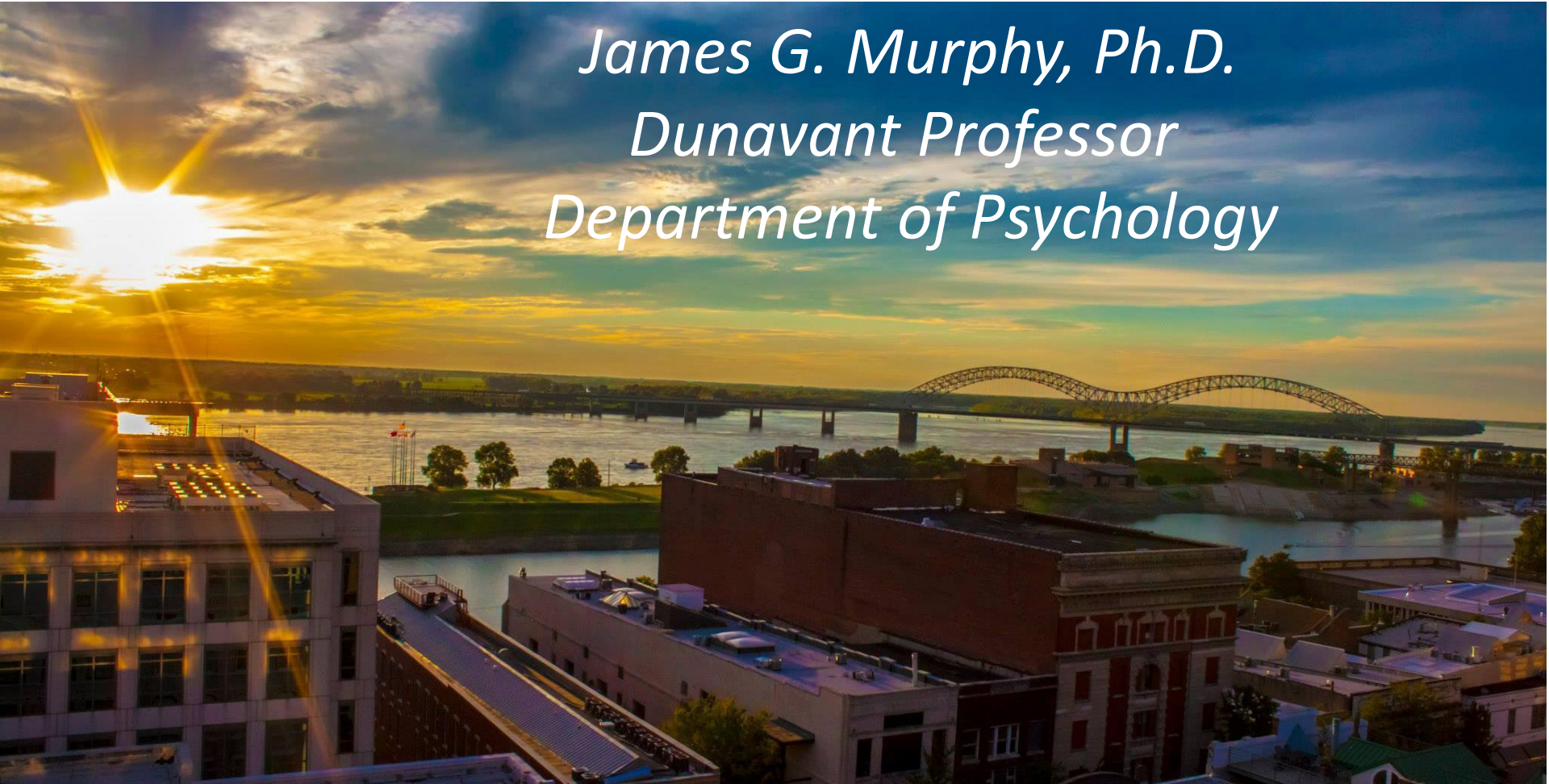


# Implications of Behavioral Sciences for Reducing Addiction and Enhancing Health

*James G. Murphy, Ph.D.  
Dunavant Professor  
Department of Psychology*



# My Background

- BA Psychology, Seton Hall University (1995)
- Ph.D. in Clinical Psychology, Auburn University (2003)
- Postdoctoral Fellowship in Addiction Research, Brown University (2006)
- Psychology Department Faculty, University of Memphis (2006 – Present)
- Director of Clinical Psychology Ph.D. program (2012 – 2018)
- Published over 150 scientific papers related to young adult alcohol and drug misuse, addiction, brief interventions, and behavioral economics.
- Research funding by the National Institute on Alcohol Abuse and Alcoholism, Department of Defense, Department of Education
- Teach classes in clinical psychology and supervise graduate students in the treatment of mental health and substance abuse



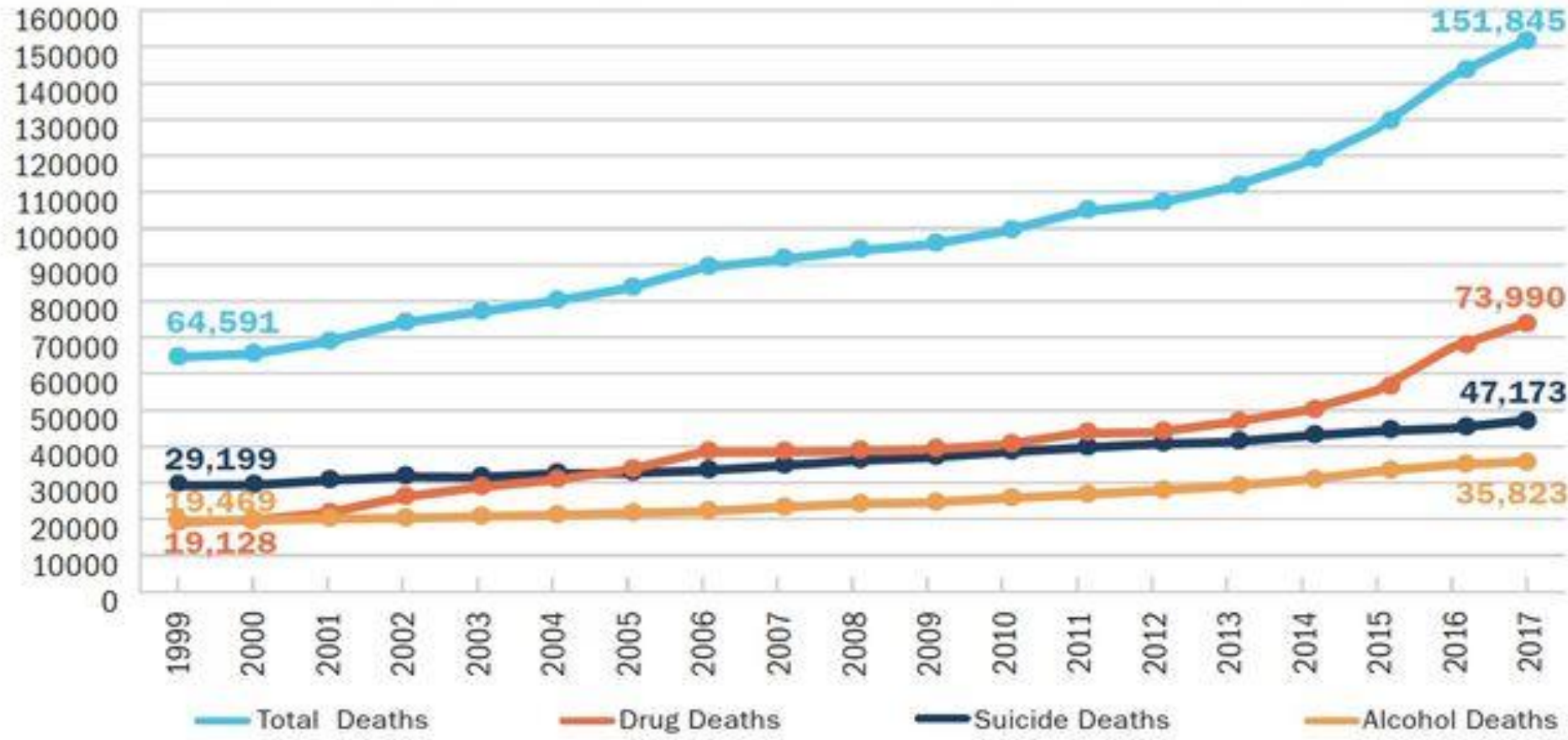
# Overview

- America is experiencing unprecedented behavioral/mental health epidemics
  - occurring despite robust economy and significant advances in medical treatments
- What can social, behavioral, and neuroscience tell us about the causes of these epidemics and possible policy-level solutions?
  - Particular focus on behavioral economics and alcohol and drug misuse



# Substantial Increases in “Deaths of Despair”

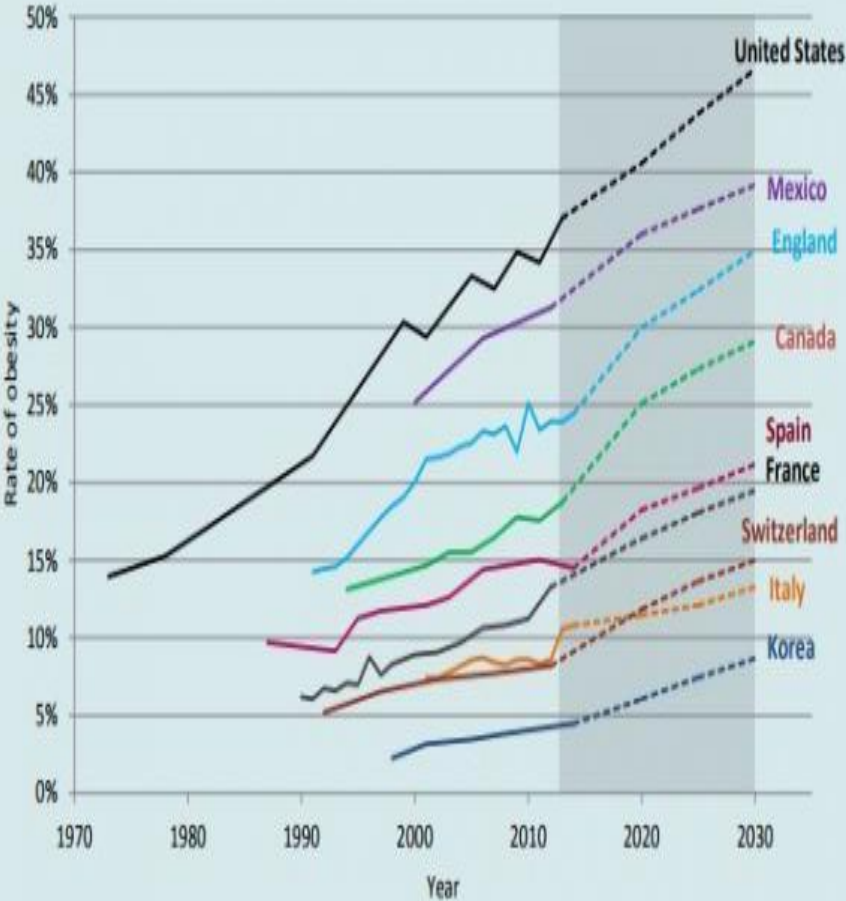
Annual Deaths from Alcohol, Drugs, and Suicide in the United States, 1999–2017



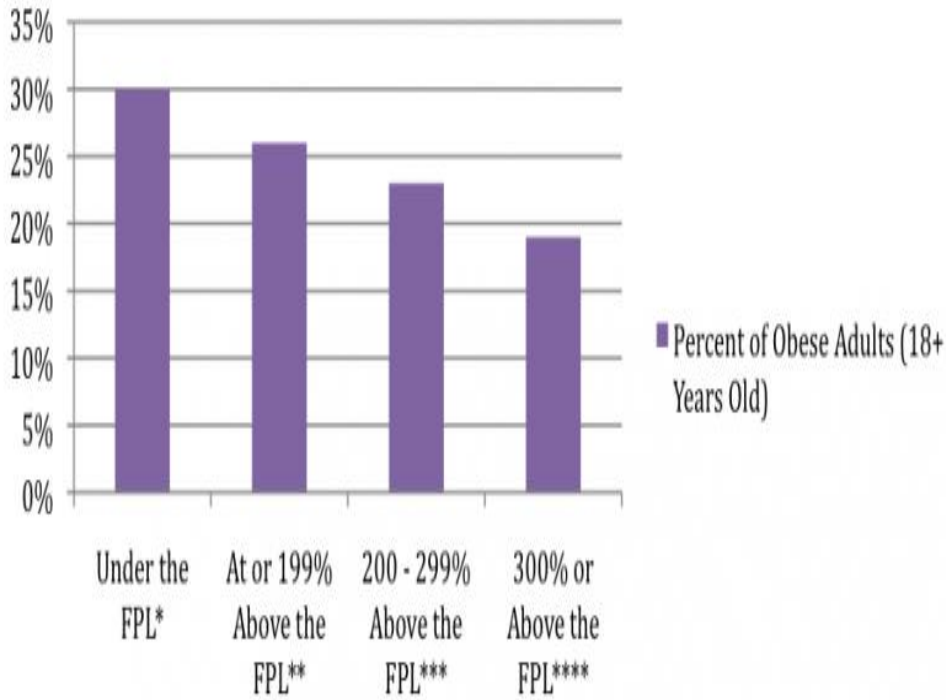
Source: Trust for America's Health and Well Being Trust analysis of data from National Center For Health Statistics, CDC

# Obesity Epidemic

Figure 5: Projected rates of obesity



## Obesity Rate and the Federal Poverty Level (FPL)



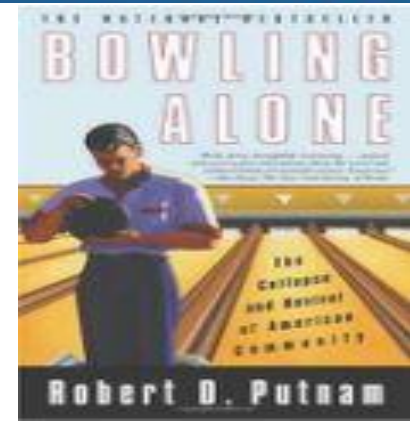
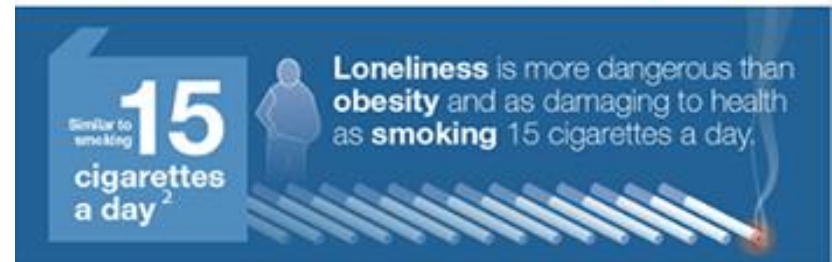
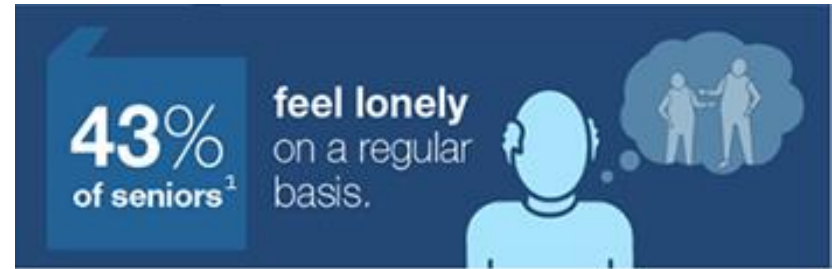
# Loneliness Epidemic



Poor social relationships → 30% increase in heart disease/strokes

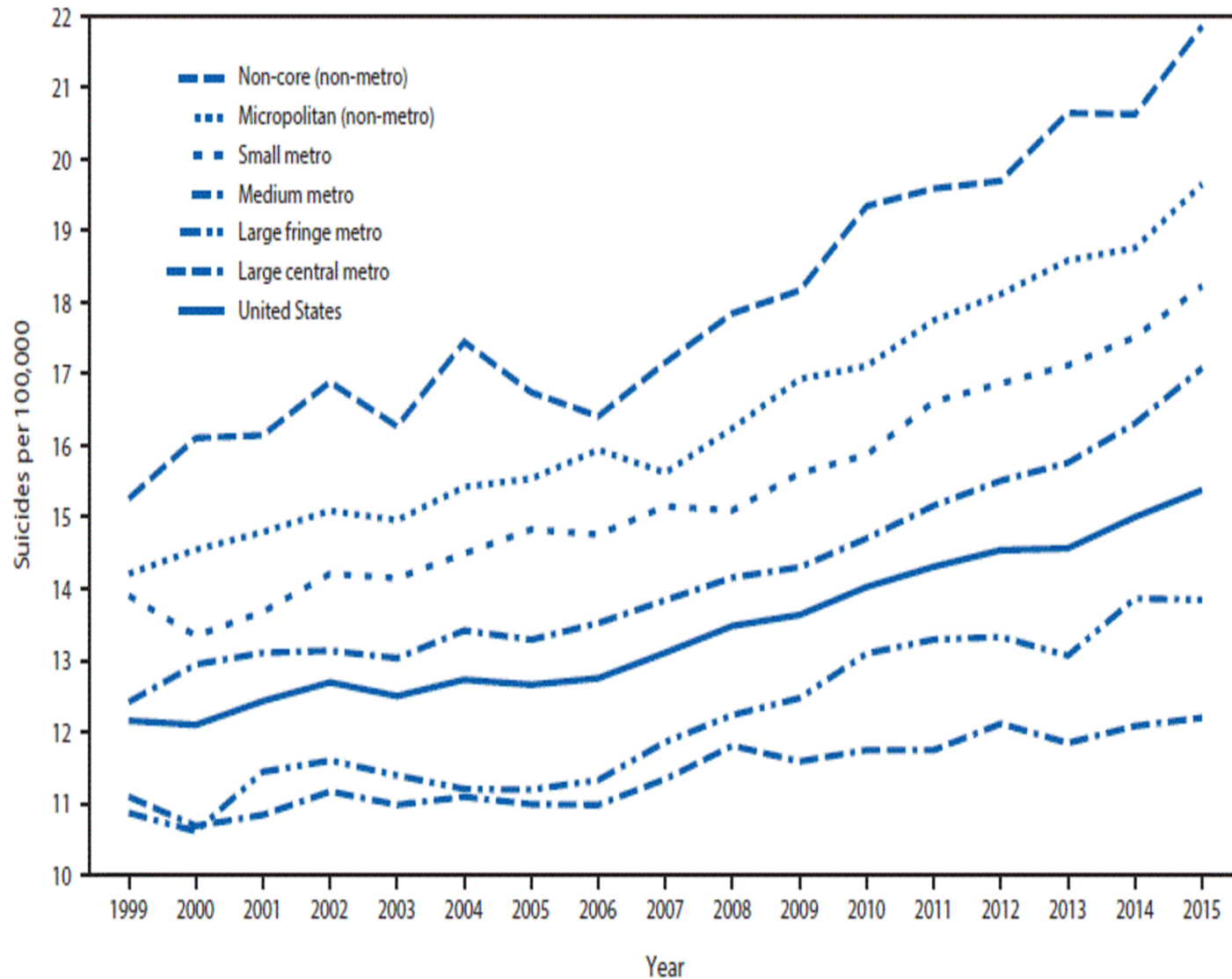
## Multiple causes -

Later age of marriage, smaller families, more social mobility (moving away from families and friends), less interactions with neighbors, less community engagement, more suburban vs. urban living, more people living alone



# Suicide more common in rural areas

FIGURE. Suicide rates\* by level of county urbanization† – United States, 1999–2015



Why?  
social  
isolation,  
poverty

# Americans are Increasingly Unhappy (1973 – 2015)

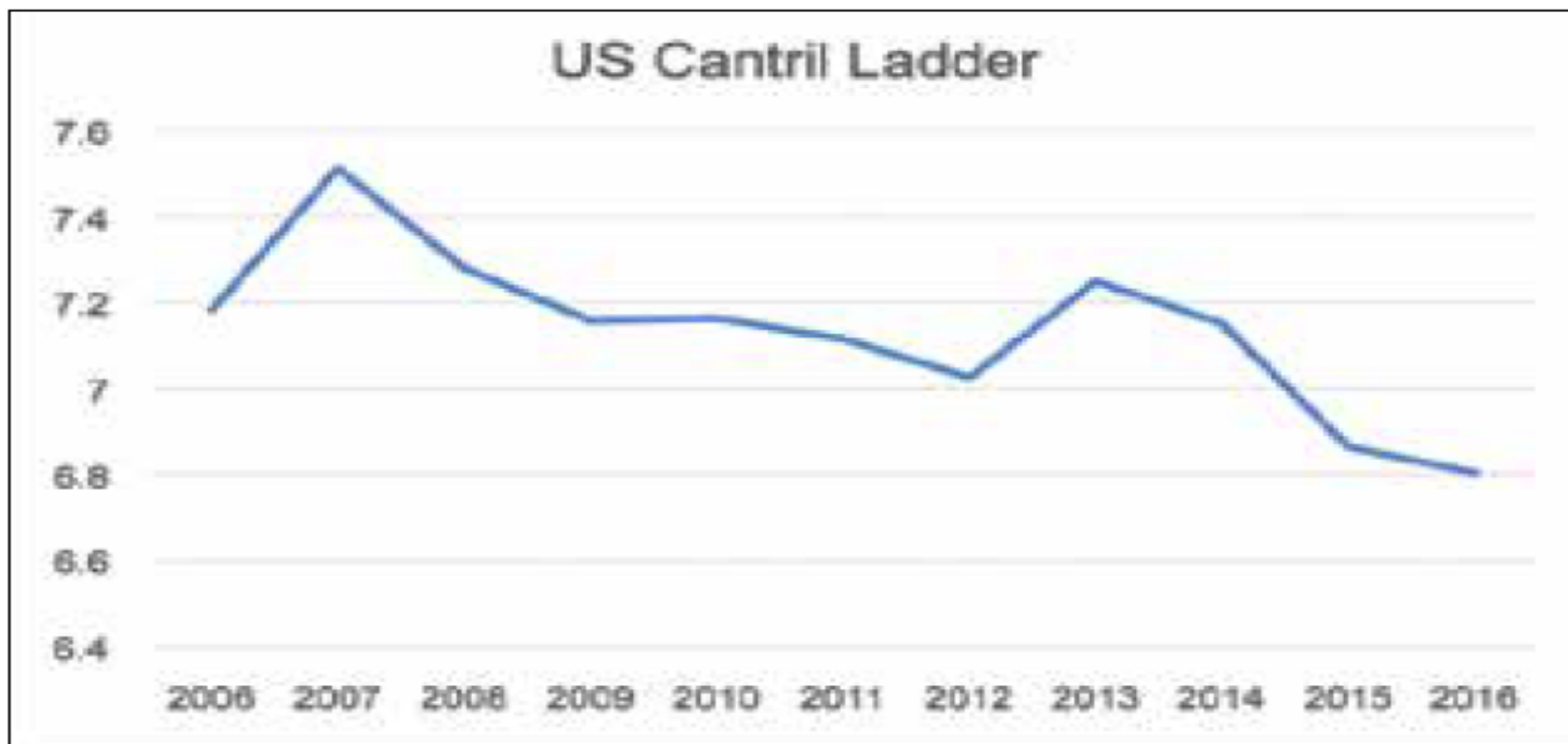
**Figure 5.1: General happiness, U.S. adults, General Social Survey, 1973-2016**

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# Figure 7.1. US Happiness Score, 2006-2016



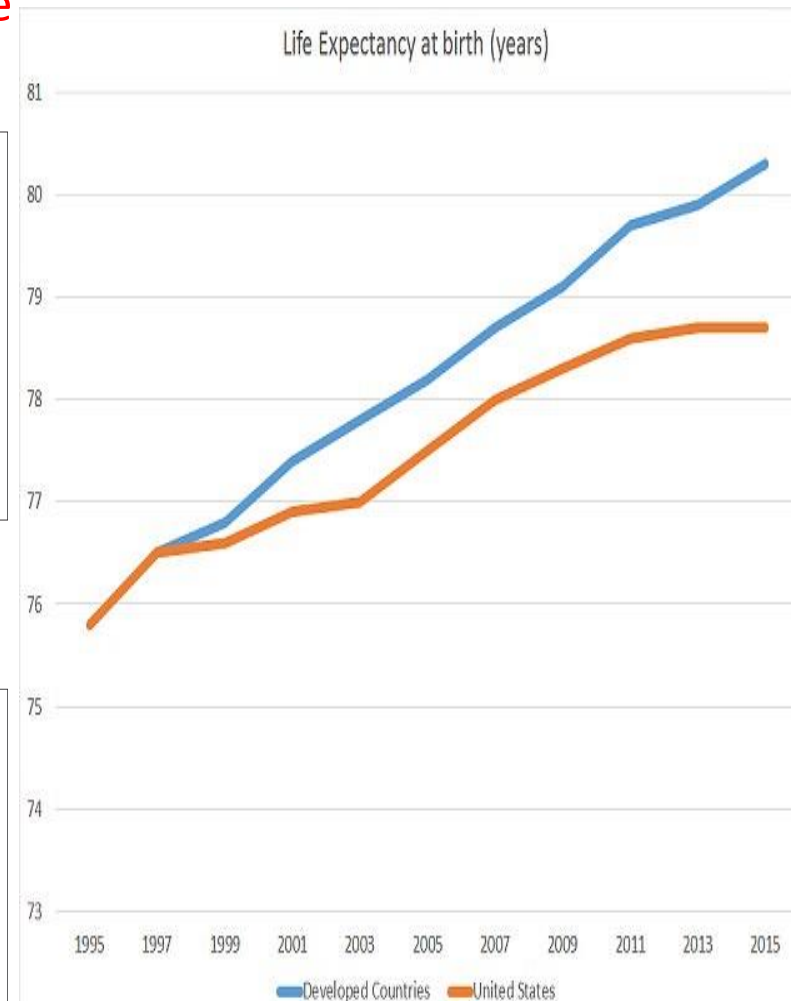
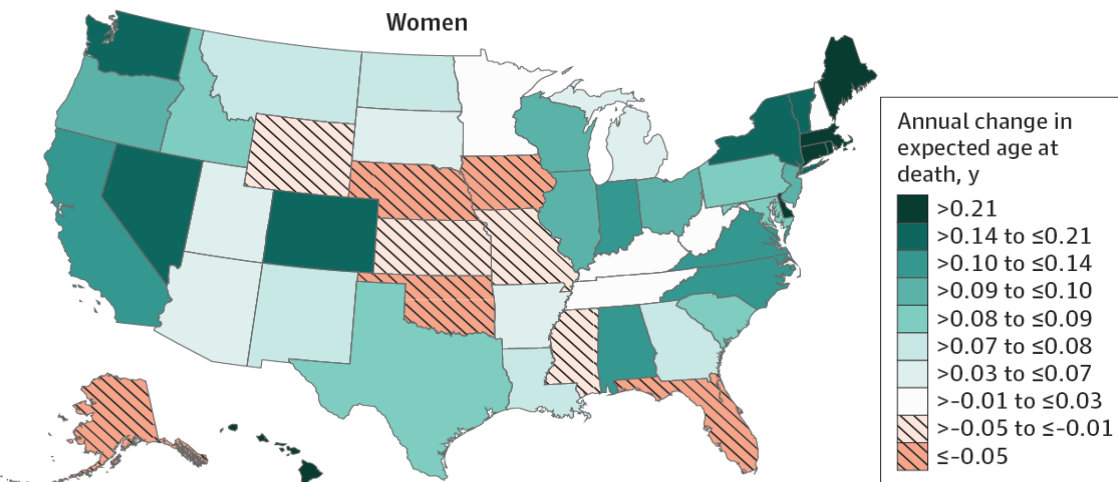
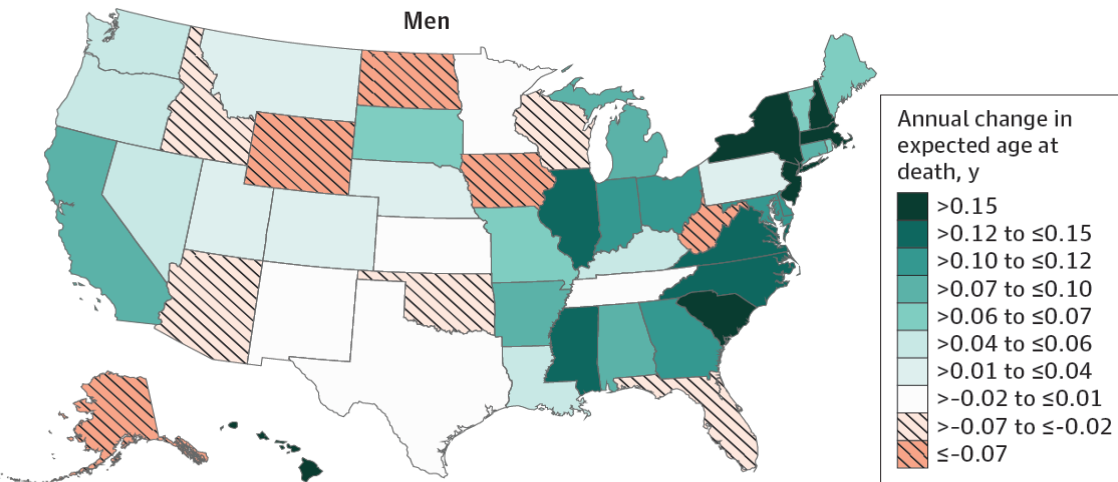
Source: Gallup International Cantril ladder

Depression prevalence increased significantly in the U.S. from 2005 to 2015 among all demographic and income groups.

Despite improving economic conditions and lower crime rates, we are growing less happy, more overweight, isolated, depressed and addicted

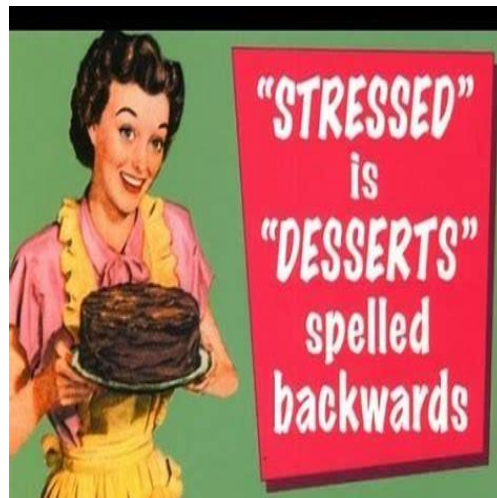
# All of this has lead to unprecedented decrease in US life expectancy among all ethnic/racial Groups

- Primary causes: drugs, alcohol, obesity, suicide



# This behavioral and mental health crisis is impacting the whole world but especially concentrated in America

- The three epidemics are distinct but can be inter-related
  - depression is a risk factor for both obesity and substance misuse; substance misuse can enhance depression





# Social and Economic Factors

- Decline in social support systems, more loneliness, systematic mistrust of others and of government  
= lower “social capital”
- Despite strong overall economy, persistent poverty among a significant portion of the U.S. population
  - income and education relative to others predicts unhappiness
- Biological/cultural factors
  - declining physical activity, increased consumption of high sugar and processed food, less time spent in nature

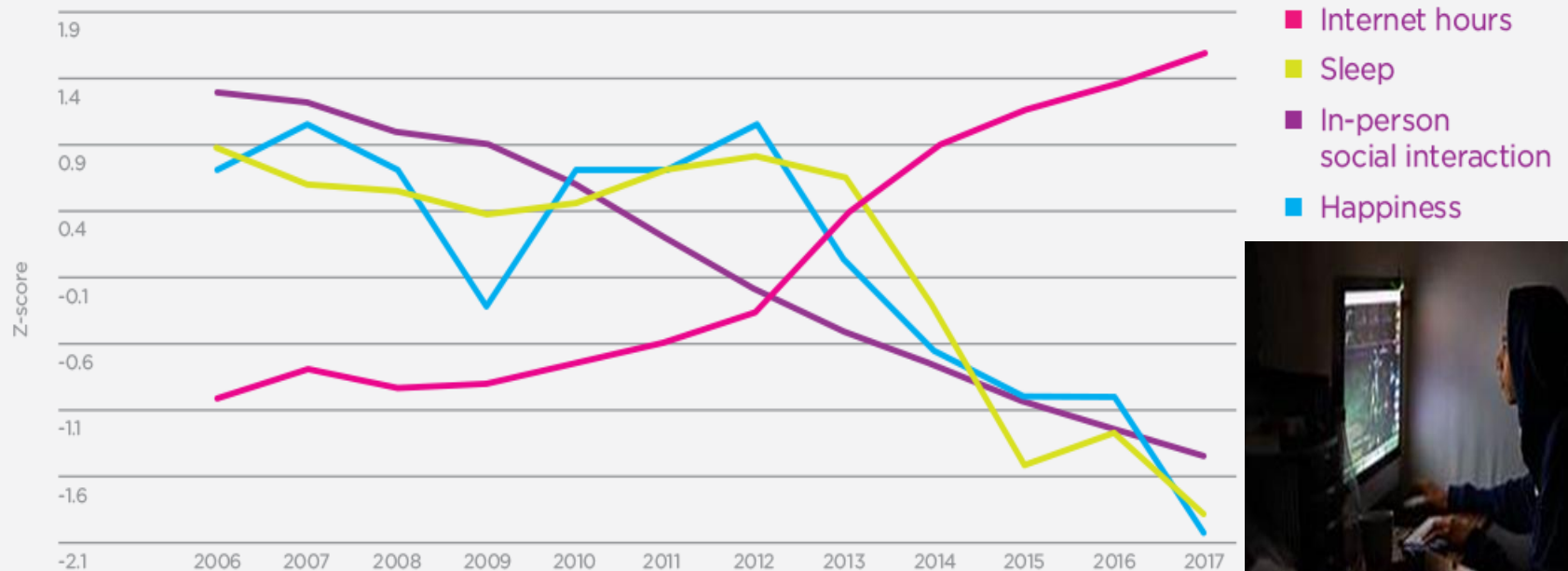
# Predictors of Happiness and Quality of Life Outcomes

- Economic factors (such as income and employment), social factors (such as education and family life), and health (mental and physical).
- Parental income and school quality are strong predictors of academic outcomes
- Maternal mental health is the best predictor of the child's emotional health and behavior.
- Having a spouse/partner
- WORLD HAPPINESS REPORT (Helliwell et al. 2017)



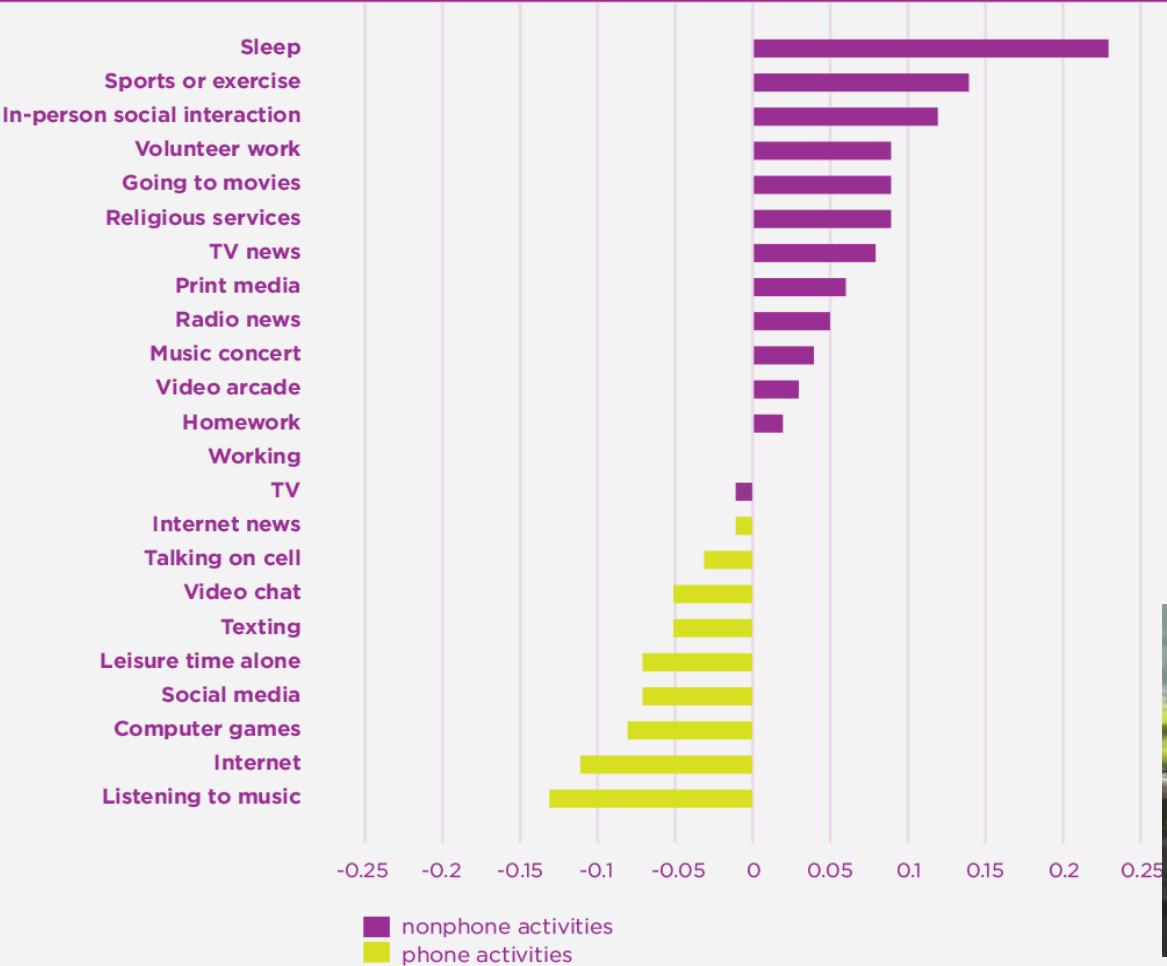
# Americans may be less happy due to fundamental shifts in how they spend their leisure time

**Figure 5.4: Time spent on the internet, sleeping more than 7 hours a night most nights, frequency of in-person social interaction across 7 activities, and general happiness, standardized (Z) scores, 8th and 10th graders, Monitoring the Future, 2006-2017**



# Americans may be less happy due to fundamental shifts in how they spend their leisure time

Figure 5.5: Correlation between activities and general happiness, 8th and 10th graders, Monitoring the Future, 2013-2016 (controlled for race, gender, SES, and grade level)





# Unhappiness and Screen Time: Correlation or Causation?

- Tromholt (2017) randomly assigned more than 1,000 adults to either continue their normal use of Facebook or give it up for a week; **those who gave up Facebook reported more happiness and less depression at the end of the week.**
- Hunt et al. (2018) asked college students to limit their social media use to 10 minutes a day per platform and no more than 30 minutes a day total, compared to a control group that continued their normal use. **Those who limited their use were less lonely and less depressed over the course of several weeks.**
- Friends randomly assigned to have their phones available while having dinner at a restaurant **enjoyed the activity less than those who did not have their phones available** (Dwyer et al., 2018)
- Longitudinal studies have found that **digital media use predicts lower well-being later** (Allen & Vella, 2018)



## Cell Phone Addiction



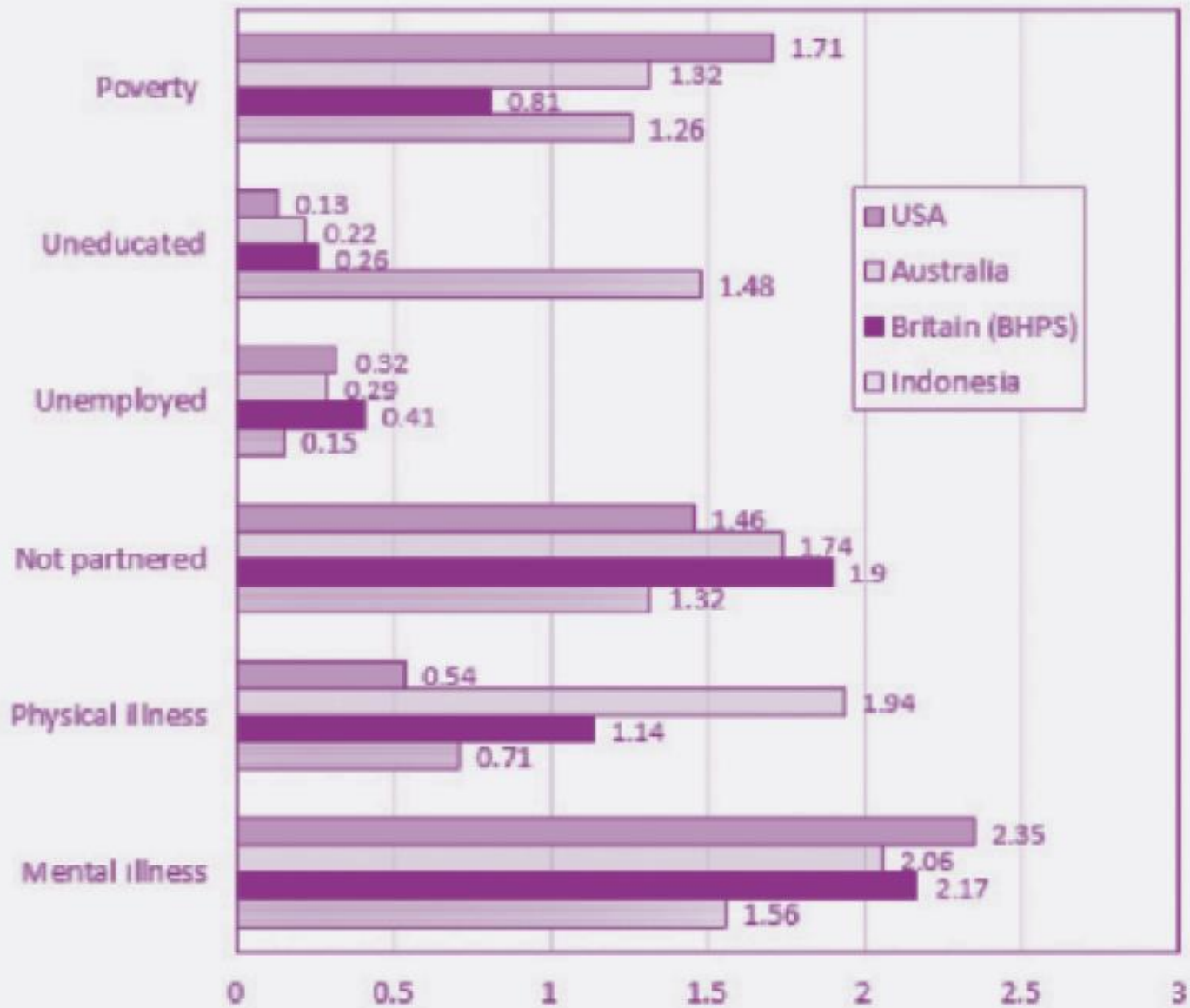
# Teens and Young Adults are Especially Susceptible to Advertising of Products that Can Lead to Obesity and Addiction



# Inadequate Mental/Behavioral Health Treatment

- Evidence-based mental health services are often not available (e.g., shortage of psychiatrists and psychologists)
  - Limited availability of medications for opiate addiction (e.g., suboxone)
  - The emphasis is on acute treatment rather than prevention or aftercare
- Evidence-based **behavioral treatments** for mental health and health behavior change are especially underutilized
  - Examples – behavioral therapy is highly effective for depression, poor sleep, and for pain but underutilized
- Mental & behavioral health care is stigmatized, segregated, and **not focused on lifelong wellness and prevention**

**Figure 7.9: Percentage Fall in Misery if Various Problems Could Be Eliminated**

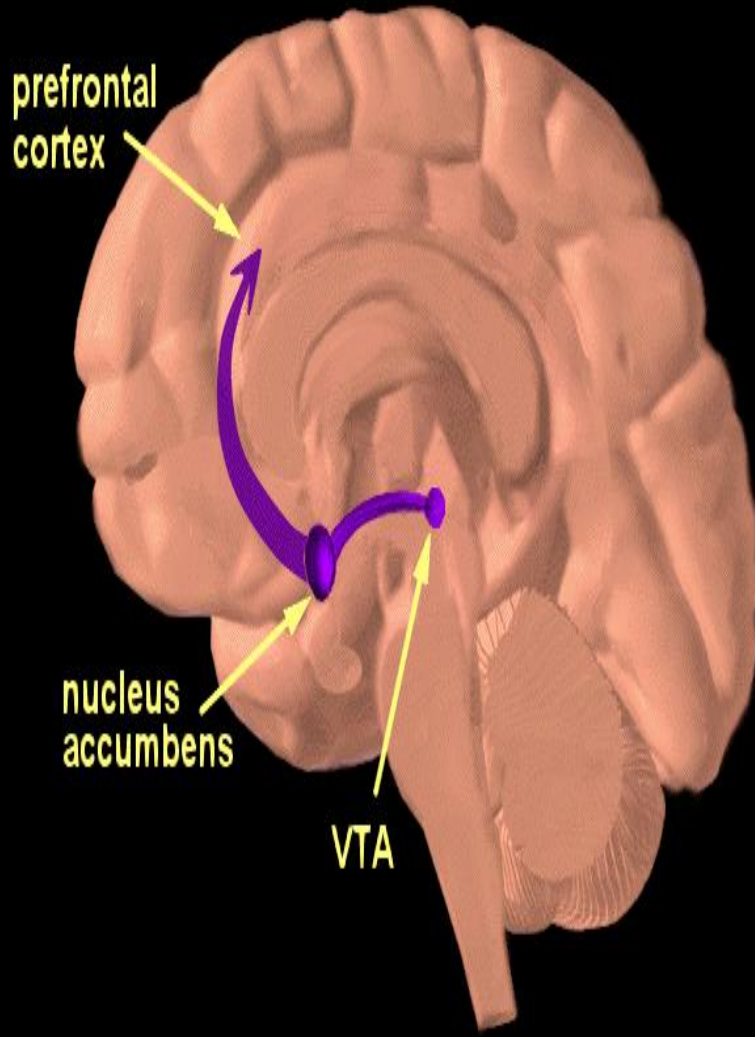


Source: Clark et al. (2017)



Potential Solutions Start with  
Understanding the Nature of Human  
Behavior and Motivation (as illustrated  
through research on addiction and  
behavior change)

# What Motivates us To Do Things: The Mesolimbic Dopamine Reward System



Drugs are powerful **motivators of behavior**

Drugs activate brain mechanisms that ensure that organisms survive and reproduce - e.g., eating, sex, physical activity, social affiliation, achieving goals (natural highs).

Thus, drug users become highly motivated to experience this feeling, especially when they lack natural highs; but chronic drug use reduces our ability to experience natural highs (vicious cycle)

Until the past few centuries, we lived in environments of scarcity; survival required sustained effort, outdoor physical activity, and social cooperation (all were learned)







- Thus, we are prepared for “scarcity” & especially motivated to pursue short-term “low effort” rewards when they are available (next meal was uncertain)



- Self-control was less necessary as there were few cheap/easy meals or ways to feel good that were not linked to strenuous effort





# Thus, we are biologically ill-equipped for:

- self-control challenges of modern life (e.g., immediately available low effort food, drugs, electronics, gambling) which are now essential for health and financial success
- Living alone, spending most time indoors
- Even 30 years ago food prep took much longer (before microwaves & fast food) and we walked everywhere (we didn't have to think about managing weight)
- Poverty and scarcity further reduce self-control, and these effects can be transmitted across generations (epigenetics)



# Children and Young Adults Are Especially Unable to Delay Gratification

- Higher rates of binge eating, fighting, risk taking, alcohol and drug use etc. (cross-species effect)
  - Immature brain development/executive control (ADHD)
- Developing friendships and romantic relationships is key developmental task, and alcohol can facilitate this goal.



# Overview of Behavioral Economics

- Key assumption:
  - In deciding what to do, people will maximize reward while minimizing effort (utility maximization)
- Alcohol and drug use is most likely when:
  - Drug price is low and availability is high (college campus, many impoverished areas)
  - There are few other sources of reward in the environment

**Addiction** = drugs have greater reinforcing value than available alternatives



# Environmental Enrichment is Protective Against Drug Self-Administration and Addiction



“Rat Park” Studies; Alexander et al., 1978; 1981

-Treatments that increase alternatives to drug use are highly efficacious (contingency management, community reinforcement, therapeutic workplace, exercise, 12-Step)

Davis et al. 2016 *Preventive Medicine*.

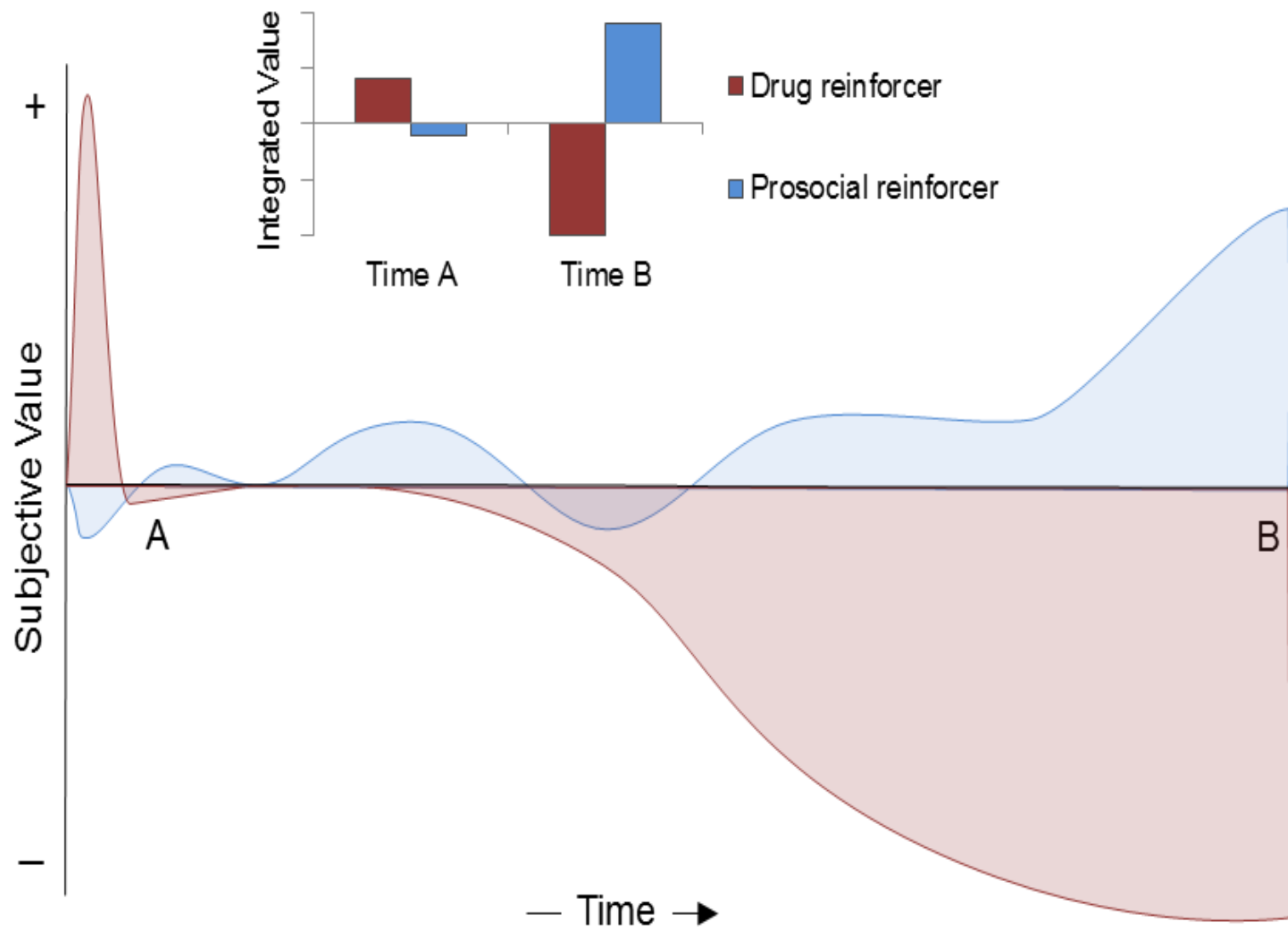


# Factors Contributing to Reward Deprivation Among Humans

- Poverty, discrimination
- Environments that lack access to social/leisure activities (some rural areas, military bases, Indian reservations)
- Mental health conditions (depression, anxiety, stress, social skill deficits)
- Injuries or medical conditions that cause pain or limit activities
- Transitions/life events –
  - Unemployment or change in job activities, divorce, moving, diminished skill or access to hobbies/sports
- Chronic alcohol and drug use erodes natural sources of reward

Thus, addiction is both a brain disease and a disease of the environment

# Why do people sometimes choose drug rewards even in the presence of alternatives? (present time bias)

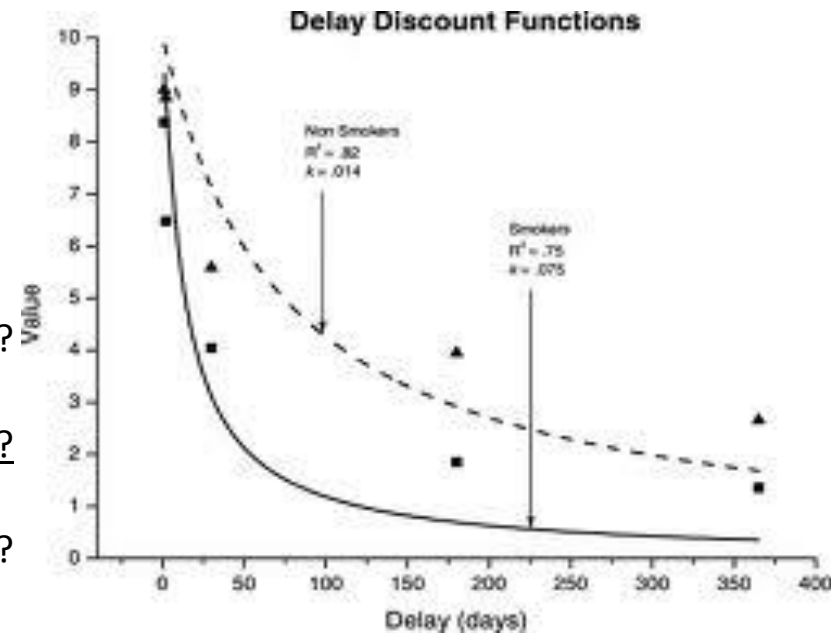


**Figure 2.** Depiction of the accrual of reinforcing value of two commodities over time. The y axis represents relative subjective value, and the x axis represents time over a course of years. The red curve denotes the reinforcing value of choosing

# Delay Discounting (DD)

- The rate of decrease in reward value as a function of delay

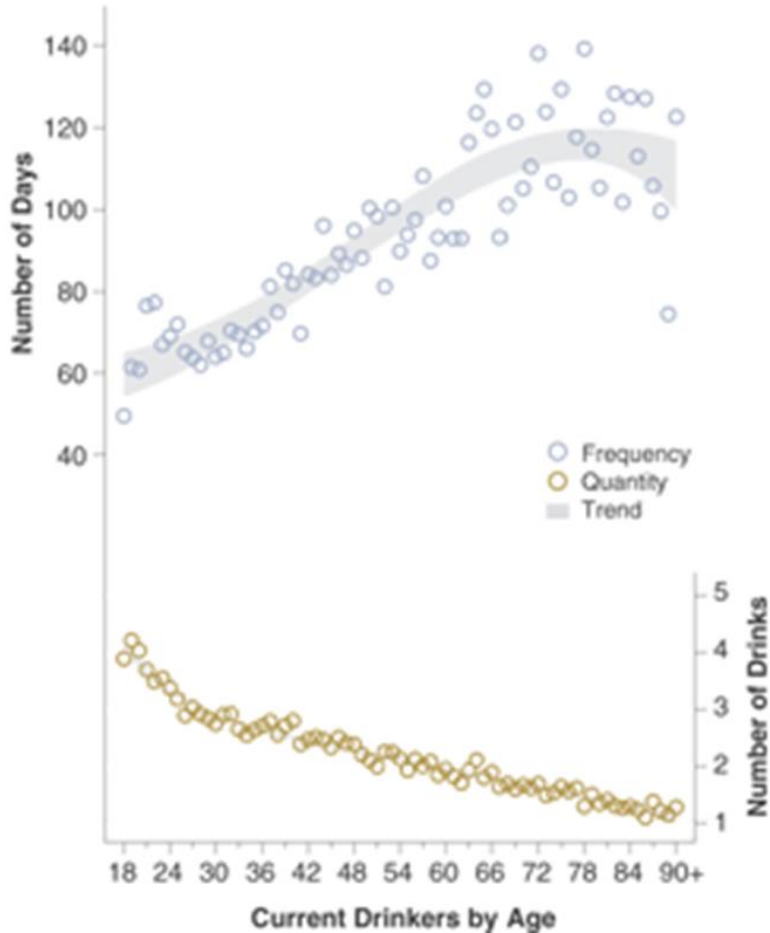
1. Would you rather have \$50 Today Or \$100 in 1 month?
2. Would you rather have \$75 Today Or \$100 in 1 month?
3. Would you rather have \$95 Today Or \$100 in 1 month?



- Strong preference for (immediate) drug-reinforcers relative to (delayed) drug-free reinforcers may be key feature of addiction

- Higher DD rates in in heavy drinkers, smokers, stimulant dependent individuals, opiate dependent individuals and problematic gamblers than in controls<sup>1</sup>
- Predicts escalation of use in humans and animals, poor response to treatment

# Research on Young Adult Alcohol and Drug Use Prevention



**44% are classified as "heavy drinkers"**

**4 out of 5 college students drink alcohol**

**1,825** students die each year from alcohol related injuries

**599,000** students are unintentionally injured each year under the influence

**3,360,000** students drive under the influence of alcohol each year



# Reducing Young Adult Heavy Drinking

- High-risk but not motivated for treatment or change
  - experience substantial social benefits associated with drinking despite considerable health and academic risk
  - interventions must be very brief and target motivation
- Brief Motivational Interventions have demonstrated efficacy in reducing drinking
  - Discuss pros and cons of drinking, normative feedback “*you drink more than 90% of your peers*”, feedback on risks, “harm reduction” strategies
  - Disseminated on college campuses and highly cost effective (30 – 50 minute intervention)
  - Delivered in 50 minute 1-1 counseling session, groups, or via email/text

Cronce & Larimer, 2011; Mun et al., 2015

# Brief Motivational Interventions

## Personal Feedback for John Smith.

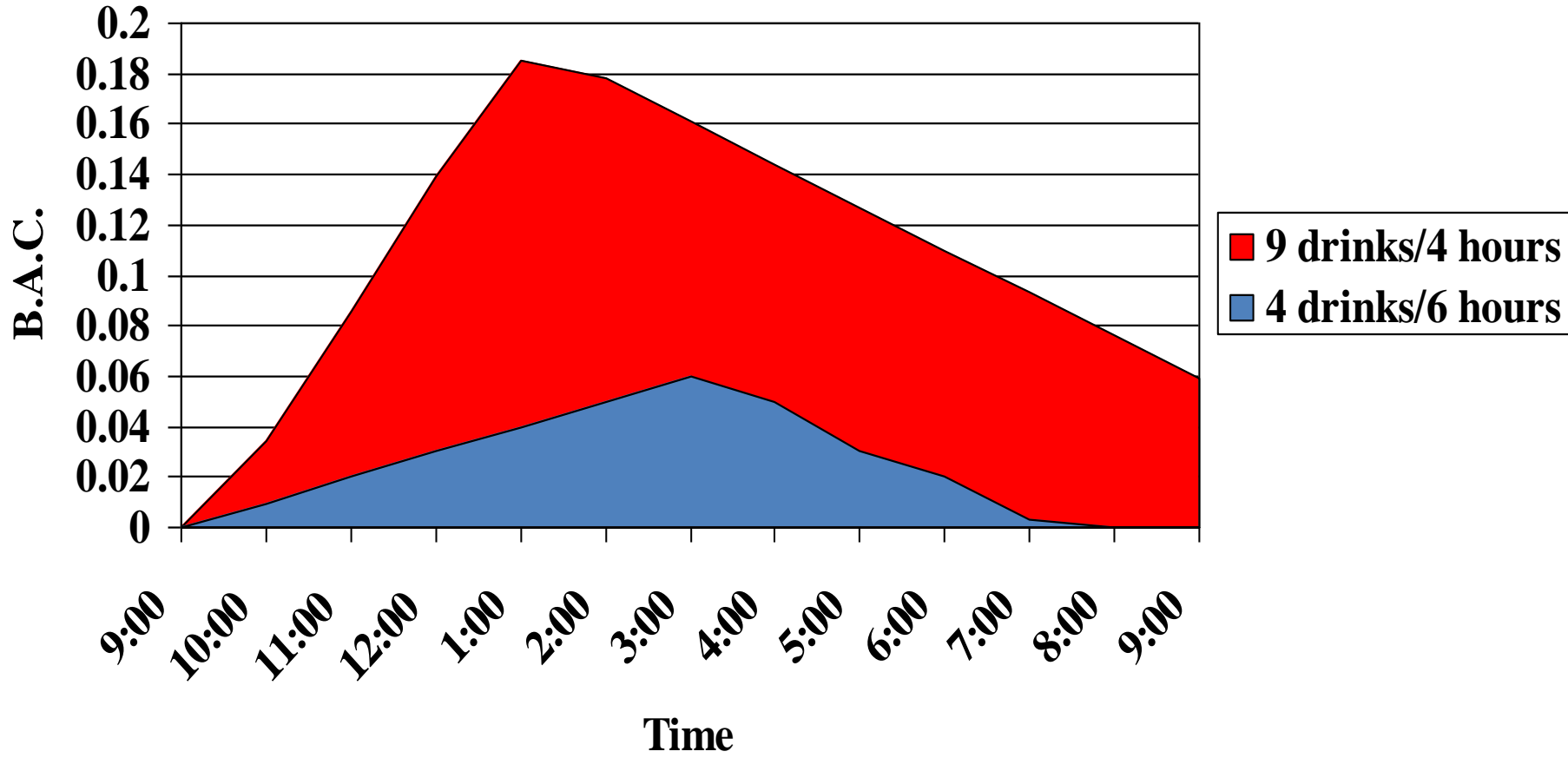
*The information provided below is intended to help you evaluate your drinking behavior and whether or not you wish to change it. The information is based on your interview and questionnaire responses.*

### How your drinking compares to other students' drinking.

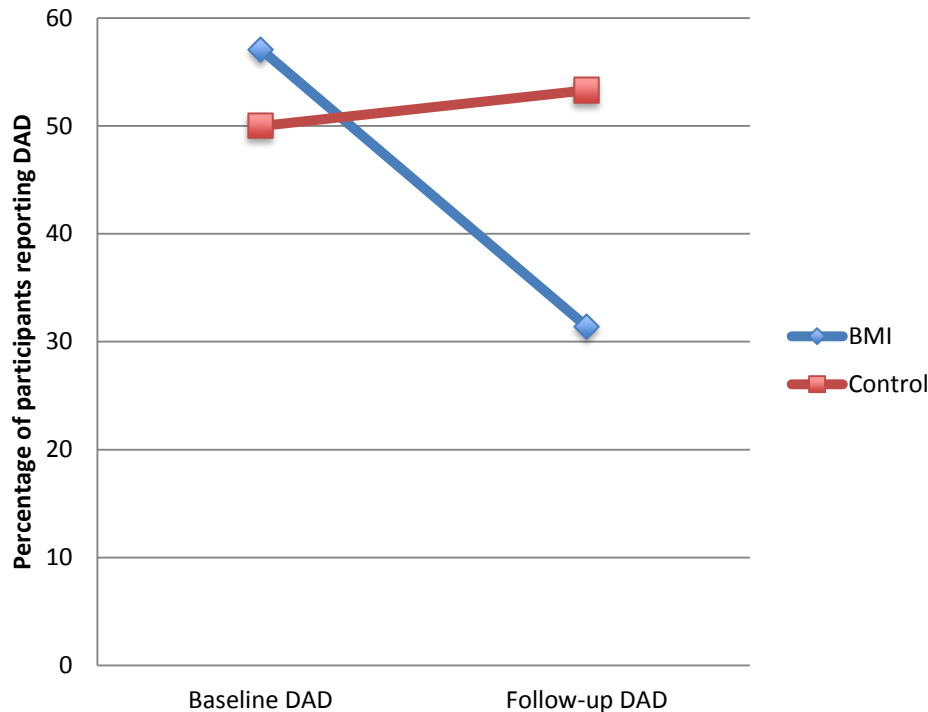
According to your responses to the questionnaire, you drink **4** days a week, and consume about **25** standard drinks a week. In comparison to other students, your percentile rank is **86**. This means that you currently drink more than 85% of male students. In other words, only 14% of college males drink as much as or more than you.



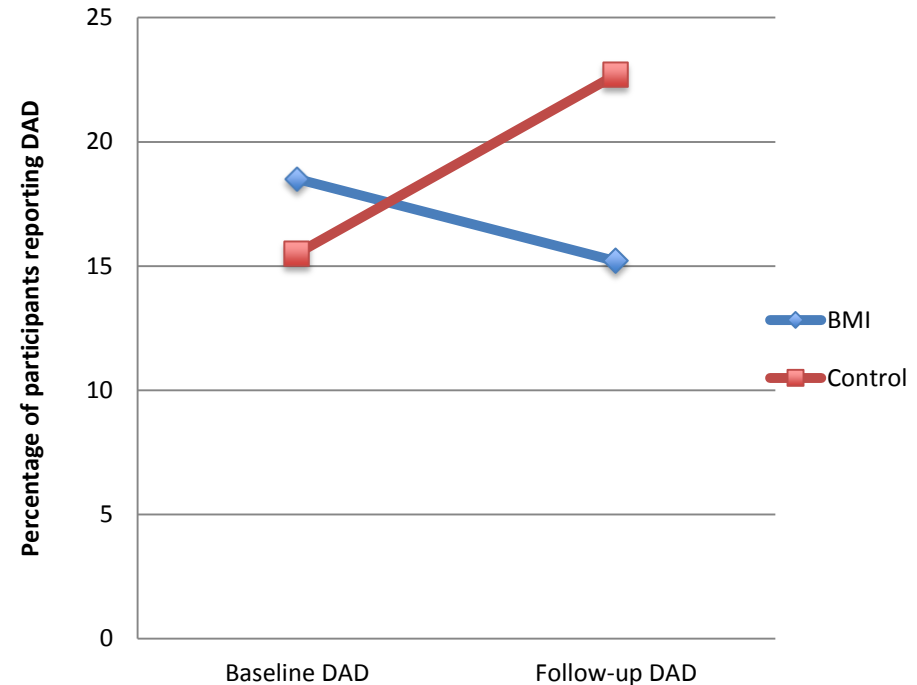
# Blood Alcohol Content



# Brief Motivational Interventions Reduce Driving After Drinking Among College Student Drinkers



Study 1 (Murphy et al., 2010)



Study 2 (Borsari et al., 2012)



# Text Message Delivered Brief Motivational Interventions for Drinking and Driving

- RCT with 82 young adult drinkers who report recent drinking and driving
  - Average 4 episodes of driving after consuming 3 + drinks in past 3 months
  - Randomized to interactive text-message MI intervention or text-based education control

## Personal Feedback for [student name]

The information provided below is intended to help you evaluate your drinking behavior and whether or not you wish to change it. The information is based on your responses to the questionnaires you completed.

### Your Beliefs About Drinking

	Frequency	Quantity	Drinks Per Week
Your estimated norm			
Actual student norms	2-3 times a week	3-4 drinks	about 9

### Your Beliefs About Drinking and Driving

What percentage of college drinkers drove after drinking 3 or more drinks?

Your Guess: x%

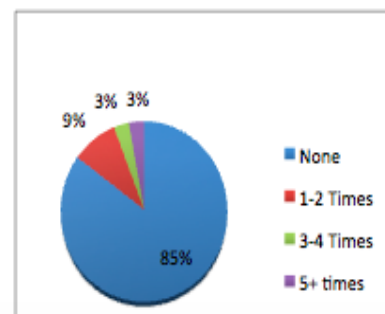
Survey Said: x%

### Your Drinking Pattern

According to your responses to the questionnaires, you drink  $x$  days a week, and consume about  $x$  standard drinks (12 oz. beer, 5 oz. wine, 1.5 oz. liquor) a week. In comparison to other female college students, your percentile rank is almost 97. **This means that you currently drink more than 96% of female college students.** In other words, about 3% of college females drink more than you.

### Your Drinking and Driving Pattern

According to your responses to the questionnaires, you drove after drinking  $x$  times in the past 3 months. In comparison to other college students, your percentile rank is almost 97. **This means that you currently drink and drive more than 96% of female college students.** In other words, about 3% of college females drink and drive more than you.



12:34 PM

- **Clinician:** Of the information you just viewed, what was most interesting to you?
- **Participant:** The amount of money for a DUI.
- **Clinician:** The fees for a receiving DUI were higher than you expected?
- **Participant:** Yeah, I thought they would be like \$1,000 at most.
- **Clinician:** How would receiving a DUI impact your future career goals?



12:34 PM

**Participant:** It would cause a huge setback in taking courses to finish school. It would make it nearly impossible to get insured right away so not having a vehicle would cause a disruption in work and school. Once graduating, if a DUI is on my record, it will reflect poorly on my character when applying for jobs, loans, etc.

**Clinician:** A DUI would impact many areas of your life. Are you interested in setting any goals related to driving after drinking?

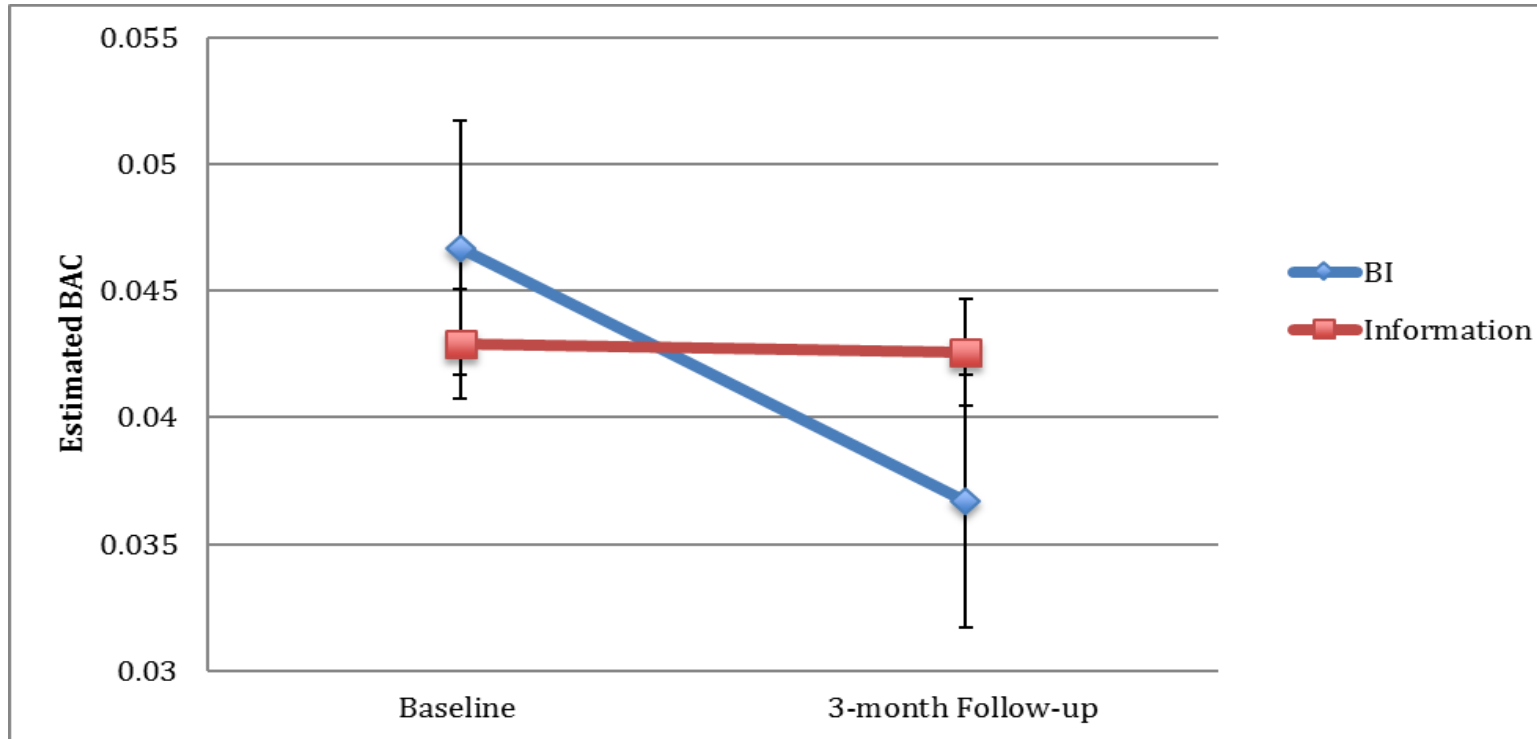


12:34 PM

**Participant:** Yes. I'd like to make it a habit of not doing it at all, but I'll set a goal of no more than one glass of wine with dinner when I'm driving, and if I'm out with friends, find alternative ways home if I've had more than two drinks in two hours.

**Clinician:** It seems like it's very important for you to stay safe. In order to make sure you're safe, you're going to stick to one glass of wine prior to driving and make sure you have a plan for getting home safely when you're out with friends.

# Changes in Drinking (Blood alcohol content) Prior to Driving





# Using Behavioral Economics to Enhance Brief Alcohol Interventions

# Limitations of Standard Brief Alcohol Interventions

- Focus on enhancing motivation to reduce drinking without increasing other ways of experiencing reward



- Do not focus explicitly on increasing future orientation

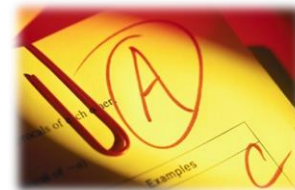
# Substance-Free Activity Session (SFAS)

- Single session behavioral economic supplement to brief motivational alcohol intervention
  - ✦ Goals are to increase:
    - positive and enjoyable substance-free activity and commitment to college/life goals (studying, internships, exercise, etc.)
    - the salience of delayed rewards
    - the extent to which behavior (e.g., attending class, internship, studying) is viewed as part of a pattern leading to delayed rewards
    - Understanding of the costs of drinking/drug use on other important goals/rewards

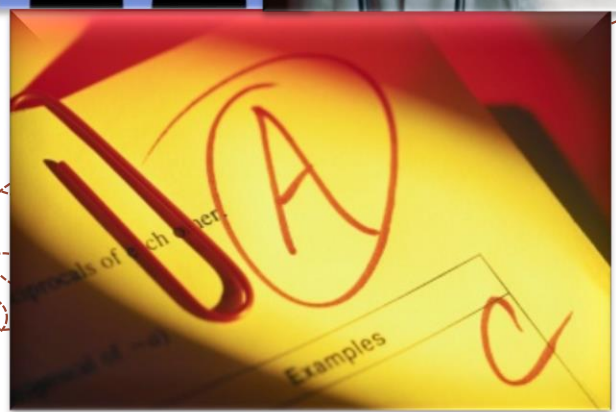
Murphy, Dennhardt, Skidmore, Borsari, Barnett, Colby, & Martens. (2012).  
*Journal of Consulting and Clinical Psychology.*

Murphy et al. (2019). *Journal of Consulting and Clinical Psychology.*

**TONIGHT!**



.....future



What are your college goals?

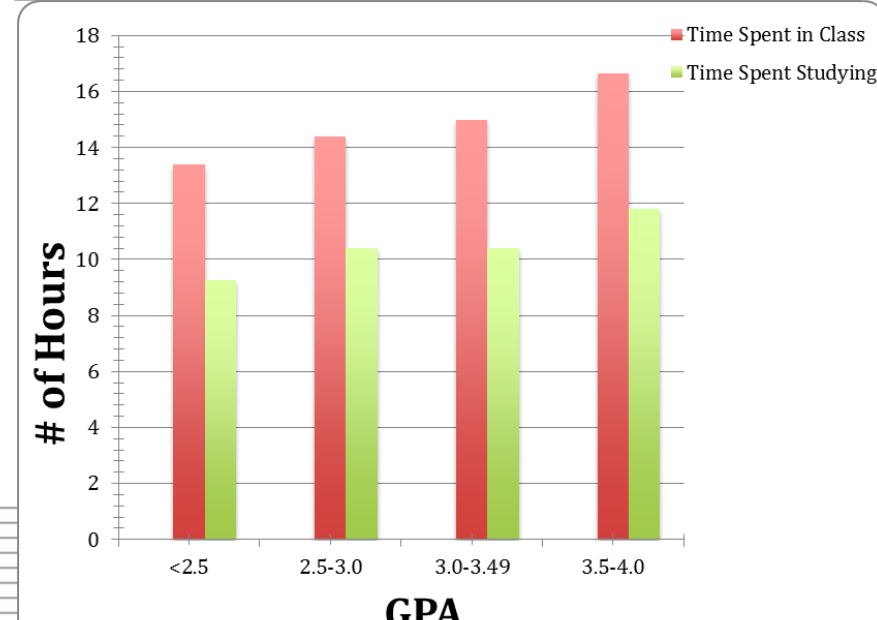
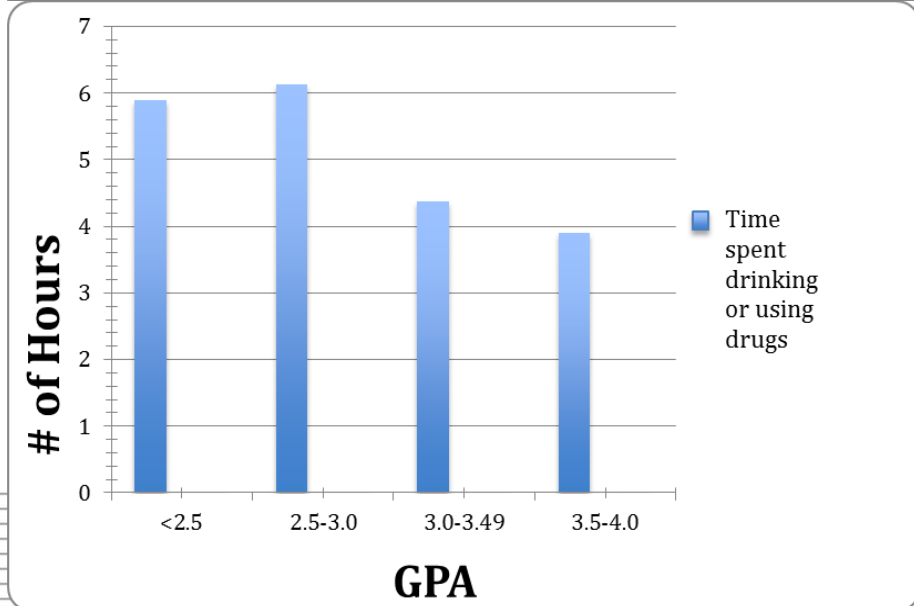
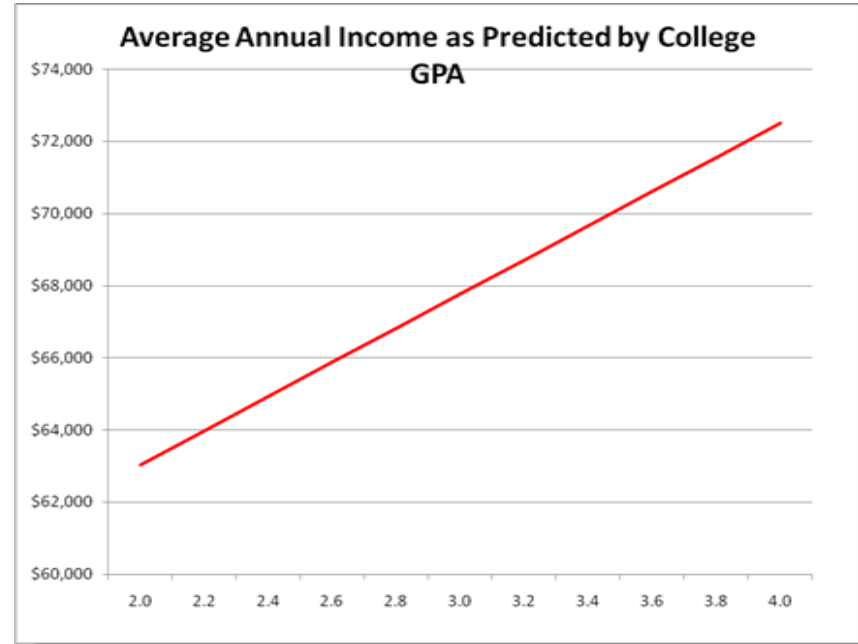
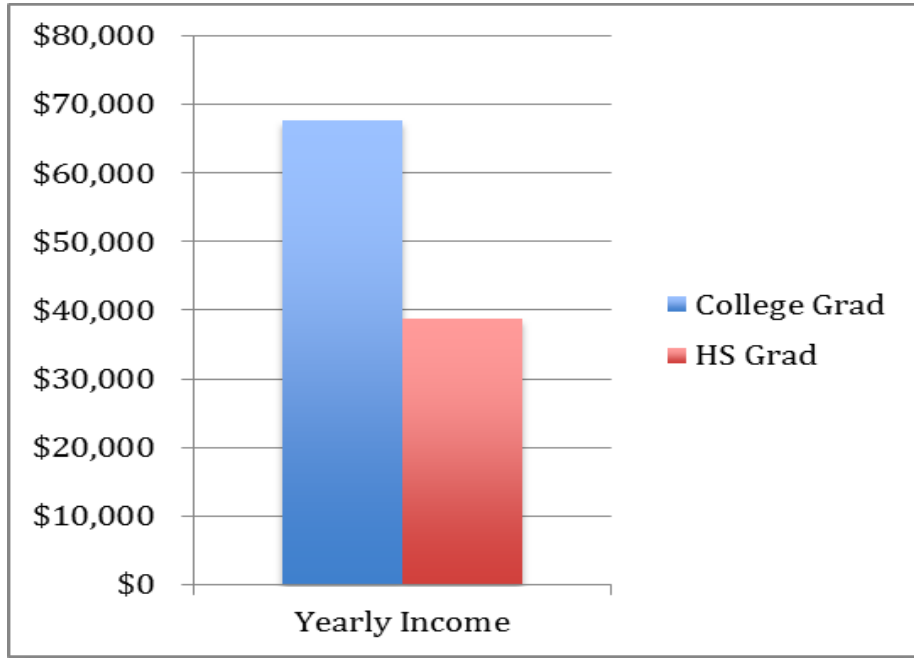
What do you need to do this semester to achieve those goals?

How does alcohol use fit in with your college goals?





# Substance-Free Activity Session Feedback



# What you need to do now to achieve your career goals

You mentioned your goal was to become a lawyer

Here is what it takes to become a lawyer:

- 4-year college degree
- 3 years of law school + passing a written bar examination.

## Getting accepted to law school:

Acceptance into most law schools depends on grades, the LSAT, work experience

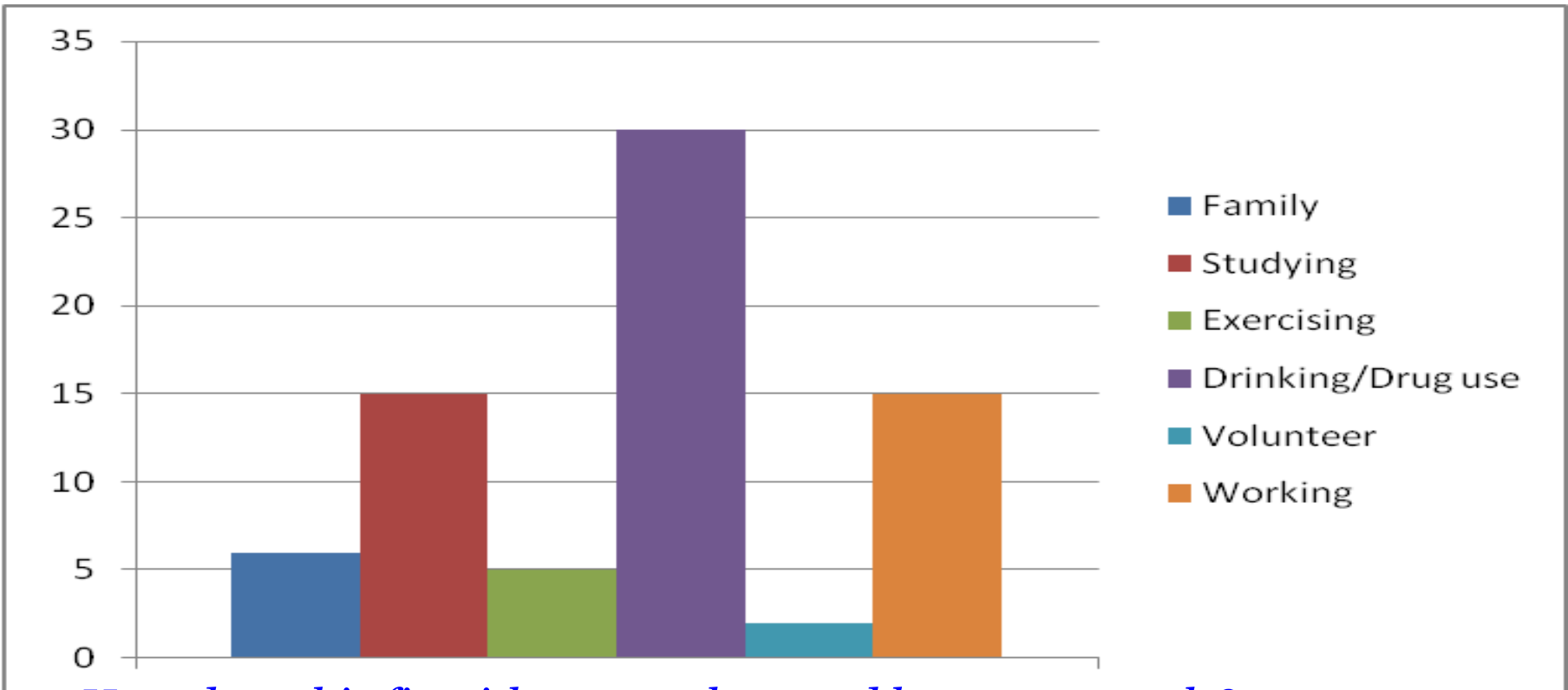
## GPA

The average GPA for admitted students to University of Memphis Law School was **3.36**.

## Extracurricular Activities

- Mock Trial Club*
- Pre-Law Society*

# Personalized Time Allocation Feedback



*How does this fit with your values and long term goals?*

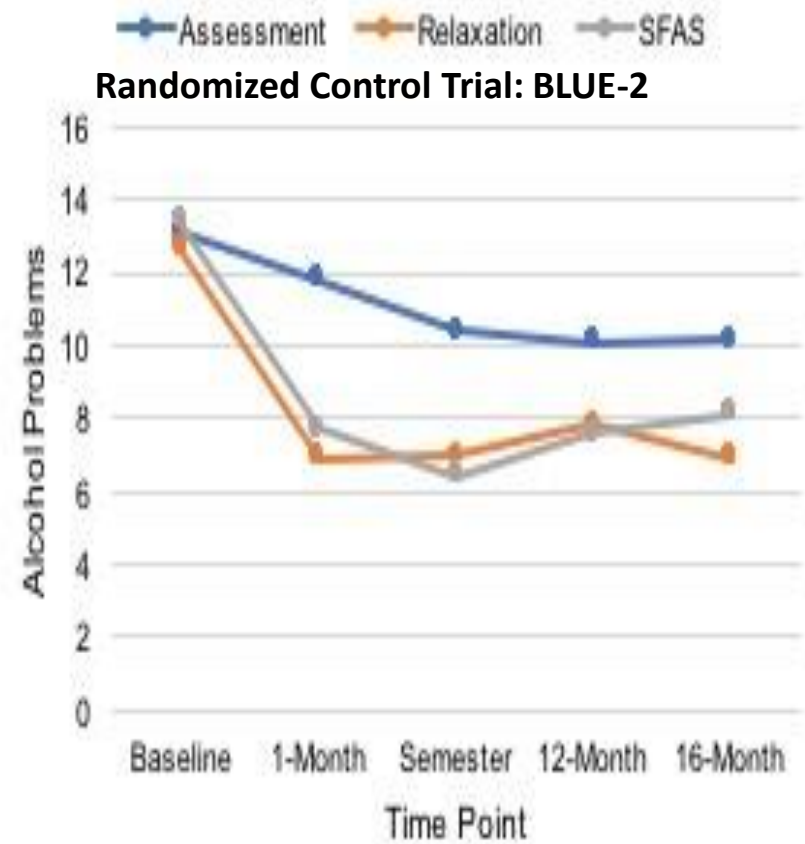
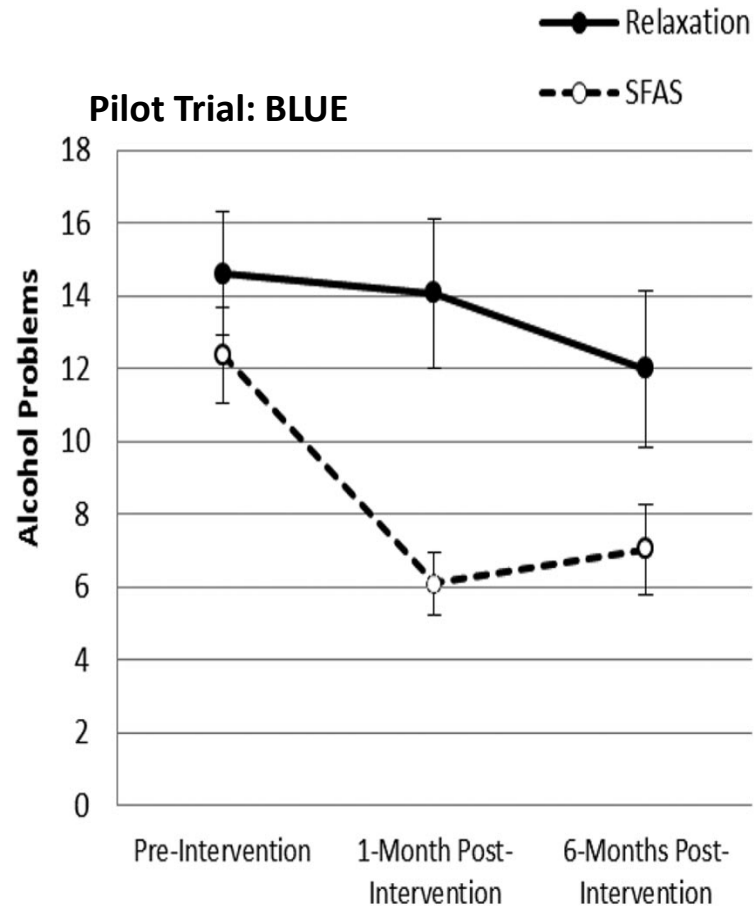
*What is the current and future value of each of these activities?*

*How would this need to change to be more aligned with your future goals?*

# Other Substance-Free Activity Session Elements

- Personalized feedback on specific career requirements, how they can pursue local internships etc.
- Personalized feedback on coping with stress/depression
- Personalized feedback on substance-free leisure activities *e.g., You mentioned you enjoy photography, here is information on a campus photography club....*
- Goal setting, info on mobile apps to facilitate goal progress
- Phone/text booster contact incorporated in current trials

# Substance-Free Activity Session (SFAS)



Treatment also decreased depressive symptoms

Murphy et al., 2012; Murphy et al., 2019 Journal of Consulting and Clinical Psychology



# Enhancing Positive Activities via Interactive Text-Messaging (Kathryn Soltis, PI)

Example  
from a Real  
Participant



Babelnet

Last seen  
3/5/19, 5:23 PM

bluem7014

Add to contacts Block contact

2/26/19, 4:17 PM  
**bluem7014:** Thinking about my future has made me a better student. I usually live in the now, not wanting to think about the future. But since i have now, i realize that i could get a lot more out of my college experience by actually learning materials instead of just winging it

2/26/19, 4:24 PM ✓  
This exercise has really been helpful for you to actually get more out of your college experience than you were anticipating. It sounds like it's got you more excited about learning the materials and considering how that could be useful for you after you graduate.

You had also set a goal for yourself to reduce to 6 drinks when you do drink. How has your progress been in reaching that goal?

2/26/19, 4:26 PM  
**bluem7014:** Great! I went to a party on saturday and just had two beers. Made me realize that I dont need to get black out drunk to have fun

2/26/19, 4:27 PM ✓  
It sounds like your progress in that goal has been going really well! How did you manage to accomplish that?

2/26/19, 4:29 PM  
**bluem7014:** Well instead of buying hard liquor, I just got a six pack of beer. So without having that big amount of alcohol available to me, i just had a small amount, which really helped me limit my drinks

Type message here...

# Potential Policy-Level Solutions to Behavioral/Mental Health Epidemics

- Mental and behavioral health “wellness” promotion from cradle to grave
- Lifestyle prevention coaching
  - Enhance social connections/skills, stress management/mindfulness, physical activity, goal setting and pursuit (positive activity engagement)
  - School based (k through college)
  - Focused on high-risk groups: young adults, parents, older adults, lower SES
  - Strategic use of youth and retired adults as “coaches” to enhance wellness for others
  - Outside of traditional health care system
  - Include involvement from behavioral scientists (psychology, public health) to measure outcomes



## GOAL SETTING

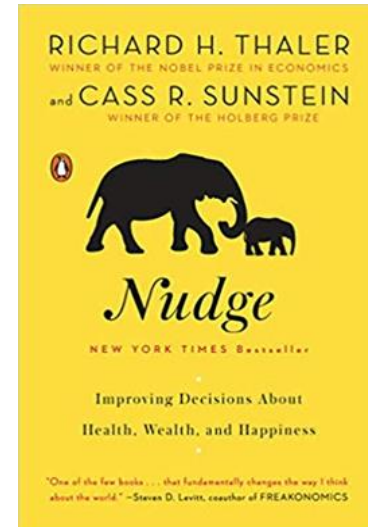
**S**PECIFIC  
**M**EASURABLE  
**A**TAINABLE  
**R**ELEVANT  
**T**IME-BOUND

A hand is shown writing the word 'SMART' vertically on the left side of the text.



# Social and Community Policies that Directly Facilitate Health and Wellness

- “Nudges” (prompts) to enhance motivation and access to physical activity, healthy eating, social interaction, meaningful hobbies, volunteer service, preventive health care, time in nature
- Structural changes to communities (bike lanes, parks/green space, community centers)
- Increased parental leave & childcare support
- Wellness/mental health promotion in schools & workplaces
  - structured physical activity and social skill development in schools; meditation/yoga



# Potential Solutions

- Increased funding for schools, job training, and enriching impoverished urban and rural environments (directly facilitating, high quality jobs, exercise especially in nature, social activity, community engagement).
- Greater connections between scientific community (universities, NIH), policy makers, educators, and health care providers.
  - Need direct pipeline from biomedical and behavioral science to practice-policy

# Potential Solutions

- Completing a 4-year college degree is a significant predictor of health and wellness throughout life
- Strong promotion of pro-health/wellness messages (equal in scope to marketing efforts for food, alcohol, tobacco)
- Increased access to mental and behavioral health treatment – emphasis on evidence-based practices and continuity of care vs. acute/crisis treatment (integrated within primary care)



# Icelandic Model to Preventing Substance Abuse by Enriching the Environment

- Increased enforcement of legal purchasing age for alcohol and tobacco; advertising bans
- Parent training to enhance parental-child bonding, parental monitoring, and positive activity promotion; pledge not to allow kids to have unsupervised parties or to buy them alcohol
- Curfews for children ages 13 and 16



# Icelandic Model to Preventing Substance Abuse by Enriching the Environment

- State funding was increased for organized sport, music, art, dance and other clubs; gives kids alternative ways to feel part of a group, and to feel good
  - funding for community workers to supervise activities
- Open area-based youth clubs that are supervised by responsible adults where tobacco and alcohol use are strictly prohibited
- Families given vouchers that can be used explicitly to fund children's recreational activities

# Islandic Model Results

-Teens quality time with parents and sports participation doubled

--Cigarette smoking, drinking and cannabis use plummeted.

– Now being applied across Europe and Asia

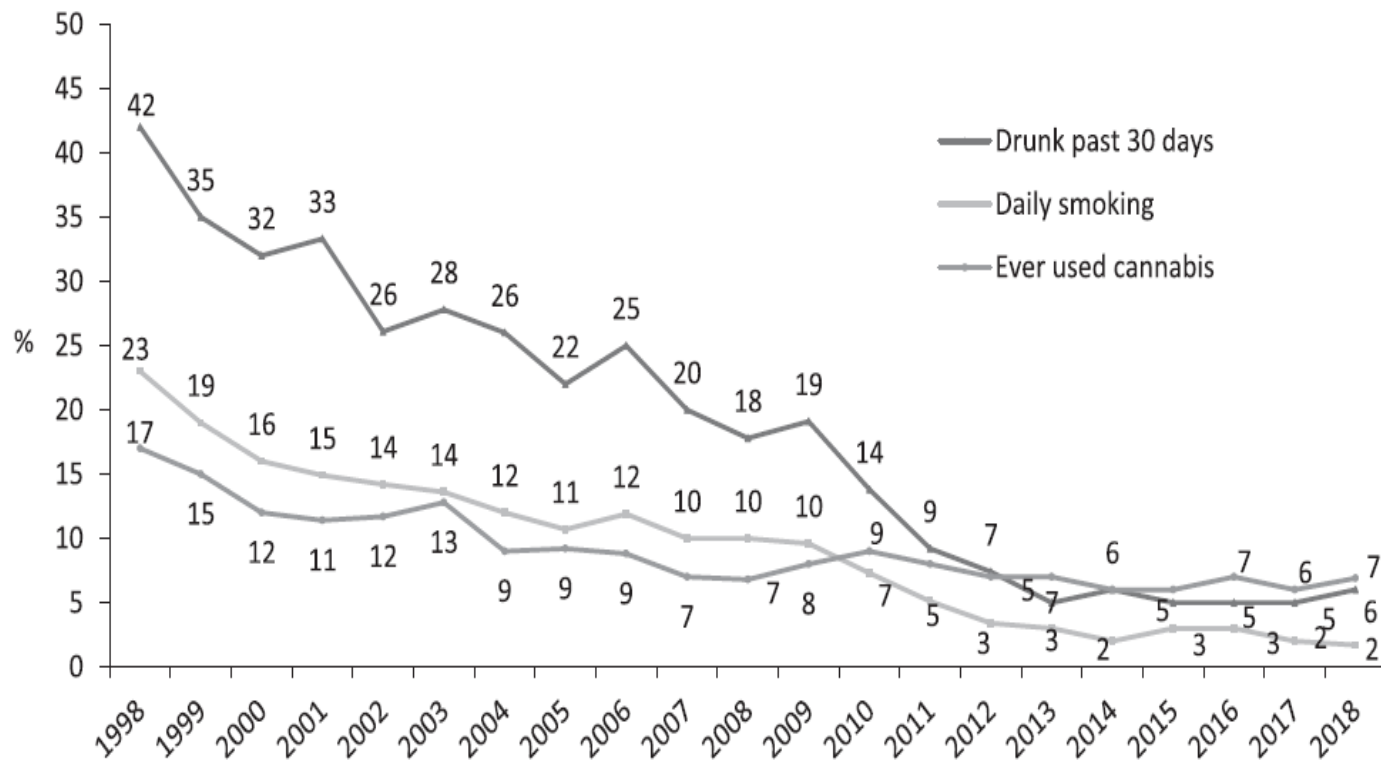


FIGURE 2 Annual Percentage of Self-Reported Substance Use Among Icelandic Adolescents, 1998-2018

SOURCE: Kristjansson et al. (2016).

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