

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.*

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## 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

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### 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

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### Two Ways to Think about Epidemiology

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

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### The ABPM Exam and Epi

**Addiction Medicine**  
2019 Examination Blueprint

**Case Content Areas**

**Core Content Areas**

- 01 - Guidelines
- 02 - Genetics
- 03 - Pharmacokinetics and Pharmacodynamic Principles
- 04 - Neurobiology of Addiction
- 05 - Epidemiological Concepts
- 06 - Epidemiological Trends of Substance Use Disorders
- 07 - Prevention
- 08 - Screening, Assessment, and Brief Intervention
- 09 - Management of Patients and Equipped Providers and Behavioral
- 10 - Pharmacologic Interventions for Addictions
- 11 - Behavioral Interventions
- 12 - Co-Occurring and Medical Disorders among Patients with Alcohol and Other Drug Use and Addiction
- 13 - Co-Occurring Psychiatric Disorders among Patients with Alcohol and Other Drug Use and Addiction
- 14 - Pain and Addiction
- 15 - Ethical, Legal, and Liability Issues in Addiction Practice

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

<https://www.theabpm.org/become-certified/exam-content/addiction-medicine-content-outline/>

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### 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



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### For the Test Strategy:



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

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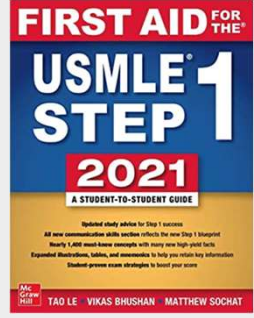
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[https://www.amazon.com/First-USMLE-Step-2021-Thirty/dp/126046752X/ref=asc\\_df\\_126046752X/?tag=hyprod-20&linkCode=df0&shvadiid=459537678676&shvpos=&shvnetw=&shvrand=12792418851990343229&shvpone=&shvptwo=&shvqnt=&shvdev=c&shvdcmdl=&shvlcint=&shvlcphy=9032089&shvtarid=pla-1113406220592&psc=1](https://www.amazon.com/First-USMLE-Step-2021-Thirty/dp/126046752X/ref=asc_df_126046752X/?tag=hyprod-20&linkCode=df0&shvadiid=459537678676&shvpos=&shvnetw=&shvrand=12792418851990343229&shvpone=&shvptwo=&shvqnt=&shvdev=c&shvdcmdl=&shvlcint=&shvlcphy=9032089&shvtarid=pla-1113406220592&psc=1)

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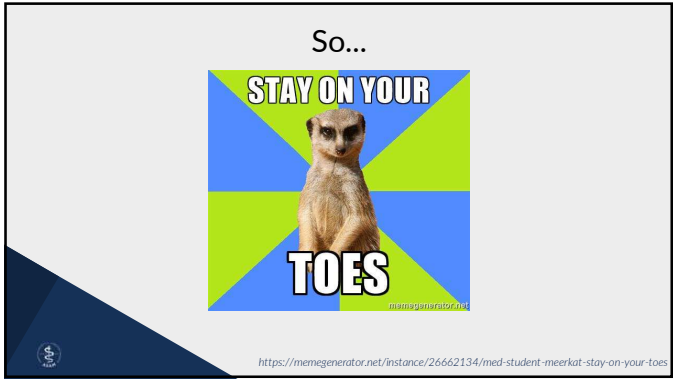
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Let's Do A Quick Matching Exercise:

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

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**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)

<http://image.slidesharecdn.com/measurementinepidemiology-141121024727-conversion-gate01/95/measurements-in-epidemiology-15-638.jpg?cb=1416559706>

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**Let's Start with A Quick Matching Exercise:**

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

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**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

<http://image.slidesharecdn.com/measurementinepidemiology-141121024727-conversion-gate01/95/measurements-in-epidemiology-15-638.jpg?cb=1416559706>

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**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

<https://press.rebus.community/introductiontocommunitypsychology/chapter/prevention-and-promotion/>

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

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First: Big Picture

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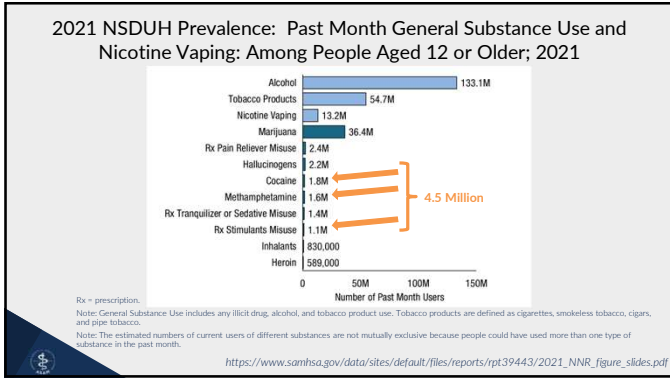
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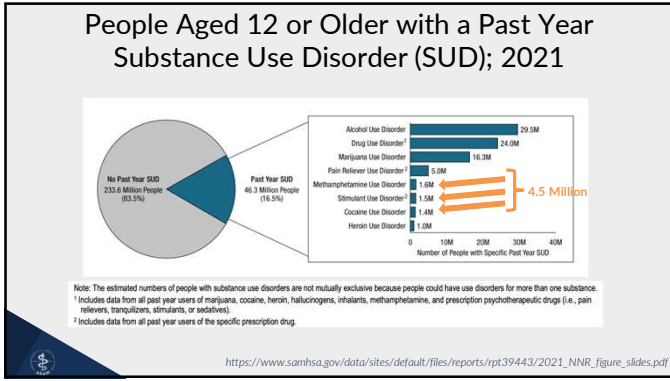
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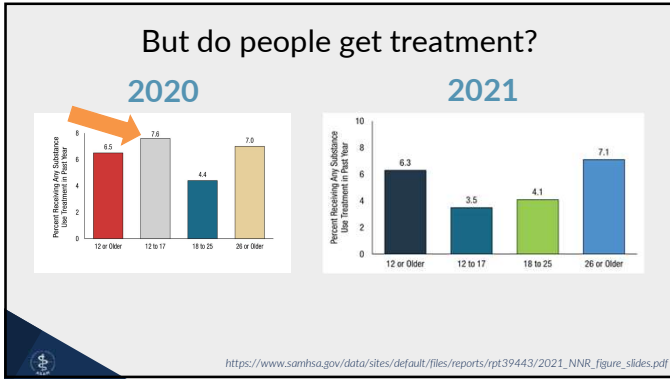
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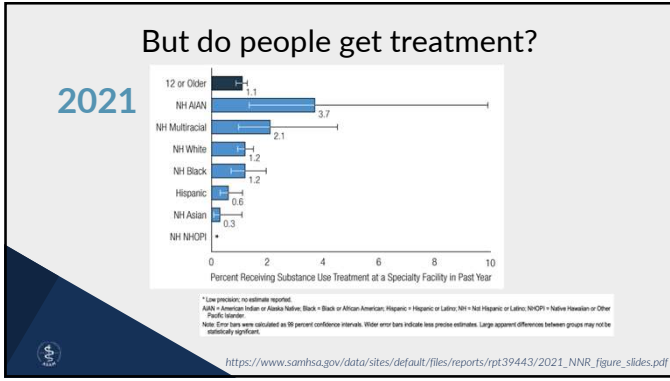
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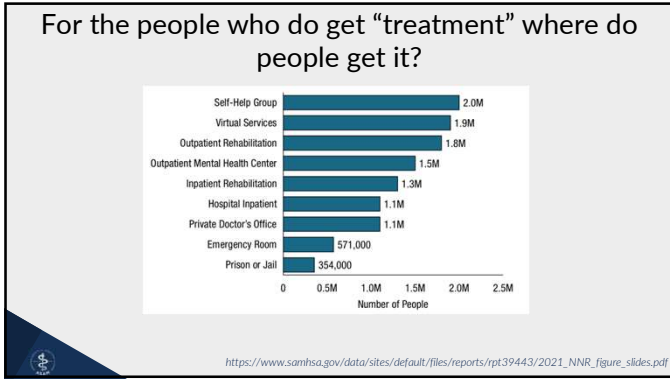
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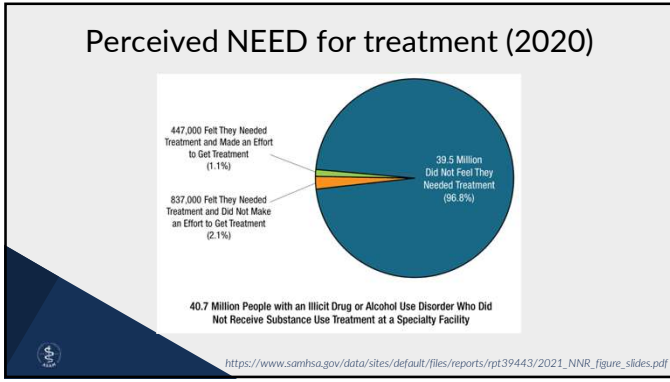
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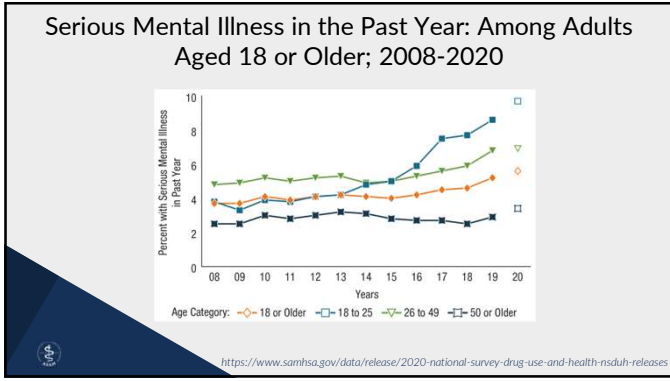
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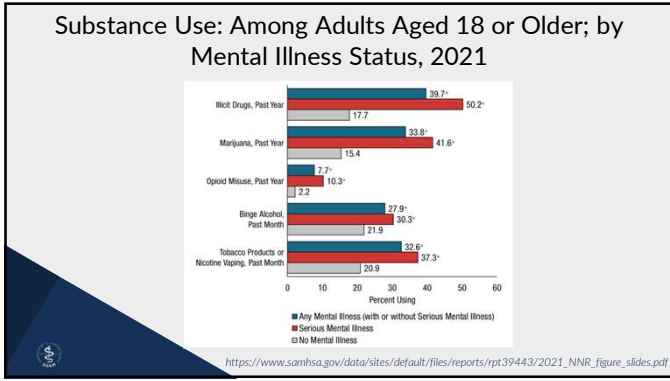
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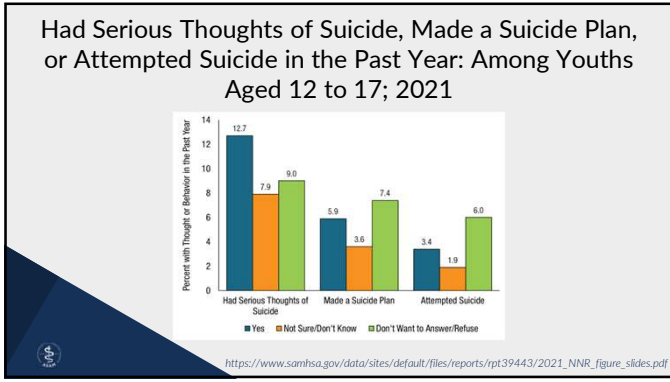
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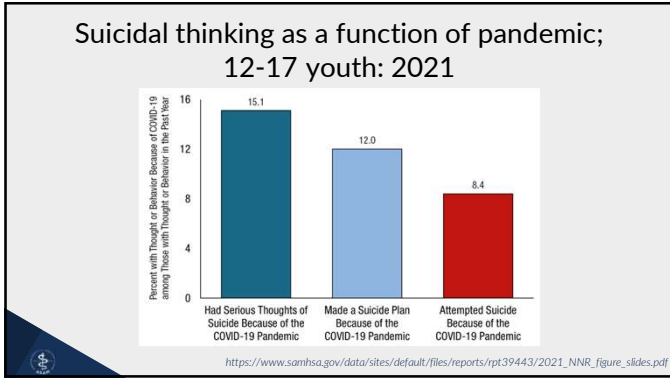
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### Second: Looking a little closer by substance



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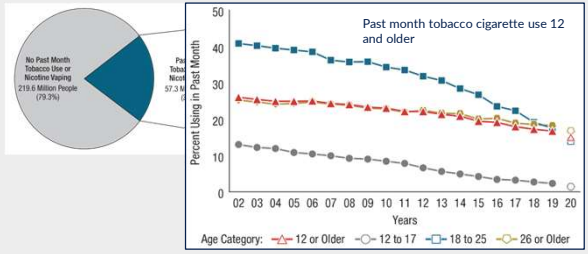
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### Tobacco, 2020



<https://www.samhsa.gov/data/release/2020-national-survey-drug-use-and-health-nsduh-releases>

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### E-Cigarettes



<https://www.fda.gov/tobacco-products/youth-and-tobacco/2018-nyts-data-startling-rise-youth-e-cigarette-use>

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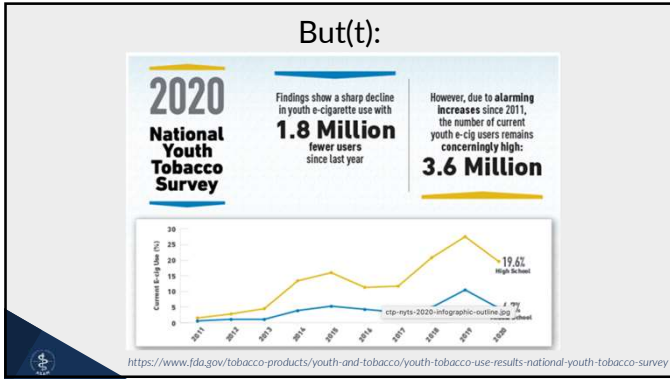
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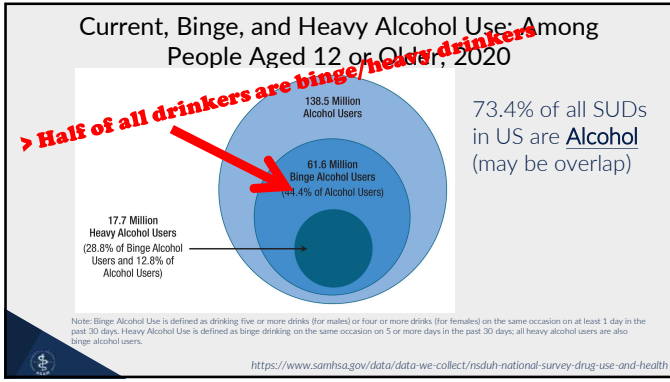
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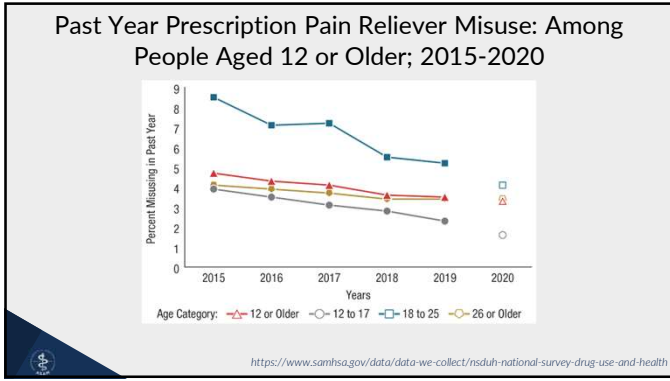
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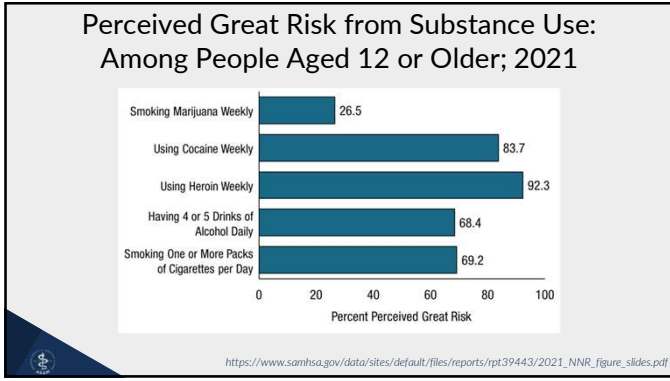
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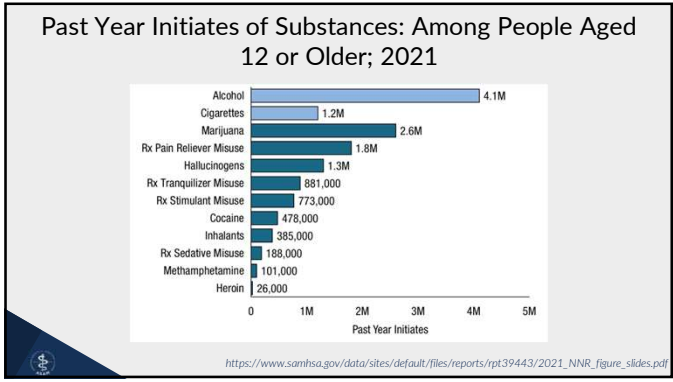
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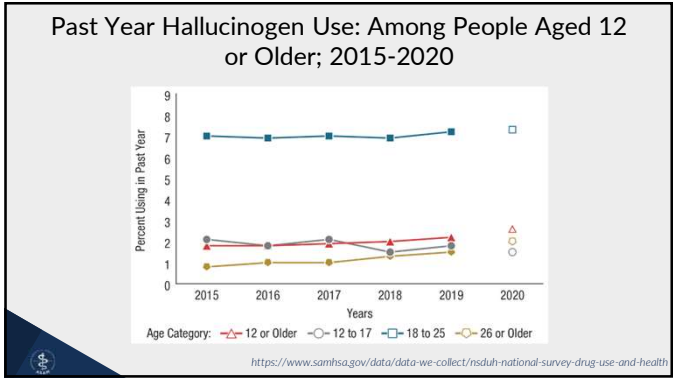
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**People who used 'magic mushrooms' less likely to develop opioid use disorder, study finds**

ASHLEIGH RODRIGUEZ / USA TODAY  
Updated 2:00 pm EDT Apr 1, 2022

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

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.

Read more on this page from Reuters by clicking on the "More & Related" column. We may earn commissions on some of the links you click on here.

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**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

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

ANDREW BATELSON — NOV 15, 2021

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

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## Third: Other Important Parts of the Story



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### Race/Ethnicity 2021

	National Average (%)	Black (%)	Asian (%)	American Indian/Alaska Native (%)	Hispanic (%)	Hawaiian/Pacific Islander (%)	Identity C
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	.3
Past Year Illicit Drug Use (12+)	21.9	24.3	11.1	36.1	19.4	**	12.4
Past Year Marijuana Use (12+)	18.7	21.3	8.6	35	15.8	**	37.6 2.9
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	

https://www.samhsa.gov/data/sites/default/files/reports/rpt31104/2019NSDUH-1-68-1-68%202019%20NSDUH.pdf  
https://www.samhsa.gov/data/reports/2021-nsduh-data-releases.html

https://www.samhsa.gov/data/release/2021-national-survey-drug-use-and-health-nsduh-releases#annual-national-report

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### 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/files/2021-national-survey-drug-use-and-health-nsduh-releases#annual-national-report>

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**THE CRIME REPORT**  
YOUR CRIMINAL JUSTICE NETWORK

**Nearly Half of State Incarcerates Suffer From Substance Abuse: Survey**

By Blake Diaz | July 14, 2021

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<https://thecrimereport.org/2021/07/14/nearly-half-of-state-incarcerates-suffer-from-substance-abuse-survey/>

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### 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

McHugh RK, et al. Sex and gender differences in substance use disorder. Clin Psychol Rev. 2017 Nov 10.

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**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/kbw003  
Advance Access publication February 15, 2016

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

Arianna Marconi<sup>1</sup>, Marta Di Forti<sup>1</sup>, Cathryn M. Lewis<sup>2</sup>, Robin M. Murray<sup>1</sup>, and Evangelos Vassos<sup>1,2</sup>

<sup>1</sup>Department of Psychosis Studies, King's College London, Institute of Psychiatry Psychology & Neuroscience, London, UK; <sup>2</sup>King'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 P982, De Crespigny Park, London SE5 8AF, UK; tel: +44-20-7848-5433, fax: +44-20-7848-0866, e-mail: [evangelos.vassos@kcl.ac.uk](mailto:evangelos.vassos@kcl.ac.uk)

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**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

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**What can we say about this study?**

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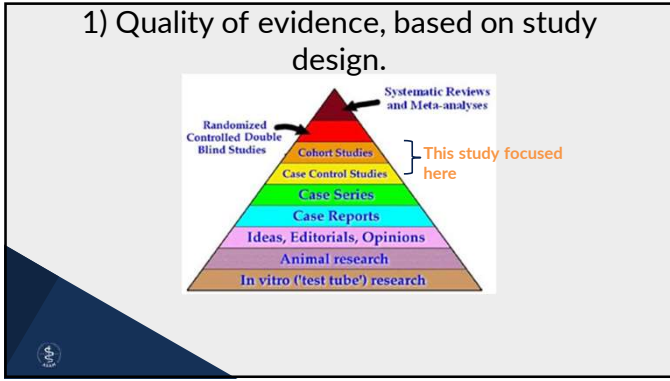
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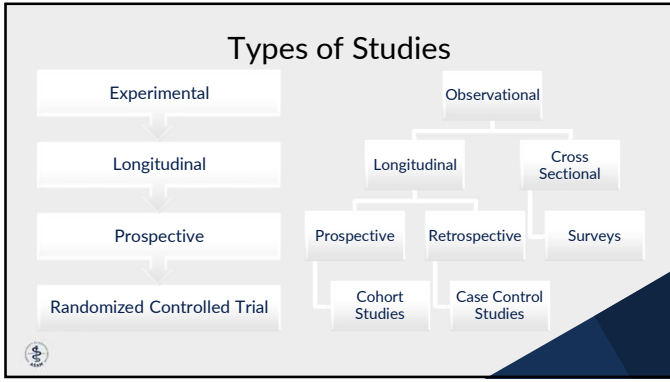
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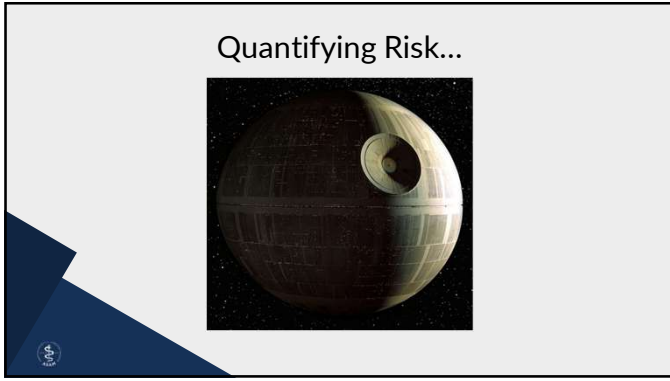
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### Quantifying Risk...

	Disease	
	+	-
⊕ Risk factor of intervention	a	b
⊖	c	d

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

$$NNH = 1/AR$$

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

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

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

$$NNT = 1/ARR$$

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### 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
- (those with disease who were exposed/those with disease not exposed)/(those without disease exposed/those without disease not exposed)

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### 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

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**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

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**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)

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**Oh No, Not the “Null Hypothesis”!!!**



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Oh No, Not the “Null Hypothesis”!!!

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

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Oh No, Not the “Null Hypothesis”!!!

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

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

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

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2) An Association Was Found

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

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Why the heck is his urine toxicology screen negative?

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**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?

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**Sensitivity vs. Specificity**

	Disease		
	+	-	
Test	+	TP	FP
	-	FN	TN
		PPV = $\frac{TP}{TP + FP}$	
		NPV = $\frac{TN}{TN + FN}$	
		Sensitivity = $\frac{TP}{TP + FN}$	
		Specificity = $\frac{TN}{TN + FP}$	

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

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- 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

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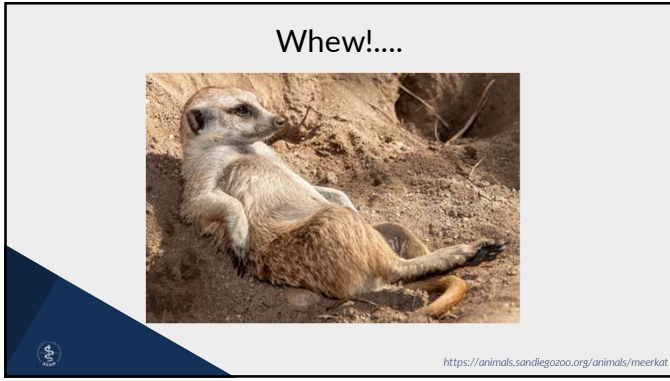
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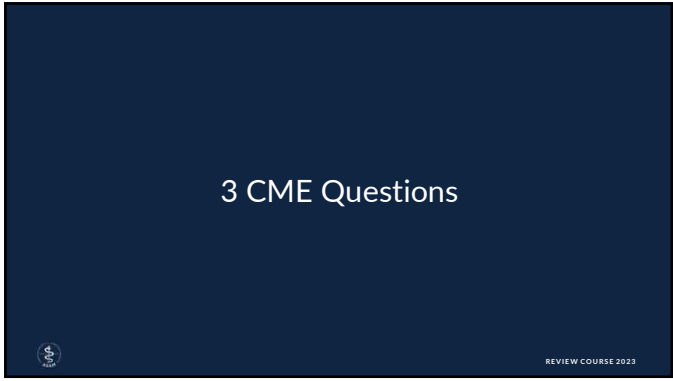
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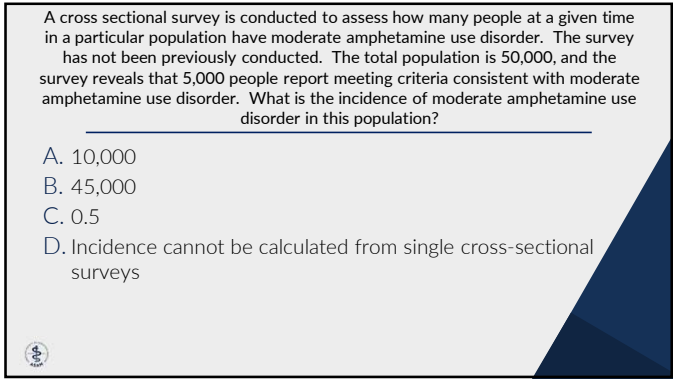
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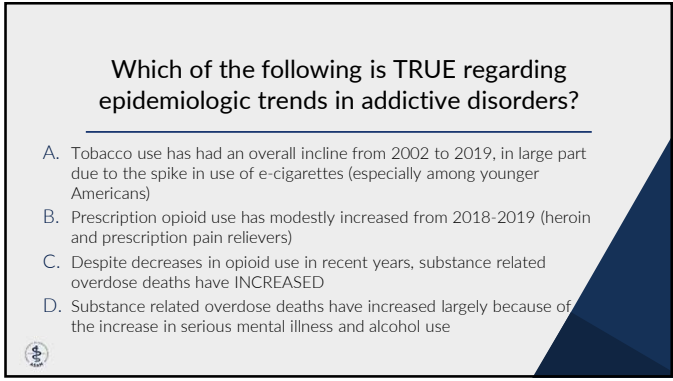
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A case control study finds an odds ratio of 5.5 (95% CI 0.5 to 7.5) regarding the association between an exposure and development of a condition. Which is true regarding the above comment?

- 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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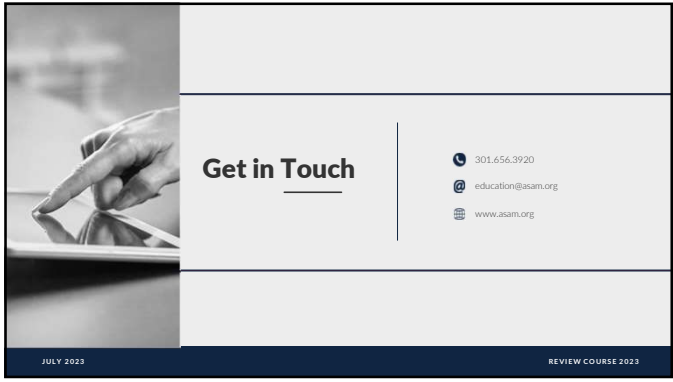
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**Get in Touch**

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