ASAM REVIEW COURSE 2025

Other Classes of Drugs: Pharmacology and Epidemiology

Annie Lévesque, MD, MSc
Associate Professor
Mount Sinai West Hospital, Icahn School of Medicine
New York, NY

Financial Disclosure

Annie Lévesque, MD, MSc

- No relevant disclosures

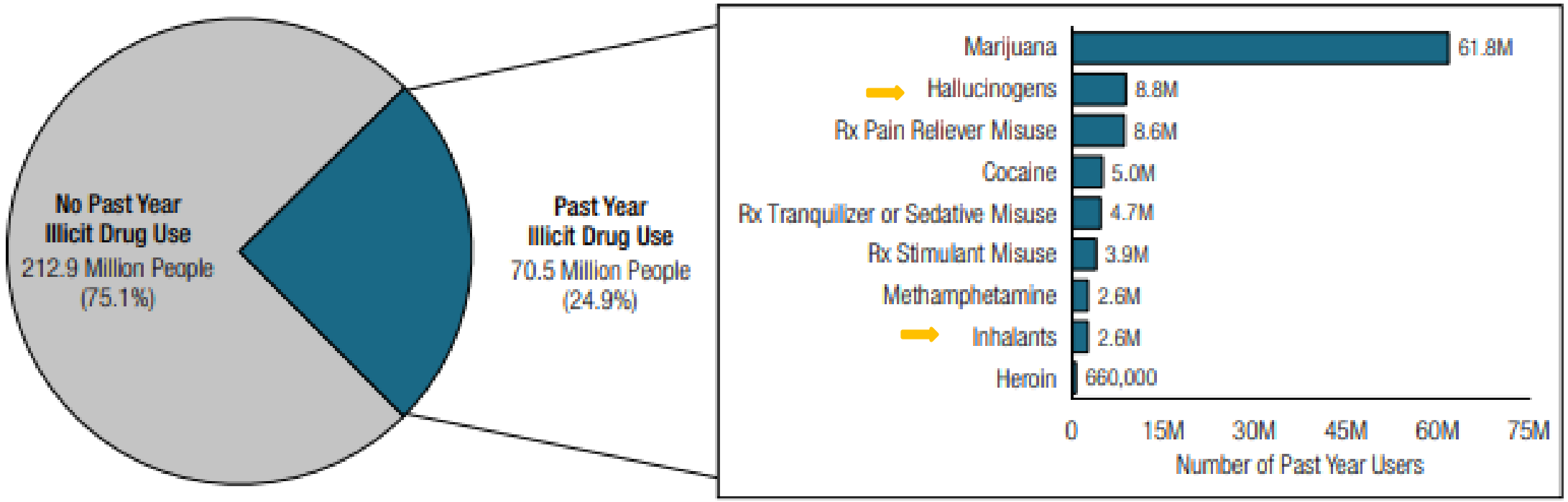
LEARNING OBJECTIVE

Identify other classes of drugs, their physiological impacts, and treatment considerations.

In Summary

1. Hallucinogens
2. Dissociatives
3. Inhalants
4. Anabolic-Androgenic Steroids

Figure 12. Past Year Illicit Drug Use: Among People Aged 12 or Older; 2023



Rx = prescription.

Note: The estimated numbers of past year users of different illicit drugs are not mutually exclusive because people could have used more than one type of illicit drug in the past year.

SAMHSA National Survey on Drug Use and Health 2023

TABLE D-54 (continued)

STEROIDS: [o,bb] Trends in Lifetime, Annual, and 30-Day Prevalence of Use in Grades 8, 10, and 12

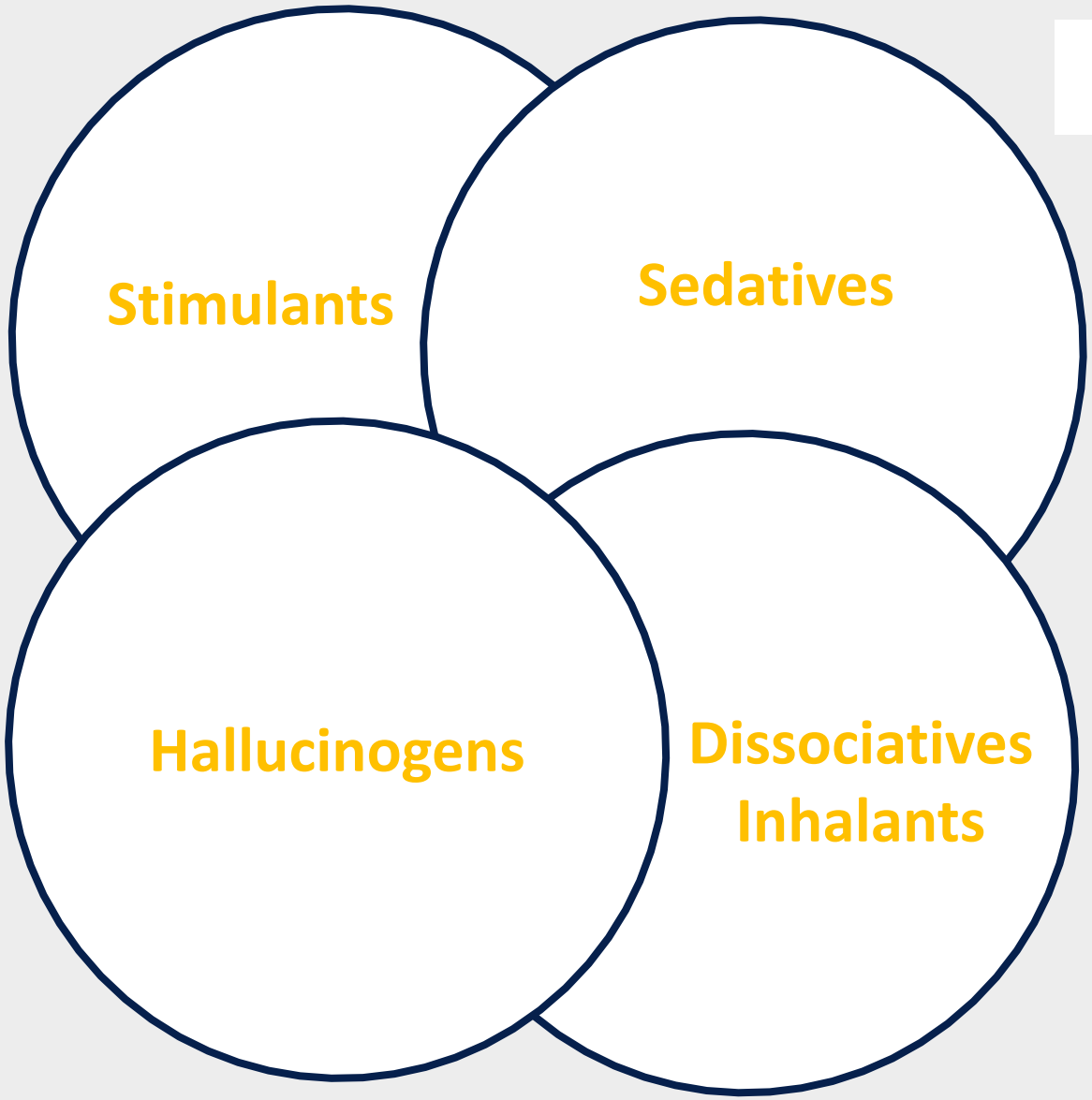
(Entries are percentages.)

	2018	2019[ii]	2020	2021	2022	2023	2022-2023 change	2020-2023 change	2020-2022 change	2020-2021 change	2018-2023 change	Proportional change	Peak year–2023 change	Proportional change	Low year–2023 change	Proportional change
Lifetime																
8th Grade	1.1	1.5	2.0	1.2	1.6	1.2	-0.4	-0.9	-0.4	-0.9 s	+0.1	+7.0	-1.8 sss	-61.0	+0.3	+29.3
10th Grade	1.2	1.6	1.7	0.7	0.9	1.2	+0.2	-0.5	-0.7 s	-0.9 s	0.0	-1.8	-2.3 sss	-66.3	+0.4 s	+59.0
12th Grade	1.6	1.6	2.0	0.8	1.5	0.9	-0.6	-1.1	-0.5	-1.2	-0.6	-40.0	-3.0 sss	-76.3	+0.1	+11.3
Last 12 Months																
8th Grade	0.6	0.8	1.1	0.5	0.8	0.6	-0.1	-0.5	-0.3	-0.7 s	0.0	+1.0	-1.0 sss	-61.2	+0.2	+43.0
10th Grade	0.6	0.8	0.9	0.3	0.5	0.5	0.0	-0.4	-0.4 s	-0.6 sss	-0.1	-18.6	-1.7 sss	-76.3	+0.2 s	+80.3
12th Grade	1.1	1.0	1.2	0.5	1.3	0.7	-0.7	-0.6	+0.1	-0.7	-0.5	-41.3	-1.9 sss	-74.3	+0.1	+26.2
Last 30 Days																
8th Grade	0.3	0.3	0.3	0.2	0.5	0.3	-0.2	0.0	+0.2	-0.2	0.0	+10.0	-0.5 sss	-61.4	+0.2	+99.9
10th Grade	0.4	0.4	0.5	0.1	0.3	0.4	+0.1	-0.1	-0.2	-0.3 ss	0.0	-5.5	-0.7 sss	-64.9	+0.2 s	+150.7
12th Grade	0.8	0.7	1.2	0.5	1.3	0.5	-0.7 s	-0.6	+0.1	-0.7	-0.3	-32.1	-1.0 ss	-65.2	+0.1	+20.0

Source. The Monitoring the Future study, the University of Michigan.

Note. See last four pages for relevant footnotes.

Dopamine
Norepinephrine



GABA

Serotonin

NMDA
Glutamate

Hallucinogens

Hallucinogens

- Serotonin 5HT-2A receptor agonists
- Alterations in cognition, perception, and emotion
- Minimal autonomic side effects or craving

“Illusionogen”

- Illusions = alteration or enhancement of existing sensory perception
- May be more accurate term
  - Reality testing is generally intact
  - Effect varies greatly with expectations and environment

Hallucinogens

Classical Hallucinogens:

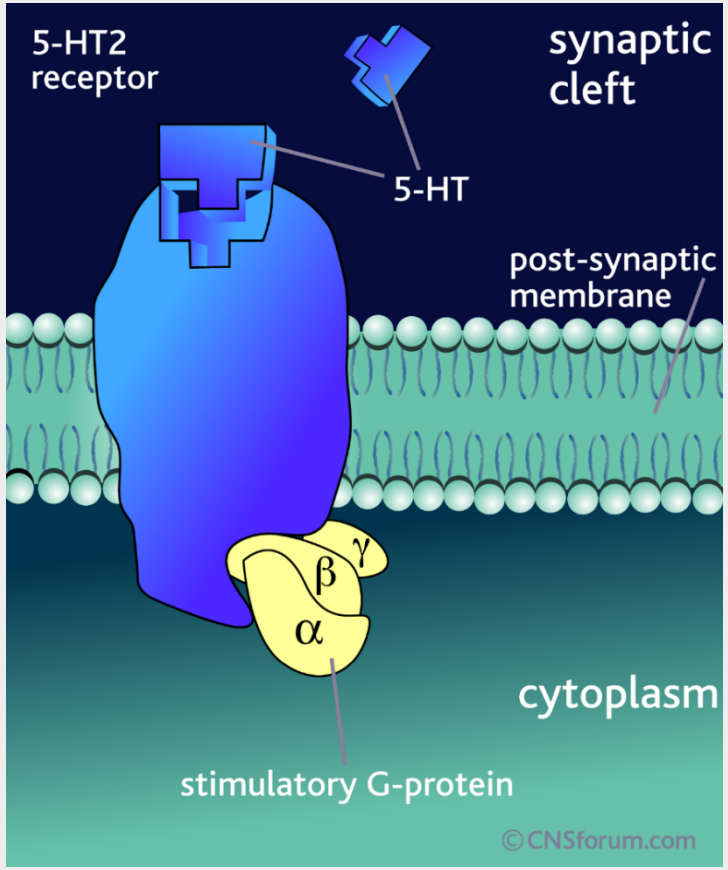
- 5HT-2A agonists or partial agonists
- LSD, DMT, psilocybin, mescaline

Empathogens:

- Creates a sense of connection to others
- MDMA and related substances

Others:

- Salvia, Ibogaine



Effects of Hallucinogens

Altered shapes and colors

Synesthesia

Alterations in mood (can be tension and anxiety)

Distorted sense of time

Depersonalization

Dreamlike feeling

Effects of Hallucinogens
Somatic

Dizziness	Weakness	Tremors	Nausea

Drowsiness	Paresthesias	Blurred Vision

Most hallucinogens induce rapid tolerance

DMT

Naturally occurring (plants, toad)

- Inhalation (smoking) or injection (rare)
- Can be taken orally, but requires MAOI
- Rapid onset (<5 min), short duration of action (30 min)

In contrast to other classical hallucinogens, DMT does not induce tolerance in humans.

Ayahuasca

- Brew containing DMT, MAOIs, and other hallucinogens
- Used ceremonially in some traditional religious ceremonies
- Can cause significant vomiting
- High dose may lead to seizure

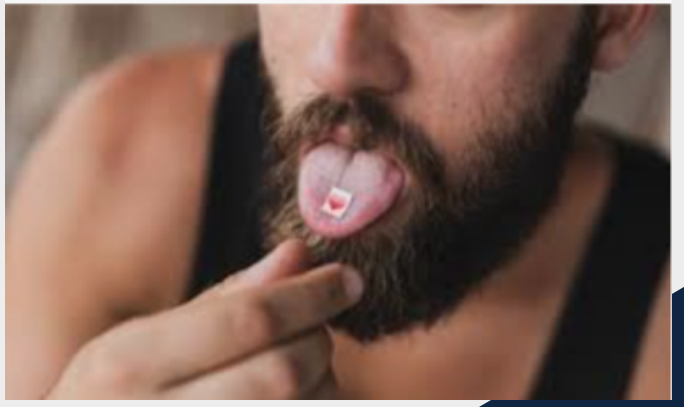
Psilocybin

Psilocybin (Pro-drug) → psilocin

- Found as naturally occurring tryptamine in certain varieties of mushrooms
- Inability to discern fantasy from reality
  - Can lead to panic attacks, psychosis
- Duration: 4-6 hours

Lysergic Acid Diethylamide (LSD)

- First hallucinogen to be synthesized
- Blotter paper with dried solution of LSD
- Breath mints, sugar cubes, pressed into pills or thin gelatin squares
- Onset: 30-60 min, Peak: 2-4 hours, Duration 8-12 hours



Effects

- Altered shapes and colors, heightened sense of hearing
- Depersonalization, visual hallucinations, alterations in mood

Mescaline/Peyote

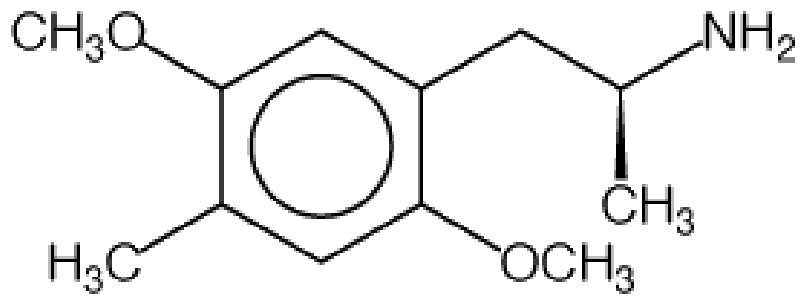
- Buttons from top of peyote cactus
  - 6-10 buttons for intoxication
- Slow onset (30-60 min)
  - **First hour**:
    - Minor perceptual changes
    - Increased respiratory rate,
    - Nausea
  - **Next several hours (5-10):**
    - Visual illusions/hallucinations
    - Synesthesia

DOM

- Results from structural modification of mescaline-like substances
- Extremely potent
- Used as model hallucinogen in drug discrimination studies

DOM

2,5-dimethoxy-4-methylamphetamine



MDA (*Sass*)

- Powder or pill – swallowed or sniffed
- Produces stimulant, empathogen and hallucinogenic effects
- Increases release of serotonin, norepinephrine and dopamine
- Closely related to MDMA (*Ecstazy*)
- Is sometimes used as an adulterant and falsely sold as MDMA

Salvia

- Naturally grows in the US
- Can be ingested or smoked
- Active ingredient: salvinorin A (kappa opioid agonist)
- Changes in visual perception
- Decreased ability to interact with surroundings
- Intense and short-lived
  - Onset < 1 minute, Duration < 30 minutes

Hallucinogen Intoxication

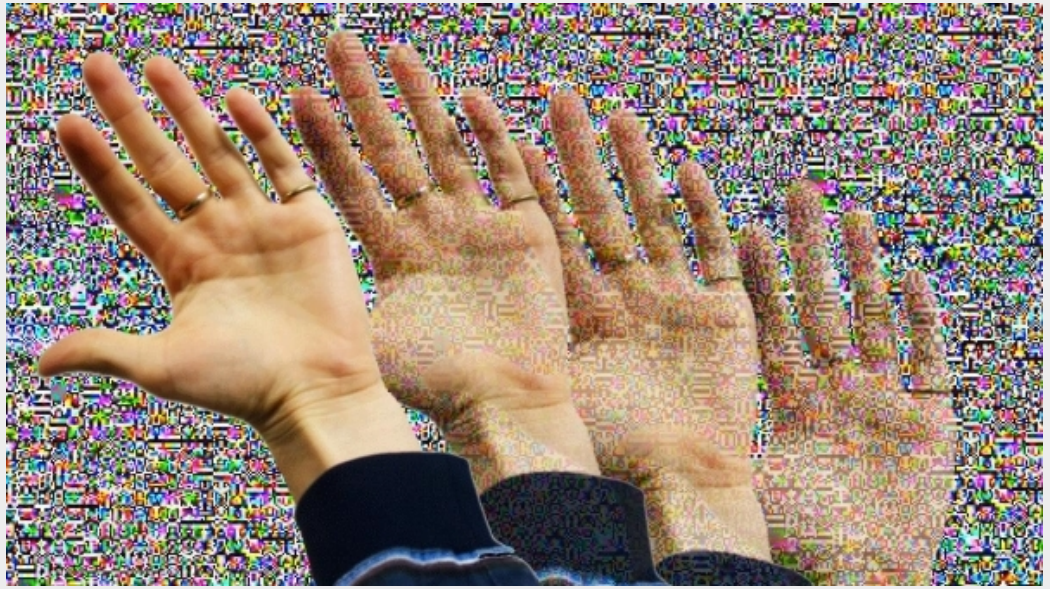
- Anxiety, “Bad Trip”
- Usually self-limited and returns to baseline without treatment
- Treatment
  - First line: Low stimulus environment, reassurance
  - Second line: Benzo
  - Third line: Antipsychotic

Summary: Hallucinogen Intoxication

- Clear Sensorium
- Intact Memory
- Hyperalert
- Tolerance
- Intact reality testing
- Visual Hallucinations >> Auditory

Hallucinogen Persisting Perception Disorder (HPPD)

- Re-experiencing of perceptual symptoms experienced while intoxicated following cessation of use (flashbacks)



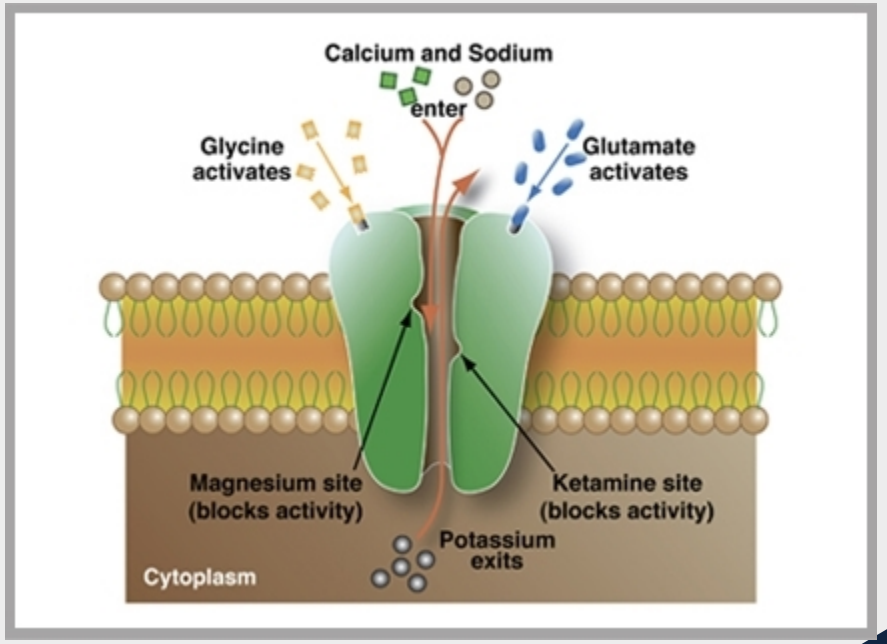
Hallucinogen Persisting Perception Disorder (HPPD)

- Unrelated to dose or number of exposures
- Usually resolves within 1-2 years of last use
- Can be triggered by other substance use

Dissociatives

Definition

- NMDA receptor antagonists
  - Glutamate activates NMDA receptors to filter sensory stimuli
  - Dissociatives noncompetitively block NMDA receptors → sensory overflow



Effects

- Dissociation
- Sensory Isolation
- Mental Distortions
- Increased HR, BP, Temp

Members of the Class

- PCP
- Ketamine
- Dextromethorphan (DXM)
- Nitrous Oxide

Phencyclidine (PCP, Angel dust)

- Developed as IV anesthetic
  - No longer FDA-approved
  - Associated with prolonged delirium
  - Risk of seizures or death
- Available as powder, tablets, liquid, and sprayed onto plant leaves and then smoked

PCP Effects

Confusion, delirium, psychosis

↓

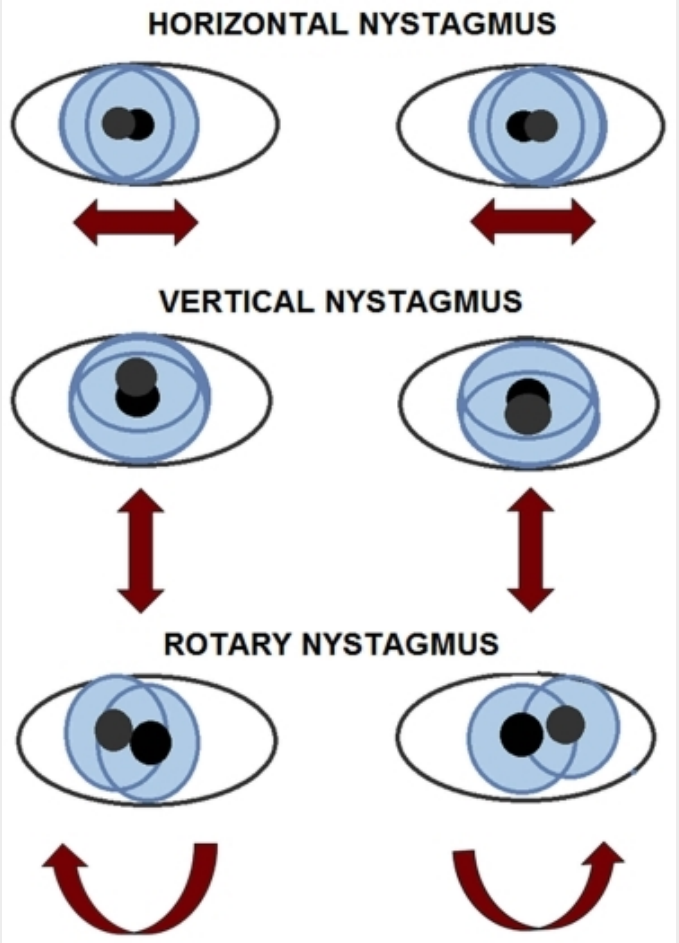
Semi-coma and coma (less common)

↓

Coma with seizures (rare)

PCP

- PCP Intoxication
  - Nystagmus (rotary, vertical, horizontal)
  - Hyperreflexia
  - HTN
  - Feelings of invulnerability
  - Management of intoxication: low stimulus environment, benzos/antipsychotics as indicated



Ketamine (K, Special K)

- FDA-approved for general anesthesia and treatment-resistant depression
- Administered as IV, IM or as nasal spray in medical settings
- Misused by inhalation, smoking, or oral administration
- Less potent, shorter-acting than PCP

Effects of Ketamine

- Analgesia / numbness
- Spacey feeling (“K-hole”)
- Amnesia
- Delirium (higher doses)
- Nystagmus (vertical and/or horizontal)
- Urinary complications

Dextromethorphan (DXM)

- OTC cough medicines
- FDA-approved for the treatment of depression (combo drug with bupropion)
- Anti-tussive dose: <120mg daily; recommended dose 10-20mg q4hours
- 300-1800mg produces PCP-like effects
  - Euphoria and hallucinations
  - Drowsiness, blurred vision, slurred speech
  - N/V, hypertension, diaphoresis

Effects of DXM

- In addition to antagonism at NMDA receptor, DXM has significant serotonergic properties
  - ↑ serotonin synthesis and release
  - ↓ reuptake

- Deaths have been reported with large doses (200x dose)
  - CNS & respiratory depression, seizure, arrhythmias

Therapeutic use of hallucinogens and dissociatives

- Research mostly stopped in the 70s with war on drugs
- More recently:
  - Ketamine for depression
  - MDMA for the treatment for PTSD
  - Research currently conducted to use of some hallucinogen and dissociative drugs for the treatment of SUD but nothing approved

Inhalants

Inhalants

Breathable chemicals that can be self-administered, also known as:

- Whippets
- Poppers
- Huff
- Bang
- Kick
- Sniff

Source of Inhalants: Products

Air freshener	Lighter fluid	Household cleaners	Gasoline
Hair spray	Mothballs	Nail polish remover	Paint thinner
Markers	Refrigerant	Rubber cement	Spray paint
	Video head cleaner	Whipped cream canisters	

Terminology

- **Sniffing** = inhaling from an open container
- **Huffing** = holding fabric soaked in substance to the nose or mouth and inhaling
- **Bagging** = concentrating vapors in a bag and inhaling

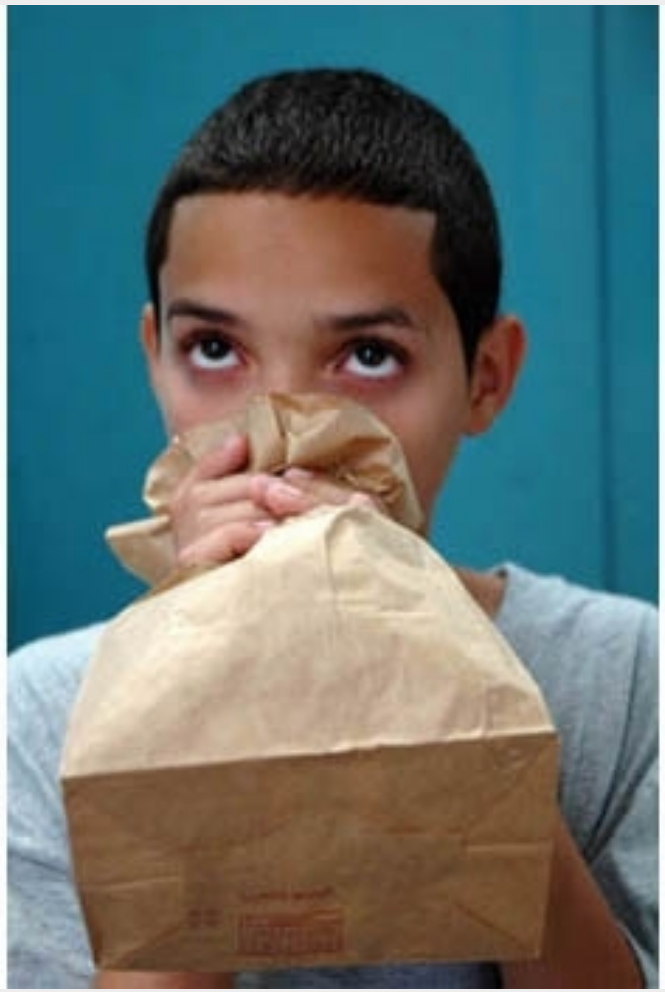
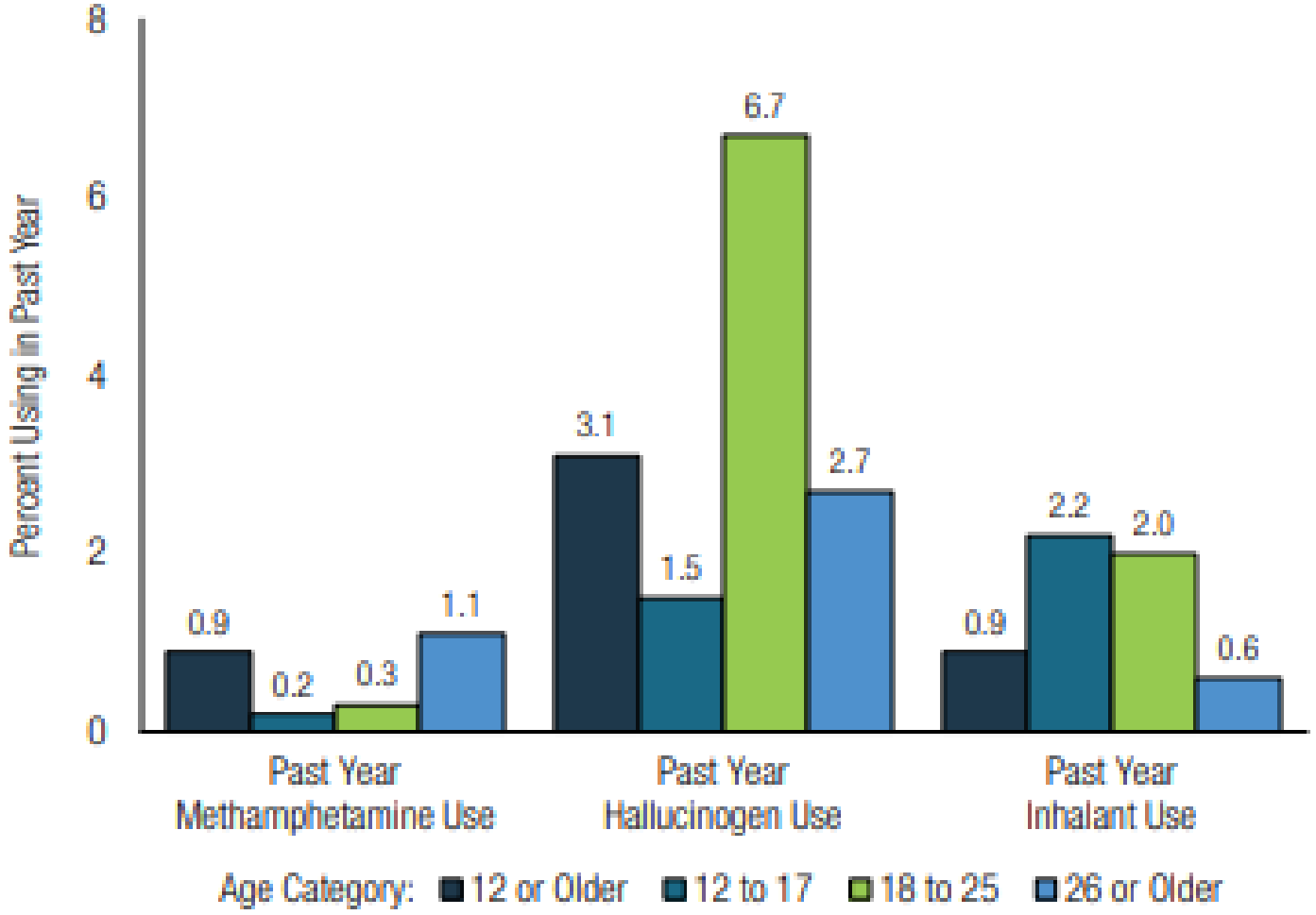


Figure 18. Past Year Methamphetamine Use, Past Year Hallucinogen Use, or Past Year Inhalant Use: Among People Aged 12 or Older; 2023



SAMHSA – NSDUH survey 2023

Abuse Liability

- Number of factors increase abuse potential
  - Free or low cost
  - Readily available
  - Difficult to test for
  - Perceived as low risk

- Inquire about inhalant use, especially when working with adolescent population
- Provide education regarding consequences of use

Inhalant Pharmacology

- Highly lipophilic
- Rapidly absorbed through the lungs
- Crosses blood-brain barrier
- Accumulates in brain, liver and fatty tissue
- Rapid onset, short duration
- Synergistic effect: alcohol, benzos

Effects of Inhalants

Acute Effects

- Euphoria
- Disinhibition
- Dizziness / lightheadedness
- Slurred speech
- Ataxia

Toxic Effects and Overdose

- Respiratory depression
- Arrhythmias
- Asphyxia, cardiac arrest and death can occur

Chronic Effects of Inhalants

CARDIAC

arrhythmia

cardiomyopathy

DERMATOLOGICAL

perioral infection

rash

GASTROINTESTINAL

hepatorenal failure

MUSCULOSKELETAL

Rhabdomyolysis

Chronic Effects of Inhalants

PULMONARY

emphysema

hypoxia

aspiration pneumonia

GENITOURINARY

glomerulonephritis

hypokalemia

HEMATOPOIETIC

aplastic anemia

leukemia

bone marrow suppression

NEUROLOGICAL

peripheral neuropathy

delirium/dementia

cerebellar atrophy

irreversible white matter changes

Treatment Considerations

- User may experience prolonged residual effects because chemicals are stored in fatty tissue
- Neurological impairment is often present
  - Talk therapy / group therapy may not be appropriate

Anabolic-androgenic Steroids

Anabolic - Androgenic Steroids (AAS)

- Anabolic = skeletal muscle-building
- Androgenic = masculinizing
- Includes testosterone and related synthetic substances
- Enhance performance and/or improve physical appearance
- May be taken at 10-100x the intended dose

Medical Indications for AAS

- Hypogonadism
- Hereditary angioedema prophylaxis
- Acquired aplastic anemia and myelofibrosis treatment
- Muscle wasting secondary to starvation, weight loss following extensive surgery, chronic infections (advanced HIV), or severe trauma
- Secondary treatment of bone metastases from breast cancer in postmenopausal women
- Menopause with methyltestosterone combined with estrogen to alleviate symptoms
- Patients on dialysis to increase lean body mass
- Female-to-male gender change

Addiction Liability

- Rarely seek treatment
- Not euphorigenic; no immediate high
- Goal is long-term reward associated with physical changes
- May be seen as socially acceptable or positive
- Often missed by clinicians

Epidemiology

3 most common populations:

- Athletes
  - Performance enhancement
- Aesthetes
  - Improve physical appearance (often adolescents)
- Fighting Elite
  - Increase aggression and/or job performance (security, law enforcement)

Terminology

Stacking: use of combinations of multiple drugs at the same time

Cycling: use of steroid combinations for weeks to months with abstinent rest periods before resumption of different steroid or combinations in order to avoid tolerance

Pyramiding: starting with a low dose and gradually increasing the dose until peak levels are achieved a number of weeks before a competition and then tapering so the individual will be drug free when tested

Steroid Side Effects

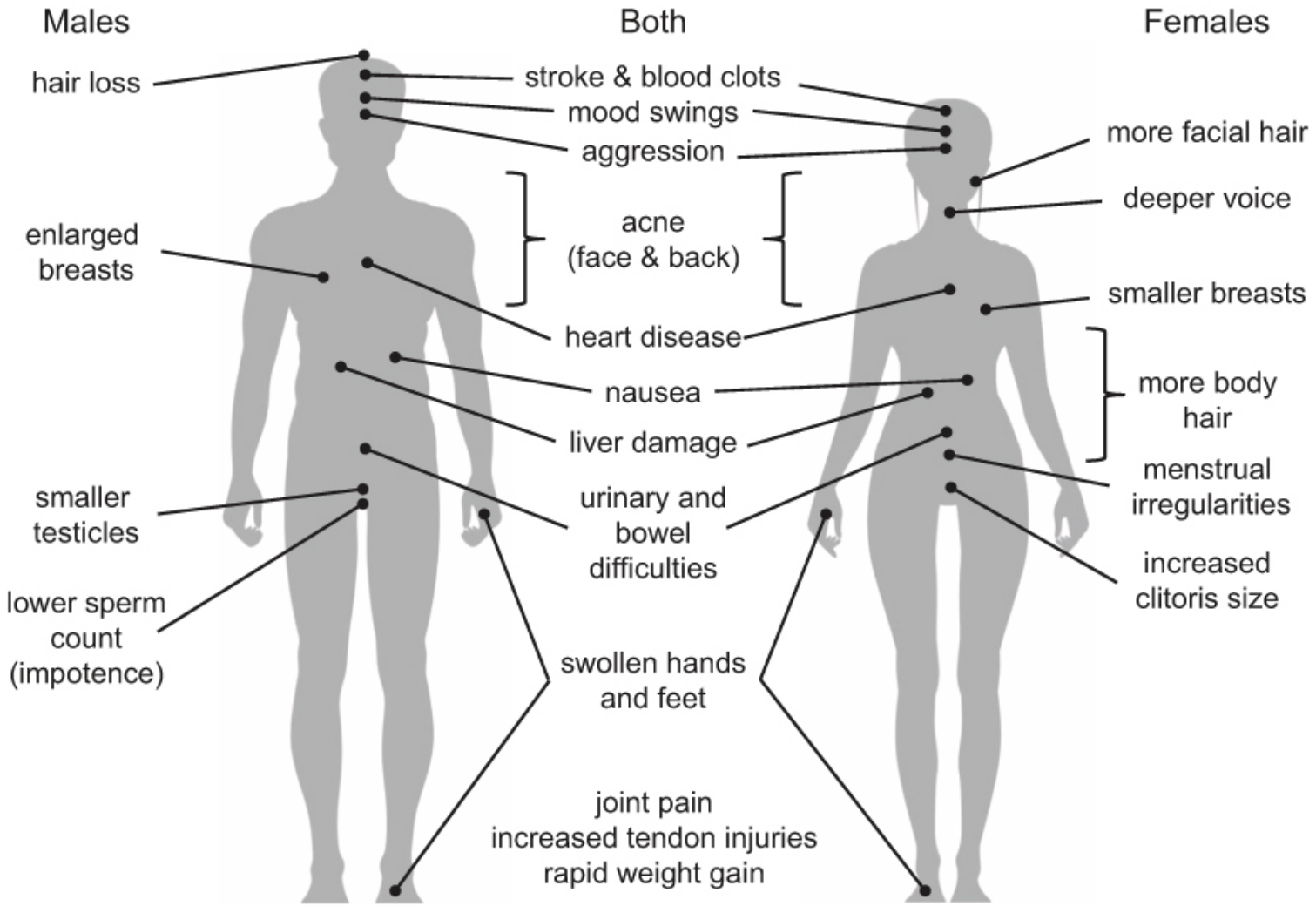


Figure 21-1. Side effect profiles of AAS in male and female persons with substance use disorder.

Miller et al. The ASAM Principles of Addiction Medicine 7th edition

Steroid Side Effects

Acne	Liver damage	↑LDL, ↓HDL	Complications of Injections
Tendon rupture	Cardiac complications	Sexual dysfunction	Polycythemia

Psychiatric Side Effects

- Aggressive / violent behavior
- Hypomania or Mania (high doses)
- Paranoia
- Extreme irritability
- Impaired judgment
- Delusions

Treatment:

- Remove AAS
- Use mood stabilizers or anti-psychotics as needed
- Generally, resolves within 1-2 weeks after cessation

Other Associated Syndromes & Treatment

- Steroid Withdrawal-Associated Depression
  - Can be responsive to SSRIs
- Comorbid SUD, especially opioid
- Body Dysmorphic Disorder / Muscle Dysmorphia

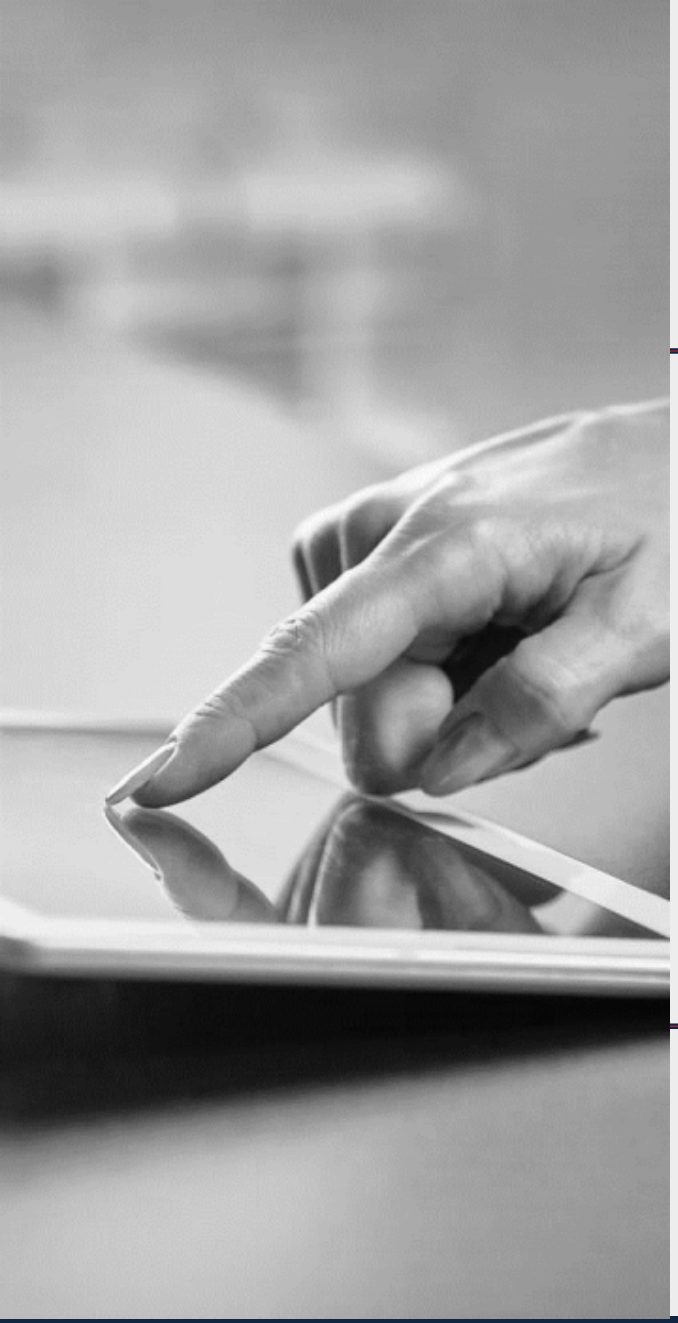
In Summary

1

Diverse group of substances with relatively low prevalence, but high abuse liability

2

Varied but significant effects from use and misuse, including long-term consequences



Get in Touch

301.656.3920

education@asam.org

www.asam.org