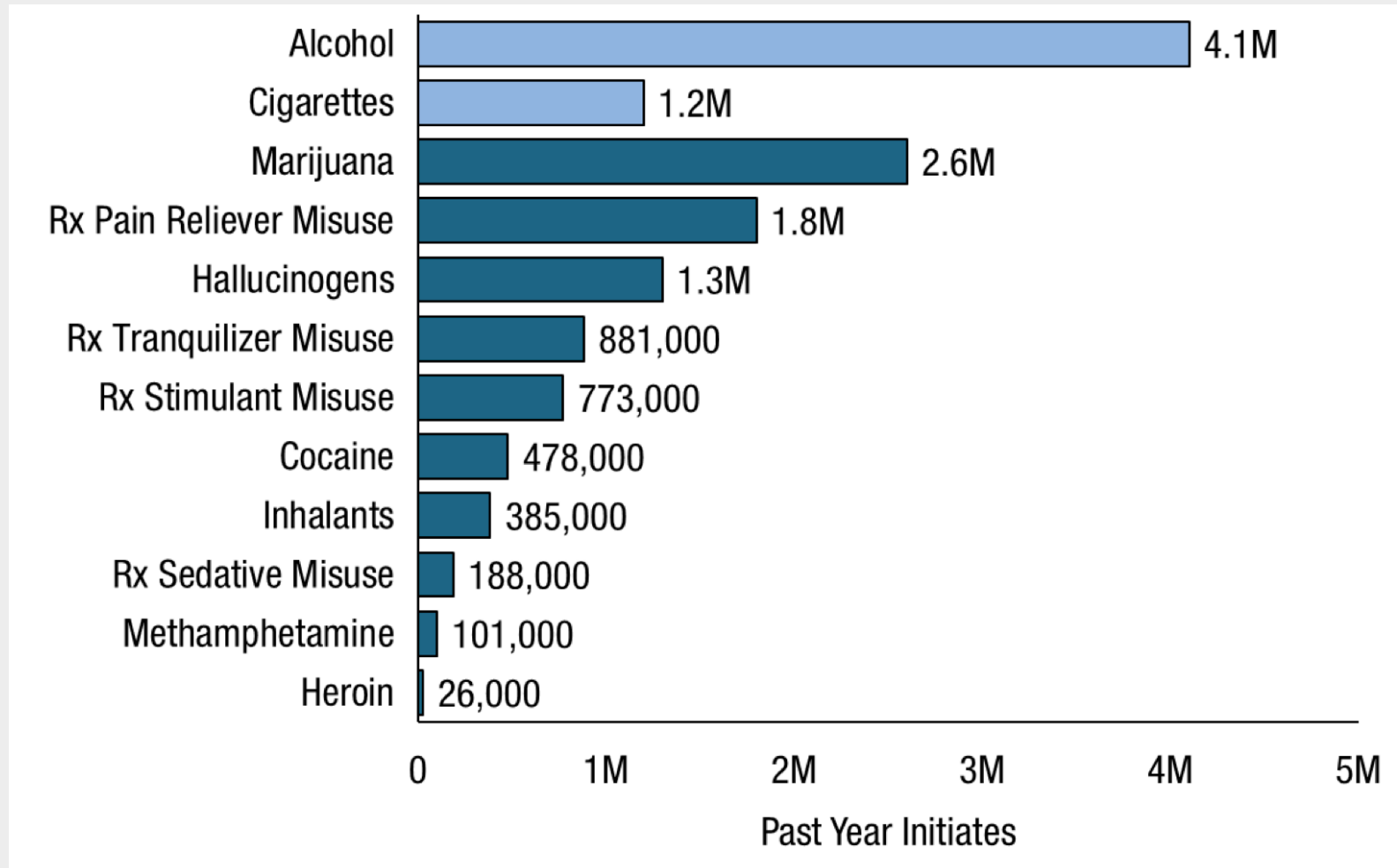
ADVERTISEMENT

<https://www.healthline.com/health-news/fda-warns-companies-to-stop-making-false-claims-for-thc-and-cbd-products>

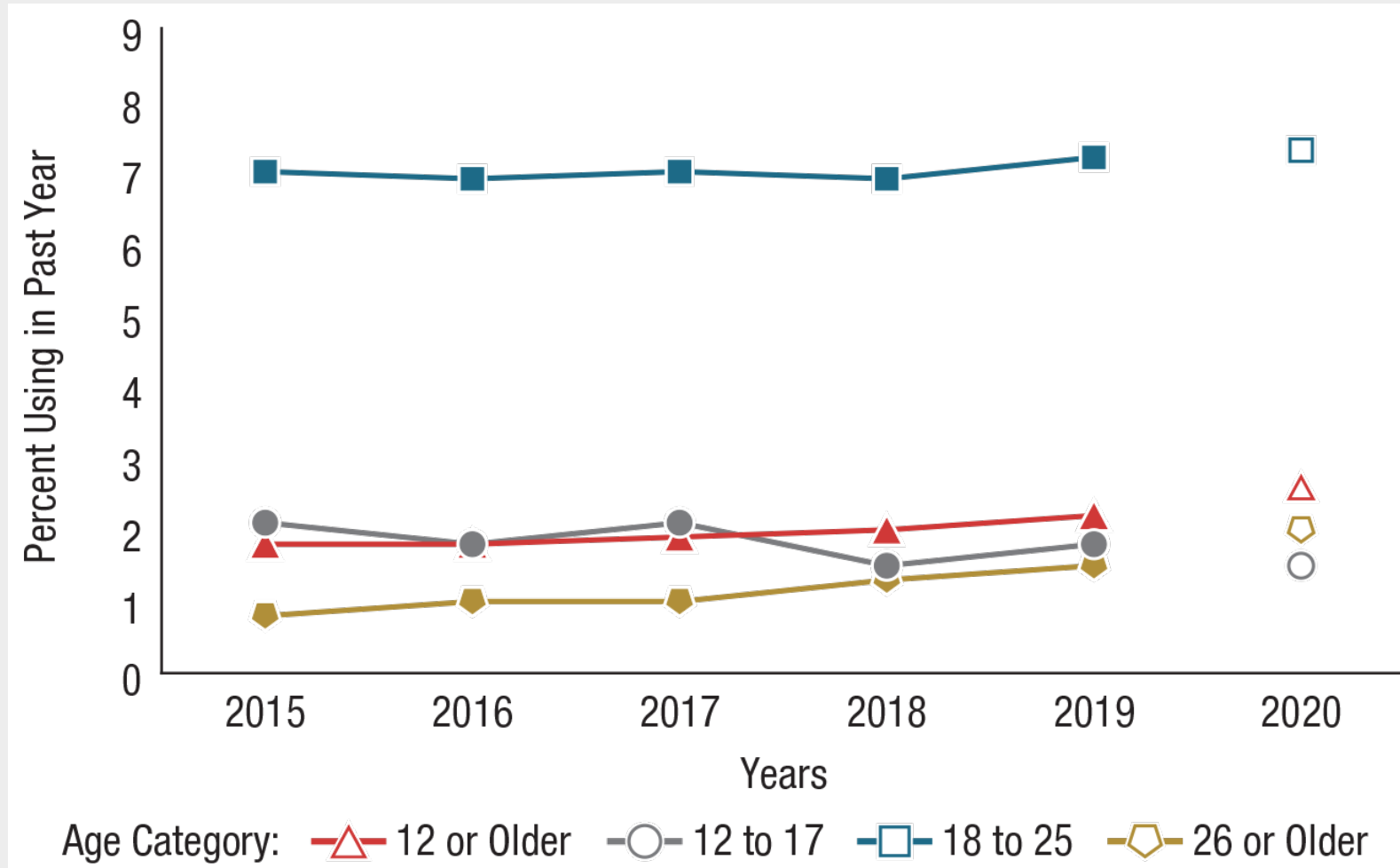
healthline



Past Year Initiates of Substances: Among People Aged 12 or Older; 2021



Past Year Hallucinogen Use: Among People Aged 12 or Older; 2015-2020



<https://www.samhsa.gov/data/data-we-collect/nsduh-national-survey-drug-use-and-health>

People who used 'magic mushrooms' less likely to develop opioid use disorder, study finds



ADRIANNA RODRIGUEZ | USA TODAY

Updated 2:58 pm EDT Apr. 7, 2022

A "shroom craze" may get even wilder after a new study that suggests a psychedelic drug found in some mushrooms may have protective benefits against addiction.

Harvard University researchers found opioid use disorders were 30% less likely among people who used psilocybin compared with those who never had it, [according to the study published Thursday in Scientific Reports](#).

Every item on this page was chosen by a Town & Country editor. We may earn commission on some of the items you choose to buy.

Why Is Everyone Smoking Toad Venom?

How an illegal amphibian-venom-derived psychedelic became the loudest whisper at a dinner party near you.



BY ALEX KUCZYNSKI — JAN 20, 2022

BOXING

Mike Tyson Says He 'Died' After Smoking Psychedelic Toad Venom

ANDREW GASTELUM • NOV 17, 2021

He Must Check and Control himself, he said, for the best



<https://www.townandcountrymag.com/leisure/arts-and-culture/a38687510/toad-venom-bufo-illegal-psychedelic-drug/>

<https://www.si.com/boxing/2021/11/17/mike-tyson-says-he-died-smoking-psychedelic-toad-venom>

Third: Other Important Parts of the Story



Race/Ethnicity 2021

	National Average (%)	Black (%)	Asian (%)	American Indian/Alaska Native (%)	Hispanic (%)	Hawaiian/Pacific Islander (%)
Past Month Binge Alcohol Use (12+)	21.5	21.6	10.7	21.2	22.9	**
Past Month Heavy Alcohol Use (12+)	5.8	5.2	1.9	7.2	4.7	5.6
Past Year Illicit Drug Use (12+)	21.9	24.3	11.1	36.1	19.4	**
Past Year Marijuana Use (12+)	18.7	21.3	8.6	35	15.8	**
Past Year SUD (12+)	16.5	17.2	8	27.6	15.7	20.7
Suicidal Thinking Past Year (12+)	4.8	4.6	2.6	8.5	4.9	7.4

Minority
12.4)
37.6)
2.9)

<https://www.samhsa.gov/data/sites/default/files/reports/rpt31104/2019NSDUH-LGB/LGB%202019%20NSDUH.pdf>
<https://www.samhsa.gov/data/report/2019-nsduh-detailed-tables>



Sexual Minority* 2021

	Straight (%)	Bisexual (%)	Gay (%)	Lesbian (%)
Binge Alcohol Use Past Month (18+)	22.5	33.1	33.1	28.0
Illicit Drug Use Past Month (18+)	13.3	37.7	31.3	25.3
Marijuana Use Past Month (18+)	12.2	35.2	24.7	21.7
Opioid Misuse Past Month (18+)	0.9	4.9	3.3	2.5
SUD Past Year (18+)	15.9	34.2	31.1	25.0
Suicidal Thoughts Past Year (18+)	3.7	22	14.2	9.5

* Defined by SAMHSA as people who identify as lesbian, gay, or bisexual—NSDUH began collecting this data in 2015

<https://www.samhsa.gov/data/sites/default/files/reports/rpt31104/2019NSDUH-LGB/LGB%202019%20NSDUH.pdf>

<https://www.samhsa.gov/data/report/2019-nsduh-detailed-tables>



Nearly Half of State Incarcerees Suffer From Substance Abuse: Survey

By **Blake Diaz** | July 14, 2021



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Sign

Gender...

- Women tend to initiate substance use later than men
- Women have accelerated course of disorder → “telescoping” (alcohol, marijuana, cocaine, prescription opioids)
- Women with SUDs → more severe impairment in employment, social/family, medical and psychiatric functioning

Let's Look at a Study...

- Question: Does Marijuana use cause psychosis?

Schizophrenia Bulletin vol. 42 no. 5 pp. 1262–1269, 2016

doi:10.1093/schbul/sbw003

Advance Access publication February 15, 2016

Meta-analysis of the Association Between the Level of Cannabis Use and Risk of Psychosis

Arianna Marconi¹, Marta Di Forti¹, Cathryn M. Lewis², Robin M. Murray¹, and Evangelos Vassos^{*,2}

¹Department of Psychosis Studies, King's College London, Institute of Psychiatry Psychology & Neuroscience, London, UK; ²King's College London, Institute of Psychiatry Psychology & Neuroscience, MRC SGDP Centre, London, UK

*To whom correspondence should be addressed; King's College London, Institute of Psychiatry Psychology & Neuroscience, MRC SGDP Centre, Box P082, De Crespigny Park, London SE5 8AF, UK; tel: +44-20-7848-5433, fax: +44-20-7848-0866, e-mail: evangelos.vassos@kcl.ac.uk

What Is This Study?

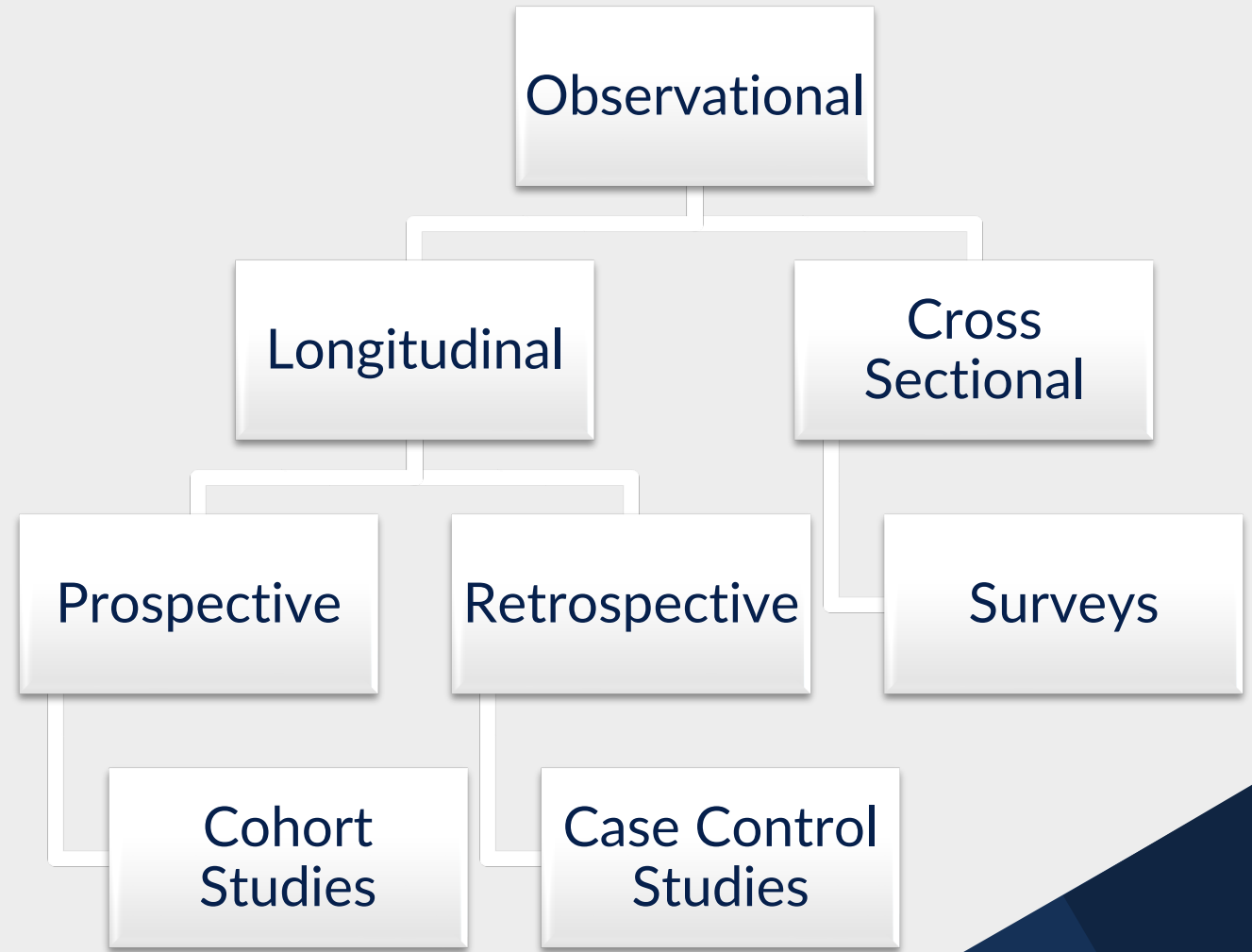
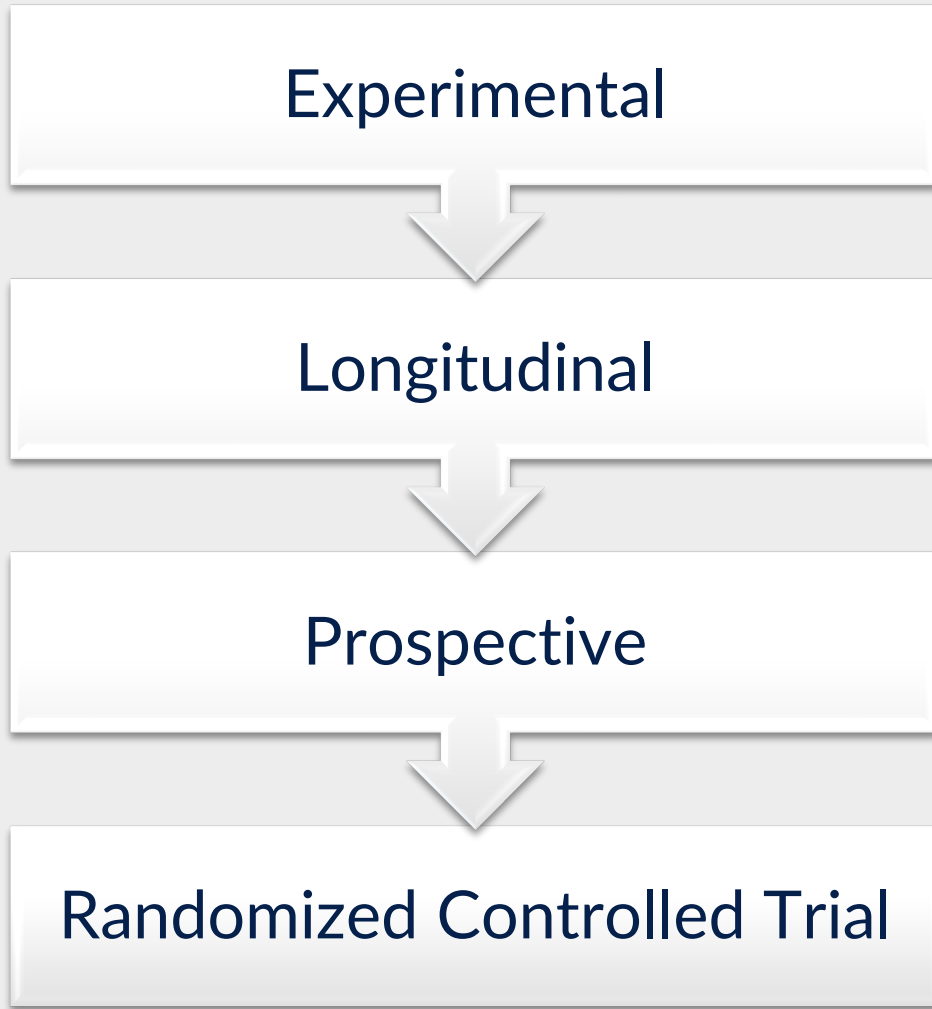
- Performed a systematic review and a meta-analysis
- Included: provided data on cannabis consumption prior to the onset of psychosis
 - 18 for systematic review and 10 for meta-analysis (66,816 individuals)
 - Continuous variable → amount of exposure
 - Cohort and cross-sectional studies included
- Findings:
 - Odds ratio 3.90 (95% confidence interval 2.84 to 5.34) for risk of schizophrenia and other psychosis-related outcomes among the heaviest cannabis users compared to non-users

What can we say about this study?

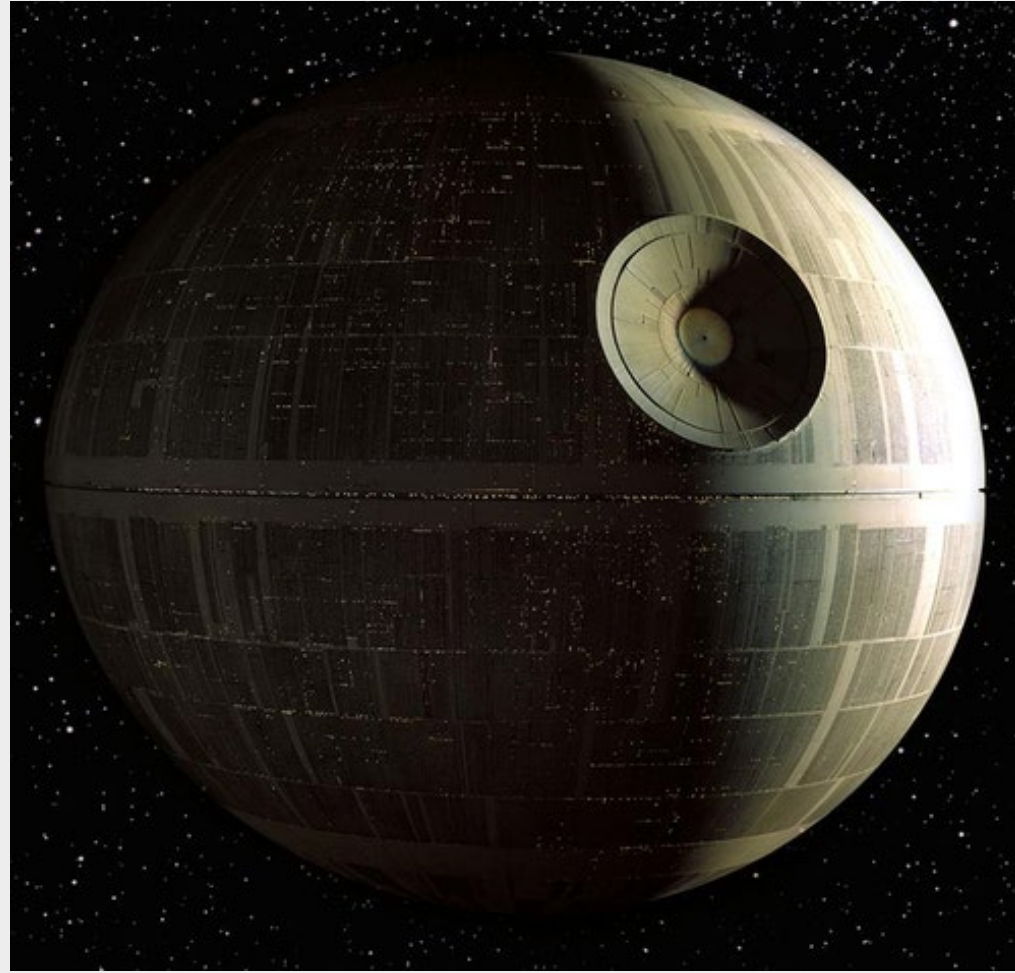
1) Quality of evidence, based on study design.



Types of Studies



Quantifying Risk...



Quantifying Risk...

		Disease	
		⊕	⊖
Risk factor or intervention	⊕	a	b
	⊖	c	d

$$AR = \frac{a}{a+b} - \frac{c}{c+d}$$

$$NNH = 1/AR$$

$$OR = \frac{a/c}{b/d} = \frac{ad}{bc}$$

$$RR = \frac{a/(a+b)}{c/(c+d)}$$

$$ARR = \frac{c}{c+d} - \frac{a}{a+b}$$

$$NNT = 1/ARR$$

Odds Ratio--more

- What is an odds ratio? **Ratio of Odds**
- Higher the Odds Ratio, stronger the association between the exposure and the outcome appears to be
- If Odds Ratio is 1, then that means that the ratio of the odds shows **NO ASSOCIATION** between the exposure and the outcome
- $(\text{those with disease who were exposed} / \text{those with disease not exposed}) / (\text{those without disease exposed} / \text{those without disease not exposed})$

Odds Ratio—An Example

- Imagine: relationship between getting breast cancer and driving an American car vs. not
 - If no correlation between these two, then the ratio of those with disease who drove American cars/those with disease who didn't would be likely close to 1, and ratio of those without disease who drove American cars/those without disease who did not drive American cars would also be close to 1, and the ratio of those two would be one = no relationship

Back To The Cannabis Paper...

2) An ASSOCIATION Was Found

- Odds ratio 3.90 (95% confidence interval 2.84 to 5.34) for risk of schizophrenia and other psychosis-related outcomes among the heaviest cannabis users compared to non-users
 - Dose-response effect seen such that increasing exposure to cannabis increases risk of psychosis-related outcomes

What about Confidence Interval?

- (95% confidence interval 2.84 to 5.34)
 - This is the range of values within which the true mean of the population is expected to fall, with a specified probability
 - Probability: 95% CI corresponds to $p=0.05$
 - If this includes 1, for odds ratio or relative risk, null hypothesis is NOT rejected (no significant difference)

Oh No, Not the “Null Hypothesis”!!!



Oh No, Not the “Null Hypothesis”!!!

		Reality	
		H_1	H_0
Study results support:	H_1	Power ($1 - \beta$)	α Type I error
	H_0	β Type II error	Correct

Oh No, Not the “Null Hypothesis”!!!

Stating that there is not an effect when one does exist:
False negative error

		Reality	
		H_1	H_0
Study results support:	H_1	Power ($1 - \beta$)	α Type I error
	H_0	β Type II error	Correct

Stating that there is an effect when none exists:
False positive error

2) An Association Was Found

- Does this mean that cannabis **CAUSES** psychosis, based on this paper?

Why the heck is his urine toxicology screen negative?

Question:

Patient's ED urine drug screen came back negative for opiates, so he must not have used the methadone he claims to be taking?

Sensitivity vs. Specificity

		Disease		
		⊕	⊖	
Test	⊕	TP	FP	PPV = $TP / (TP + FP)$
	⊖	FN	TN	NPV = $TN / (TN + FN)$
		Sensitivity = $TP / (TP + FN)$	Specificity = $TN / (TN + FP)$	

High sensitivity screen for opiates (those metabolized to morphine), but low sensitivity for synthetic opioids (methadone)

What We've Done

- Briefly reviewed scope of epidemiology covered on ABPM exam
- Examined trends in addictions and explored ways to find that data for future professional or personal use
- Followed two common questions in addiction medicine as a springboard for reviewing key concepts in epidemiology

Whew!....



3 CME Questions



A cross sectional survey is conducted to assess how many people at a given time in a particular population have moderate amphetamine use disorder. The survey has not been previously conducted. The total population is 50,000, and the survey reveals that 5,000 people report meeting criteria consistent with moderate amphetamine use disorder. What is the incidence of moderate amphetamine use disorder in this population?

- A. 10,000
- B. 45,000
- C. 0.5
- D. Incidence cannot be calculated from single cross-sectional surveys

Which of the following is TRUE regarding epidemiologic trends in addictive disorders?


- A. Tobacco use has had an overall incline from 2002 to 2019, in large part due to the spike in use of e-cigarettes (especially among younger Americans)
- B. Prescription opioid use has modestly increased from 2018-2019 (heroin and prescription pain relievers)
- C. Despite decreases in opioid use in recent years, substance related overdose deaths have INCREASED
- D. Substance related overdose deaths have increased largely because of the increase in serious mental illness and alcohol use

A case control study finds an odds ratio of 5.5 (95% CI 0.5 to 7.5) regarding the association between an exposure and development of a condition. Which is true regarding the above comment?

- A. The odds ratio of 5.5 reflects a strong association between the exposure and the development of the condition
- B. The high odds ratio here conclusively means that the exposure causes the development of the condition
- C. The 95% confidence interval crosses 1, meaning there is an intolerable risk that the perceived relationship (OR 5.5) is due to chance—a type 1 error (no effect/relationship exists)
- D. Since case control studies generally “look forward” (i.e. are prospective), this study is likely to have a low chance of asserting a Type II (Beta) error.



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