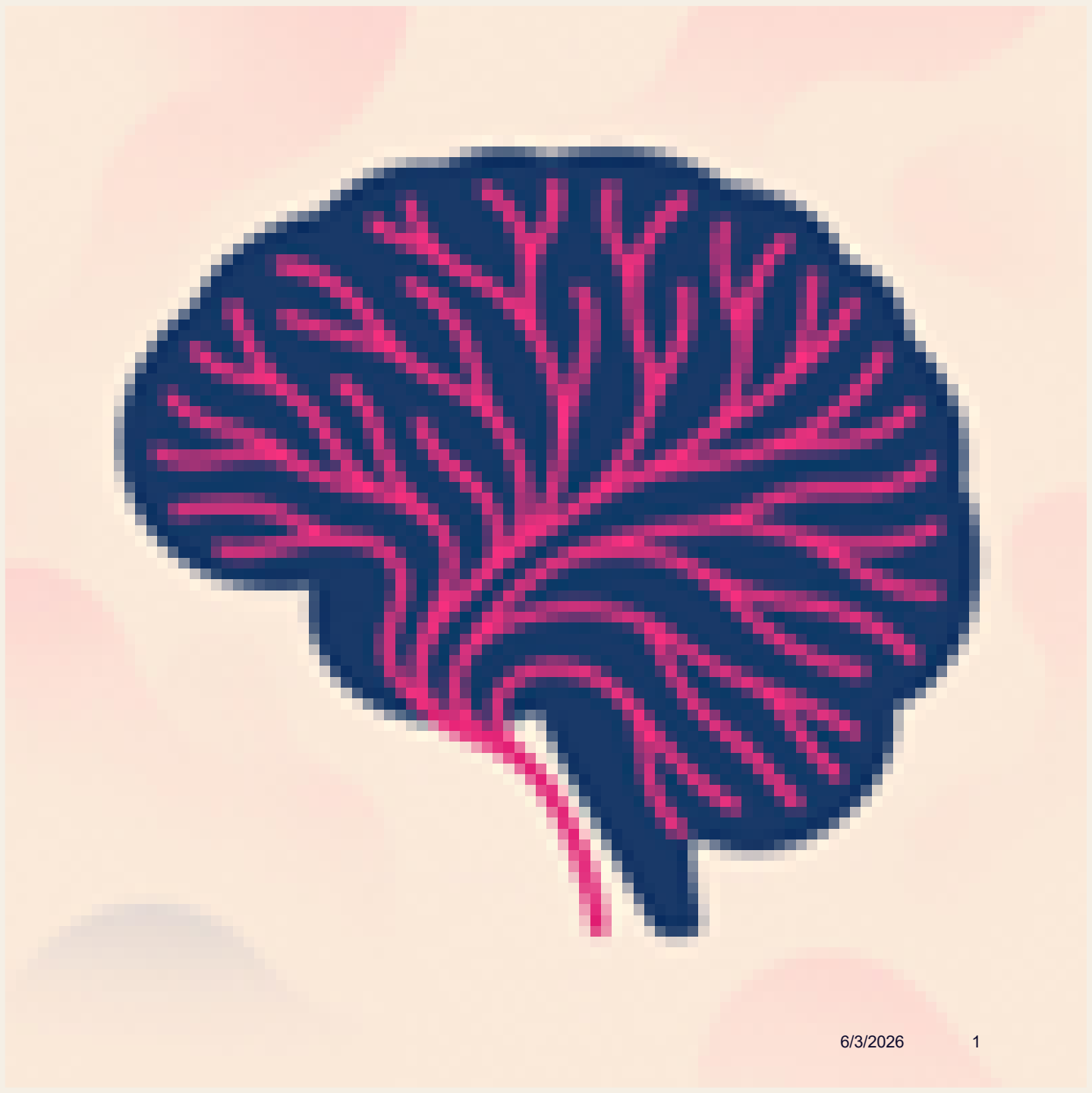


# DRUGS AND THE FEMALE BRAIN

**Unique effects and considerations for  
girls**





## AGENDA

- Understanding brain development in girls
- How drugs affect the brain
- Gender-specific effects on girls' brains
- Prevention and support strategies

# UNDERSTANDING BRAIN DEVELOPMENT IN GIRLS

# ADOLESCENT BRAIN STAGES

## 01

### **Early synaptic pruning**

Ages 10–13, earlier in girls.  
Unused neural connections reduce, especially in the prefrontal cortex.

## 02

### **Increased myelination**

Ages 13–16. Faster neural transmission supports improved cognitive processing across networks.

## 03

### **Prefrontal cortex maturation**

Ages 16–19, earlier in girls.  
Decision-making and impulse control strengthen.

## 04

### **Adult brain foundation**

End of adolescence. Adult-like structure and function emerge, with timing varying by sex.

# HORMONES AND THE ADOLESCENT BRAIN

## **Hormonal surges reshape circuits**

Estrogen and progesterone influence emotion regulation, stress response, and reward pathways during puberty.

## **Neurotransmitters are modulated**

Dopamine and serotonin signaling shifts can alter mood vulnerability and risk-taking tendencies.

## **Cycles shape cognition and affect**

Fluctuating hormone levels can influence cognitive performance and emotional resilience over time.

## **Implication for adolescent health**

Understanding these dynamics guides support for mood stability, learning, and decision-making.



# BRAIN MATURATION DIFFERENCES



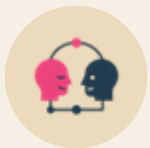
## Cortical thickness

Girls typically reach peak cortical thickness earlier than boys, supporting faster cognitive development in childhood.



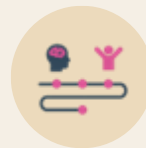
## White matter volume

Girls show earlier increases in white matter volume, which is associated with improved neural connectivity and information processing.



## Brain network connectivity

Girls exhibit stronger connectivity in networks related to social cognition and emotional processing, contributing to differences in interpersonal skills.



## Maturation and milestones

Earlier brain maturation in girls correlates with earlier achievement of cognitive and behavioral milestones compared to boys.

# HOW DRUGS AFFECT THE BRAIN

# DRUG ACTION MECHANISMS



## **Receptor binding**

Drugs can mimic or block neurotransmitters by binding to their receptor sites, altering signal transmission.



## **Neurotransmitter release**

Some drugs increase or decrease the release of neurotransmitters, affecting the intensity of neural signals.



## **Reuptake inhibition**

Certain drugs prevent the reabsorption of neurotransmitters, prolonging their action in the synaptic cleft.



## **Receptor sensitivity**

Drugs may enhance or reduce receptor responsiveness, modifying how neurons react to neurotransmitters.

# BRAIN EFFECTS OF DRUG USE

## Short-term effects

Altered consciousness, memory lapses, and impaired motor coordination can occur acutely after use.

## Long-term neuroadaptations

Receptor downregulation, altered synaptic plasticity, and neuronal loss contribute to addiction and cognitive decline.

## Mental health risks

Chronic exposure elevates risk of mood and anxiety disorders and impairs executive function.

## Adolescent vulnerability

Developing brains show heightened structural changes and long-lasting cognitive effects.



# DRUG CLASSES & EFFECTS

## Stimulants

Increase central nervous system activity.  
Examples: cocaine, amphetamines.  
Effects include heightened alertness, elevated mood, increased heart rate and blood pressure, and reduced appetite. High risk of dependence due to strong dopamine system activation and reinforcement of drug-seeking behavior.

## Depressants

Decrease central nervous system activity.  
Examples: alcohol, benzodiazepines.  
Effects include sedation, anxiety relief, slowed cognition, and impaired coordination. Dependence risk arises via GABAergic pathways, with tolerance and withdrawal (e.g., rebound anxiety, seizures) possible with chronic use.

## Opioids & Hallucinogens

Opioids (heroin, prescription analgesics): alter pain perception, produce euphoria; high addiction risk via mu-opioid receptor activation and respiratory depression hazard. Hallucinogens (LSD, psilocybin): disrupt sensory processing; effects include altered perception and cognition, with low physical dependence but possible psychological impacts.

# DRUG EFFECTS ON GIRLS' BRAINS

# ADOLESCENT GIRLS' VULNERABILITIES

## 1. Earlier brain maturation

Accelerated limbic–prefrontal development can heighten reward sensitivity and weaken top-down control during initial drug exposure.

## 2. Hormones and stress reactivity

Fluctuating estrogen and higher stress sensitivity can intensify emotional responses and elevate neurotoxicity risk in the hippocampus and prefrontal cortex.

## 3. Faster escalation risk

Epidemiological data show quicker progression from first use to problematic use, underscoring the need for gender-specific prevention.



2X

Girls and women are twice as likely to progress from first use to addiction compared to boys and men



# MENTAL HEALTH IN GIRLS

## **Elevated co-morbidity**

Neuroimaging and clinical data show higher overlap of substance use with mood and anxiety disorders in females.

## **Anxiety and depression risk**

Adolescent girls face heightened baseline risk, amplifying the impact of drug use on mental health.

## **Brain chemistry disruption**

Drug-induced changes can impair emotional regulation and heighten vulnerability to suicidal ideation.

## **Act early, intervene**

Early screening and integrated care can mitigate co-morbidity and protect long-term outcomes.

# PREVENTION AND SUPPORT FOR GIRLS

# EDUCATION AND AWARENESS PROGRAMS

## 1. Brain development knowledge

Age-appropriate lessons on adolescent brain changes and drug risks support informed choices.

## 2. Coping skills training

Practicing stress management and healthy emotion regulation builds resilience.

## 3. Peer pressure resistance

Role-play and refusal strategies strengthen confidence in high-risk situations.

## 4. Gender-sensitive curricula

Programs tailored to girls' experiences correlate with reduced initiation rates.



# FAMILY VS COMMUNITY SUPPORT

## **Family-based protective factors**

Strong family bonds and consistent parental monitoring reduce risk behaviors during adolescence. Open, ongoing communication about expectations and substance risks builds trust and supports healthy decision-making. Evidence indicates that robust social support in the home correlates with lower substance use and better mental health for girls.

## **Community-based protective factors**

Supportive community networks and mentorship programs provide pro-social norms and guidance beyond the household. Inclusive, accessible prevention initiatives strengthen belonging and resilience, complementing family efforts. When families and communities align, adolescents experience clearer boundaries and more consistent support.

# HELP & RECOVERY RESOURCES



## Counseling & Therapy

Gender-sensitive counseling addresses trauma and mental health, fostering trust and engagement in recovery for girls.



## Rehabilitation Programs

Programs tailored to girls' developmental needs show higher rates of sustained abstinence and improved quality of life.



## Peer Support Groups

Peer-led groups provide social connection and shared experiences, supporting long-term recovery.



## Outcome Metrics

Centers report increased engagement, better mental health outcomes, and higher program completion rates among girls in integrative, gender-responsive settings.

# EMPOWERING GIRLS THROUGH SUPPORT

## **Neurodevelopment insights**

Girls' brain development patterns shape how drugs affect cognition, emotion regulation, and decision-making.

## **Gender-specific risks**

Recognizing vulnerabilities unique to girls enables more precise prevention, screening, and early support.

## **Education and community**

Clear education and engaged families, schools, and peers build protective norms and resilience.

## **Access and empowerment**

Providing timely, accessible resources helps girls make informed choices and pursue healthier futures.