Brain Development

Volume
Metabolism
Myelination
Blood Flow
Receptors
Synaptic Refinement

Prenatal
Post-birth Age

Rate of Change

Adolescence

Source: Tapert & Schweinsburg, 2005
Synaptic Refinement
Myelination
Dopamine Receptors
Eat, Drink, Have Sex, Use Drugs
IT IS SAD TODAY.
How Cocaine Works

- **Dopamine**
- **Cocaine**
- **Nerve Terminal**
- **Degraded Monoamines**
- **Mitochondria**
- **Synaptic Cleft**
- **Dopamine Reuptake Transporter**
- **Dopamine Receptor**
- **Post-Synaptic Membrane**

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How Heroin Works
This is Normal Development

- Act First, Think Later
- More Risky Impulsive Behavior
- Less than Optimal Planning
- Less Consideration of Negative Consequences
- Preference for Physical Activity and Sensation Seeking
- Emotions Felt Very Intensely
- Strongly Influenced by Friends and Peers

This is Normal Development
LAST TWO DECADES OF ALCOHOL, CIGARETTE, AND ILLICIT DRUG USE*

*Past-month use

Alcohol 1995: 50%  
2015: 40%

Cigarettes 1995: 60%  
2015: 40%

Illicit drugs 1995: 50%  
2015: 30%

35.3% OF 12TH GRADERS  
21.5% OF 10TH GRADERS  
9.7% OF 8TH GRADERS

11.4% OF 12TH GRADERS  
6.3% OF 10TH GRADERS  
3.6% OF 8TH GRADERS

23.6% OF 12TH GRADERS  
16.5% OF 10TH GRADERS  
8.1% OF 8TH GRADERS

NIH National Institute on Drug Abuse
WWW.DRUGABUSE.GOV
Past-Month Alcohol Use Continues Steady Decline

2016

- 12th graders: 33.2%
- 10th graders: 19.9%
- 8th graders: 7.3%

1996 - 2016

Graph showing a steady decline in past-month alcohol use from 60% in 1996 to 10% in 2016 for 12th graders, with a similar trend for 10th and 8th graders.

NIH National Institute on Drug Abuse
DRUGABUSE.GOV
Past-year misuse of Vicodin® among 12th graders has dropped dramatically in the past 5 years. So has misuse of all Rx opioids among 12th graders despite high opioid overdose rates among adults.

Past-year use among 12th graders

**STUDENTS REPORT LOWEST RATES SINCE START OF THE SURVEY**

Across all grades, past-year use of inhalants, heroin, methamphetamine, alcohol, cigarettes, and synthetic cannabinoids are at their lowest by many measures.
Percentage of U.S. 12th Grade Students Reporting Past Month Use of Cigarettes and Marijuana, 1975 to 2013
Percentage of U.S. 12 Grade Students Reporting Daily Marijuana Use vs. Perceived Risk of Regular Marijuana Use

Source: The Monitoring the Future study, the University of Michigan
“Not Addictive”

“It’s Natural”

“Better than Alcohol”

“It’s Medicine”

“It is Legal”

“Never Killed Anyone”
Marijuana (Tetrahydrocannabinol)

Endo-cannabinoid (Anandamide)

Source: NIDA
Acute effects of using marijuana (during intoxication)

- Altered judgment
- Slowed reaction time
- Euphoria
- Impaired memory
- Increased appetite
- Panic/paranoia/psychosis
- Impaired coordination
- Altered pain sensitivity
- Anti-nausea effects
Deficits in cognitive functioning among active users

Many studies show that adolescents who use marijuana heavily tend to score worse than non-users on tests of:

- attention
- verbal learning
- memory
- processing speed

... even when they are not high.

Messinis, et al 2006
Adult life outcomes affected by marijuana use in adolescence

College grad by age 25

Fergusson DM & Boden JM, Cannabis use and later life outcomes. Addiction. 2008 Jun; 103(6):969-76
Loss of adult IQ with marijuana dependence in adolescence

Findings:

• Those who developed marijuana dependence before age 18 showed IQ decline in adulthood.
• The longer their dependence persisted, the greater the decline, with a decline of 8 IQ points for the most persistent users.
• Those who began using in adulthood did not show IQ decline.
• Quitting in adulthood did not restore functioning in those who began in adolescence.
Data from the NIDA-sponsored Potency Monitoring program at the University of Mississippi, showing average THC and CBD levels in samples of marijuana seized by federal, state and local governments in each year shown.
THC Concentrates

“Green Crack” wax

“Ear Wax”

Butane Hash Oil (BHO)

Hash Oil Capsules

“Budder”

“Shatter”
Ways to consume marijuana

SMOKING
- Pipe
- Bong
- Bubbler

EDIBLES
- Candy
- Ice cream
- Baked goods

VAPORIZING
- Desktop vaporizer
- Portable vaporizer

BEVERAGES
- Tea
- Soda
- Alcohol
- Milk

OTHER
- Capsules
- Spray
- Tincture
Products & packaging: Like this?
Is Marijuana Addictive?

% of users (of all ages) who develop dependence

- Nicotine: 32%
- Heroin: 23%
- Cocaine: 17%
- Alcohol: 15%
- Marijuana: 9%

And 30%-50% for teens with daily use
And 17% for those who start in their teens
Big Marijuana — Lessons from Big Tobacco

Kimber P. Richter, Ph.D., M.P.H., and Sharon Levy, M.D., M.P.H.

The United States is divided over the legalization of marijuana. Arguments in favor include protection of individual rights, elimination of criminal sentencing for minor offenses, collection of tax revenue, and elimination of the black market. Counterarguments include the

It took the medical and public health communities 50 years, millions of lives, and billions of dollars to identify the wake of illness and death left by legal, industrialized cigarettes. The free-market approach to tobacco clearly failed to protect the public’s welfare and the common good: in spite of recent federal regulation, tobacco use remains the leading cause of death in the United States.

History and current evidence suggest that simply legalizing marijuana, and giving free rein to the resulting industry, is not the answer. To do so would be to once again entrust private industry with safeguarding the health of the public — a role that it is not designed to handle.
Genetics + Early Use + Trauma → Poor Mental Health
Genetics Account for 50% of Risk of Addiction
Addiction is a Developmental Pediatric Disease

Source: NIAAA National Epidemiologic Survey on Alcohol and Related Conditions, 2003
Teen Alcohol Use Wires The Brain For Addiction

40% of kids who begin drinking at age 15 will become alcoholics.

Only 7% of those who begin drinking at age 21 become alcoholics.


* Photo courtesy of NIAAA and MADD
Adverse Childhood Experiences
Emotional Neglect
Abuse
Household Dysfunction
Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults

The Adverse Childhood Experiences (ACE) Study

Vincent J. Felitti, MD, FACP, Robert F. Anda, MD, MS, Dale Nordenberg, MD, David F. Williamson, MS, PhD, Alison M. Spitz, MS, MPH, Valerie Edwards, BA, Mary P. Koss, PhD, James S. Marks, MD, MPH

Background: The relationship of health risk behavior and disease in adulthood to the breadth of exposure to childhood emotional, physical, or sexual abuse, and household dysfunction during childhood has not previously been described.

Methods: A questionnaire about adverse childhood experiences was mailed to 13,494 adults who had completed a standardized medical evaluation at a large HMO; 9,568 (70.5%) responded. Seven categories of adverse childhood experiences were studied: psychological, physical, or sexual abuse; violence against mother; or living with household members who were substance abusers, mentally ill, or ever imprisoned. The number of categories of these adverse childhood experiences was then compared to measures of adult risk behavior, health status, and disease. Logistic regression was used to adjust for effects of demographic factors on the association between the cumulative number of categories of childhood exposures (range: 0–7) and risk factors for the leading causes of death in adult life.

Results: More than half of respondents reported at least one, and one-fourth reported ≥2 categories of childhood exposures. We found a graded relationship between the number of categories of childhood exposure and each of the adult health risk behaviors and diseases that were studied ($P < .001$). Persons who had experienced four or more categories of childhood exposure, compared to those who had experienced none, had 4- to 12-fold increased health risks for alcoholism, drug abuse, depression, and suicide attempt; a 2- to 4-fold increase in smoking, poor self-rated health, ≥50 sexual intercourse partners, and sexually transmitted disease; and a 1.4- to 1.6-fold increase in physical inactivity and severe obesity. The number of categories of adverse childhood exposures showed a graded relationship to the presence of adult diseases including ischemic heart disease, cancer, chronic lung disease, skeletal fractures, and liver disease. The seven categories of adverse childhood experiences were strongly interrelated and persons with multiple categories of childhood exposure were likely to have multiple health risk factors later in life.

Conclusions: We found a strong graded relationship between the breadth of exposure to abuse or household dysfunction during childhood and multiple risk factors for several of the leading causes of death in adults.

Finding Your ACE Score

While you were growing up, during your first 18 years of life:

1. Did a parent or other adult in the household often or very often…
   Swear at you, insult you, put you down, or humiliate you?
   or
   Act in a way that made you afraid that you might be physically hurt?
   Yes  No  If yes enter 1  

2. Did a parent or other adult in the household often or very often…
   Push, grab, slap, or throw something at you?
   or
   Ever hit you so hard that you had marks or were injured?
   Yes  No  If yes enter 1  

3. Did an adult or person at least 5 years older than you ever…
   Touch or fondle you or have you touch their body in a sexual way?
   or
   Attempt or actually have oral, anal, or vaginal intercourse with you?
   Yes  No  If yes enter 1  

4. Did you often or very often feel that…
   No one in your family loved you or thought you were important or special?
   or
   Your family didn’t look out for each other, feel close to each other, or support each other?
   Yes  No  If yes enter 1  

5. Did you often or very often feel that…
   You didn’t have enough to eat, had to wear dirty clothes, and had no one to protect you?
   or
   Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
   Yes  No  If yes enter 1  

6. Were your parents ever separated or divorced?
   Yes  No  If yes enter 1  

7. Was your mother or stepmother:
   Often or very often pushed, grabbed, slapped, or had something thrown at her?
   or
   Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard?
   or
   Ever repeatedly hit at least a few minutes or threatened with a gun or knife?
   Yes  No  If yes enter 1  

8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?
   Yes  No  If yes enter 1  

9. Was a household member depressed or mentally ill, or did a household member attempt suicide?
   Yes  No  If yes enter 1  

10. Did a household member go to prison?
    Yes  No  If yes enter 1  

Now add up your “Yes” answers: _______ This is your ACE Score.
WHAT ARE THEY?

ACEs are
ADVERSE CHILDHOOD EXPERIENCES

HOW PREVALENT ARE ACEs?

The ACE study revealed the following estimates:

**ABUSE**
- Physical Abuse: 28.3%
- Sexual Abuse: 20.7%
- Emotional Abuse: 10.6%

**NEGLECT**
- Emotional Neglect: 16.8%
- Physical Neglect: 9.9%

**HOUSEHOLD DYSFUNCTION**
- Household Substance Abuse: 26.9%
- Parental Divorce: 23.9%
- Household Mental Illness: 18.5%
- Mother treated violently: 13.3%
- Separated Household Member: 4.7%

WHAT IMPACT DO ACEs HAVE?

As the number of ACEs increases, so does the risk for negative health outcomes.

**Possible Risk Outcomes:**

- Lack of physical activity
- Smoking
- Alcoholism
- Drug use
- Mental illness
- Physical & Mental Health
- Suicide attempts
- STIs

OF 17,000 ACE study participants:

- 20% have experienced 1 ACE
- 10% have experienced 2 ACEs
- 5% have experienced 3 ACEs
- 1% have experienced 4+ ACEs

94% have at least 1 ACE.
“I was really messed up, drinking, using drugs. My parents weren’t helping the situation. It took a long time, I ran away from home, got suspended from school but the Student Assistance Counselor at my school didn’t give up on me and finally convinced me to get treatment. It took a few times going to different programs but I am clean and sober today. I don’t think I would have made it without her help.”

- Jason, former student, age 26
I don’t know exactly why, but I feel better after I talk to you. I am not so mad....” - Melissa, age 13

“My Student Assistance Counselor helped me through the toughest years of my life. She taught me how to cope with the alcohol abuse in my family. I still visit her to this day because she helped me so much.”  
- Mallory, former student, age 24

“My Student Assistance Counselor is really funny, and sassy and helps me with my problems which I have a lot of.”  
- Jola, age 12
Media

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Clip Sets

Clip Comments

Very informative. Thanks for sharing. This information needs to be available and supported by those participating the in the rights of...
3/27/17 @ 4:33 PM

Thanks for your comment, Rick. It is both, in that our culture shapes boys to express their trauma outwardly, and girls to express their...
3/27/17 @ 4:31 PM

Introducing the Strong, Prosperous, And Resilient Communities Challenge (SPARCC) [6 min - Low Income Investment Fund]
JANE STEVENS · 10 HOURS AGO

Barriers to Success - Moving Towards a Deeper Understanding of Adversity's Effects on Adolescents (America's Promise Alliance) 24 page report.pdf

ACEs Connection

If you’re working to lower ACE scores in your personal, work, play, faith-based or community life — and this includes any endeavor, from art to politics — please consider joining ACEs Connection. It’s the companion social network to ACEsTooHigh.com.

ACEsConnection.com is for people who are implementing — or thinking about implementing — trauma-informed and resilience-building practices based on ACEs research. As of October 2014, more than 3,000 people had joined.

If you join, you automatically receive a daily digest with summaries and links to the latest news, research and reports about ACEs research and implementation, plus a weekly roundup of activity within the network. ACEsConnection members post blogs, photos, videos, and events; they can find, message and chat with others who are working on similar projects. They participate in groups. There are topic-based groups....for pediatricians, educators, people in criminal justice, for the faith-based community. There are geographic-based groups....for cities, counties and states.

To join, just head to ACEsConnection.com and sign up!
Talk Early, Talk Often
“Delay, Delay, Delay or Avoid Altogether”

Genetics + Trauma + Early Use
**Figure 2**  High school ACL injury rates

High school anterior cruciate ligament (ACL) injury rates per 100,000 athlete exposures (AEs) by sport and sex. (An athlete exposure is 1 athlete participating in 1 practice or competition.)

<table>
<thead>
<tr>
<th>Sport</th>
<th>Girls</th>
<th>Boys</th>
</tr>
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<tr>
<td>Soccer</td>
<td>11.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Basketball</td>
<td>11.2</td>
<td></td>
</tr>
<tr>
<td>Girls’</td>
<td></td>
<td>2.4</td>
</tr>
<tr>
<td>Boys’</td>
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<tr>
<td>Boys’</td>
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</tr>
</tbody>
</table>

Adapted from Comstock RD, et al.³
In the Realm of Hungry Ghosts

The Body Keeps the Score

Clean

Beautiful Boy

Chasing the Scream

Dreamland
Talk Early, Talk Often

“Delay, Delay, Delay or Avoid Altogether”

Genetics

Early Use

Teen Brain Under Construction