Learning outcomes:

- Current trends in underage drinking
- How does alcohol affect the developing teenage brain?
- Gender differences
- What can parents and school counselors do to help prevent and address underage drinking?
Cost and scope of alcohol-related problems in US

### Prevalence of disorder or disease

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Millions in the US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>14.6</td>
</tr>
<tr>
<td>Illicit drugs</td>
<td>6.6</td>
</tr>
<tr>
<td>Tobacco</td>
<td>28.6</td>
</tr>
<tr>
<td>Cancer</td>
<td>14.5</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>1.2</td>
</tr>
</tbody>
</table>

### Facts and stats

- CDC – Alcohol causes ~107,000 deaths and prevents ~26,000 deaths
- Globally about 2.3 million deaths (3.6% of all deaths) – 10X more than all illicit drug related deaths combined
- ~6% (14.6 million) of people 18+ in US reached DSM-IV abuse or dependence criteria in 2016
- Rate of alcoholic cirrhosis deaths increased 35% in last 15 years (more than 21,000 per year now)
- Increase in alcohol related ED visits in last decade particularly for women and older drinkers
- <10% of people with AUD get any treatment and fewer than 1 in 20 receive pharmacotherapy

### Cost to society

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Billions of dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>249</td>
</tr>
<tr>
<td>Illicit drugs</td>
<td>193</td>
</tr>
<tr>
<td>Tobacco</td>
<td>295</td>
</tr>
<tr>
<td>Cancer</td>
<td>217</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>36</td>
</tr>
</tbody>
</table>


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### Odds of alcohol use increases across adolescence

#### Figure 3.1: Past-Month Alcohol Use, Binge Alcohol Use, and Marijuana Use, by Age: Percentages, 2015 National Survey on Drug and Health (NSDUH)

- Among all drinkers first alcohol use ~17
- Among underage drinkers ~14.5

From the 2017 Surgeon General report on addiction
Racial and ethnic differences in binge drinking

Figure 6-3. NSDUH: Prevalence of binge drinking in the past 30 days among 12- to 20-year-olds, by age, sex, and race/Hispanic origin, 2015.

Note: The threshold for females was changed to consumption of 4 or more drinks on an occasion in the past 30 days in NSDUH 2015.

Earlier onset of use increases risk for abuse and dependence later in life

Those who first used alcohol at age 14 or younger were more than 7 times as likely to be classified with alcohol dependence or abuse than those who had their first drink at age 21 or older (15.2 vs. 2.1 percent)

Source: NSDUH 2012 -- www.samhsa.gov/data/
Binge drinking is decreasing among 8th, 10th and 12th graders

Significant decline for all grade levels


Peak drinking levels declining among 12th graders
Drinking and driving declining among teens


Narrowing gender gaps in prevalence of past month alcohol use

MTF, 2017
Disappearing gender gaps in alcohol use during adolescence

Percentage of 12th grade females and males who had 5+ drinks in a single night during the last 2 weeks

Percentage of 12th grade females and males who drank every day during the last month.

Frontal lobes change during adolescence

“Within layer 3 of the frontal cortex pruning is quite significant and approximately 40% of synapses are lost between 7 and 15 years of age.”
-- Brenhouse and Andersen, 2011

• Planning, decision-making, impulse control
• Expectations, perception of norms, social awareness

Ball W et al with the Brain Development Cooperative Group (2012). Total and regional brain volumes in a population-based normative sample from 4 to 18 years: the NIH MRI Study of Normal Brain Development. Cerebral Cortex, 22(1):1-12.
“According to the model, the adolescent is biased by functionally mature subcortical relative to less mature cortical circuitry” Casey and Jones, 2010


Alcohol and other drugs activate the reward system, compelling the user to repeat the behavior.

**Incentive salience** develops to the cues (e.g., a product) associated with the pleasure. This motivates us to approach and consume the reinforcer.
“So, if indeed it is the case that adolescent animals have lower basal rates of dopamine release, then perhaps adolescents initially seek out more stimulation (rewards) that will increase dopamine release; **once stimulated, however, the adolescent will show greater dopamine release that subsequently contributes to a reinforcing feedback cycle that motivates additional reward-seeking behavior.”

Females are less driven than males by sensation seeking throughout adolescence

Shulman et al. Sex Differences in the Developmental Trajectories of Impulse Control and Sensation-Seeking from Early Adolescence to Early Adulthood. J Youth and Adolescence, 2015, 44, 1-17
Females exhibit better impulse control than males throughout adolescence.

While sensation seeking and poor impulse control help explain why teen males are drawn to substances it might not apply as much to females.

Amygdala, threats and social learning

- Learning about/reacting to potential threats, which could be snakes, heights or threats in social situations.
- The amygdala is hyper-reactive in adolescents, which could help keep us safe in the world but contribute to volatile emotional reactions and heightened anxiety.

Adolescents tend to rely more on the amygdala than frontal lobes to interpret facial expressions

"Shocked, surprised, angry"  "Fear"


Alcohol suppresses the hippocampus and causes blackouts

17% of males and 22% of females blacked out

Relationship between blackouts and other drinking-related outcomes

Table 3. Experienced Other Alcohol Problems According to Frequency of Blackouts in Past 6 Months: NEXT Generation Health Study, Wave 4 (N = 1,463, Drinkers)

<table>
<thead>
<tr>
<th>Past 6 months</th>
<th>Frequency of blackouts in past 6 monthsa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None (N = 1,189)</td>
</tr>
<tr>
<td>Had a hangover</td>
<td>26%</td>
</tr>
<tr>
<td>Missed work/class</td>
<td>4</td>
</tr>
<tr>
<td>Got behind school/work</td>
<td>3</td>
</tr>
<tr>
<td>Did something they later regretted</td>
<td>11</td>
</tr>
<tr>
<td>Argued with friends</td>
<td>10</td>
</tr>
<tr>
<td>Damaged property</td>
<td>2</td>
</tr>
<tr>
<td>Trouble with police</td>
<td>1</td>
</tr>
<tr>
<td>Injured</td>
<td>4</td>
</tr>
<tr>
<td>Alcohol overdose</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Number of other alcohol problems</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>64</td>
</tr>
<tr>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>4+</td>
<td>2</td>
</tr>
</tbody>
</table>

aAll relations p < 0.01.

Source: Hingson et al., 2016, ACER

Alcohol can cause death

Among all age groups alcohol is involved in:
- 21.2% of benzodiazepine overdose deaths
- 22.1% of opioids overdose deaths

- Alcohol, by itself, can shut off vital reflexes in the medulla and pons and cause death.
- Combining alcohol with benzodiazepines and narcotic pain medications increases the risk of overdose deaths.

Alcohol has a small Therapeutic Index (TD<sub>50</sub>/ED<sub>50</sub>)
- A toxic dose is not much higher than a moderately intoxicating dose
- Average and median BAC among 693 people who died from alcohol poisoning was 0.36%. (Jones and Holmgren, 2003)

**Potentially fatal alcohol overdoses: How much alcohol?**

If ED<sub>50</sub> = ~0.05%
And TD<sub>50</sub> = ~0.35%
Then TI = ~7

- 10 drinks in 2 hrs for a 140 lb female
  - BAC = 0.32%
  - BAC = 0.43%
  - BAC = 0.38%

- 13 drinks in 2 hrs for a 160 lb male
  - BAC = 0.35%
  - BAC = 0.48%
  - BAC = 0.44%

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**Drinking motives – Why do young people drink and does it matter?**

"**Coping motives** are directly, prospectively associated with several unique consequence domains, whereas **enhancement motives** predict consequences only by way of higher levels of drinking over the course of one year."

"Students who endorse coping motives may have a tendency toward worsening drinking problems independent of consumption."

- Merrill et al., 2014

Females and males might be motivated to use substances for different reasons

"We propose that males and females have different pathways of vulnerability to substance abuse: in adolescent boys sensation seeking and impulsivity may drive drug and alcohol use, while stressful experiences and comorbid internalizing disorders may mediate substance use in adolescent girls."


Females might be more motivated to drink for negative reinforcement

"The results from the largest drinking motive study conducted to date suggest that gender-specific prevention should take differences in the motivational pathways toward (heavy) drinking into account, that is, positive reinforcement seems to be more important for boys and negative reinforcement for girls."

-- Kuntsche et al., 2015

Anxiety and depression symptoms and alcohol use among adolescents - a cross sectional study of Norwegian secondary school students

Findings

- Sample of 6238 Norwegian adolescents aged 16–18 years
- Increasing severity of anxiety symptoms primarily associated with the alcohol consumption measures among girls
- Anxiety and depression more closely related to early onset of alcohol use in girls than for boys

Adults play huge roles in preventing/delaying drinking and helping young people make smart choices about alcohol
SAMHSA campaign “Talk. They hear you.”

http://www.samhsa.gov/underagedrinking/

Addictive Behaviors
Volume 64, January 2017, Pages 78–81

Short Communication
Peer drug use and adolescent polysubstance use: Do parenting and school factors moderate this association?

Gary C.K. Chan1, Adrian B. Kelly4, Annemariee Carroll3, Joanne W. Williams1

http://doi.org/10.1016/j.addbeh.2016.08.004

Highlights
• Adolescent polysubstance use was strongly associated with peer’s drug use.
• Parental disapproval of drug use was associated with reduced polysubstance use, and mitigated the influence of peers.
• Other parenting and school factors influenced polysubstance use independent of peer’s drug use.
Parental involvement and disapproval of use associated with lower levels of use

Among kids aged 12 to 17, those who believed their parents would strongly disapprove of them using a particular drug were less likely to use than those who felt their parents would only somewhat disapprove or not disapprove (4% vs 28% for smoking cigarettes each month, 3% vs 29% for smoking marijuana each month).

Rate of past month illicit drug use in 2013 was 7.3% for youths whose parents always or sometimes helped with homework compared with 14.7% percent among youths whose parents seldom or never helped.

Rates of current cigarette smoking and past month binge alcohol use also were lower among youths whose parents always or sometimes helped with homework (4.5 and 5.1 percent, respectively) than youths whose parents seldom or never helped (10.3 and 11.4 percent).

NSDUH 2014 -- www.samhsa.gov/data

Exposure to prevention messages inside of schools associated with lower levels of use

In 2013, the prevalence of past month use of illicit drugs or marijuana was lower among those exposed to prevention messages in school (8.4% and 6.7% for illicit drugs and marijuana, respectively) than among who were enrolled in school but reported no such exposure (10.2% and 8.7%).

The percentage of adolescents exposed to prevention messages in or out of school has decline over the last decade.

NSDUH 2014 -- www.samhsa.gov/data
Where do underage drinkers drink?

SAMHSA Report to Congress on Prevention and Reduction of Underage Drinking, May 2011

Common question: Should parents allow teens to drink at home?

Several studies in the US and other countries suggest that allowing teens to drink at home, either with parents or supervised by parents, increases the odds that a teen will binge drink outside of the home.

How about just lowering the drinking age like in European countries?

US teens (15-16 years old) are less likely to get drunk in a year than teens across Europe.


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THANK YOU!