

# Today

- Health beliefs, health behaviors, and behavior change
  - Addictive behaviors
  - Eating behavior, exercise behavior
  - MHBC, motivational interviewing

# What are health behaviors?

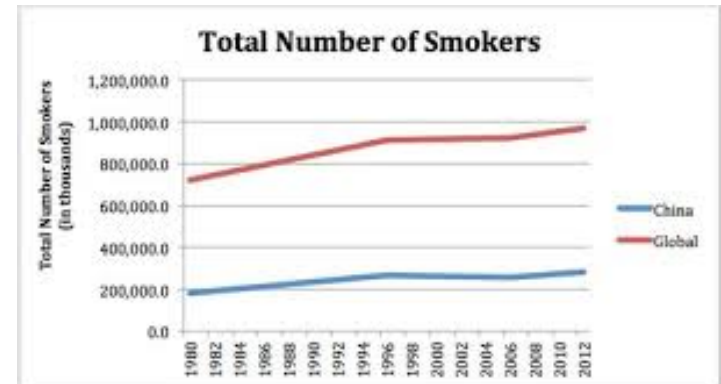
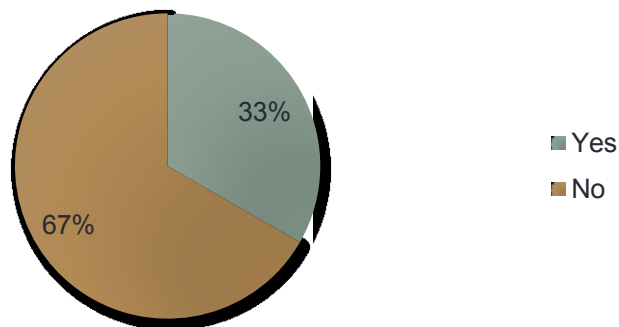
<b>Kasl and Cobb (1966)</b>	
Health behavior	Behavior aimed to prevent disease (e.g., eating a healthy diet)
Illness behavior	Behavior aimed to seek remedy (e.g., to the doctor)
Sick role behavior	Activity aimed at getting well (e.g., taking prescribed medication)

<b>Matarazzo (1984)</b>	
Health-impairing habits	Behavioral pathogens (e.g., smoking, eating a high fat diet)
Health protective behaviors	Behavioral immunogens (e.g., attending a health check)

# Smoking

- Smoking behavior is on the decline but decrease is greater in men than in women
- Smokers tend to be in the unskilled manual group
- Smokers tend to earn less than non-smokers
- Two-thirds of smokers report wanting to give up smoking
- 58% of smokers say that it would be fairly/very difficult to go without smoking for a whole day



# Components of cigarettes

- Nicotine
  - Primary addictive substance, pleasurable
  - Acts directly on CNS
- Tars
  - Chemicals which are carcinogenic
- Carbon Monoxide (CO)
  - CO reduced amount of O<sub>2</sub> in blood and places strain on heart muscle

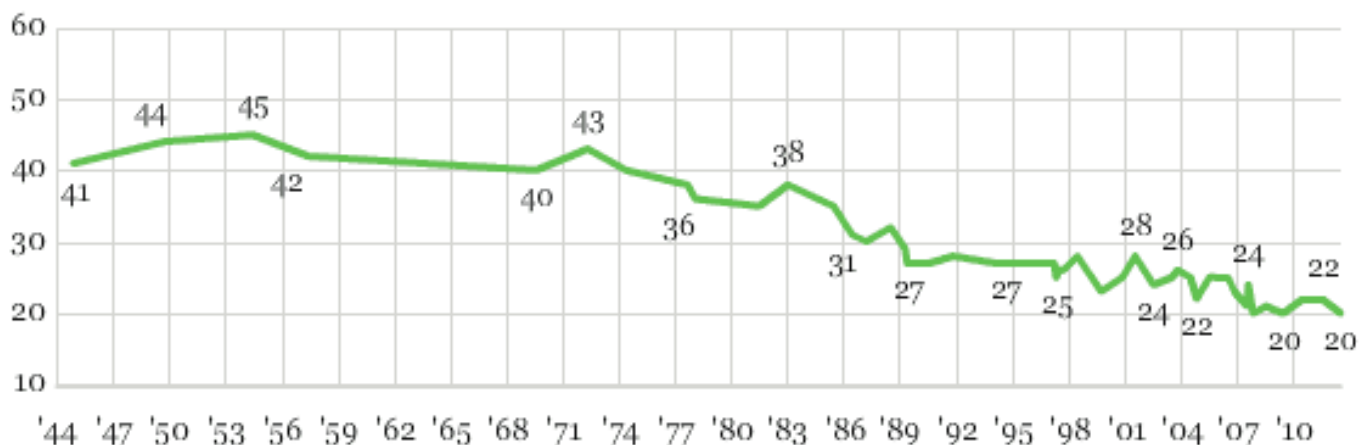
# Smoking and Health

- Smoking is the greatest single cause of preventable deaths (> 20% of all deaths)
- Half of those who smoke throughout their life will die as a direct result of their habit
- Half of these deaths will occur in middle age with an average of 21 years of life lost
- The rest will occur in old age, with around 8 years lost
- Average reduction of life expectancy = 5-9 years
- Smoking contributes to...
  - Heart disease
  - Cancer
  - Stroke
  - Influenza and pneumonia
  - Chronic bronchitis
  - Emphysema
  - Peptic ulcers
  - Respiratory disorders
  - Lower birth weight in offspring

# Smoking - USA

Percentage of U.S. Adults Who Smoke Cigarettes, 1944-2012

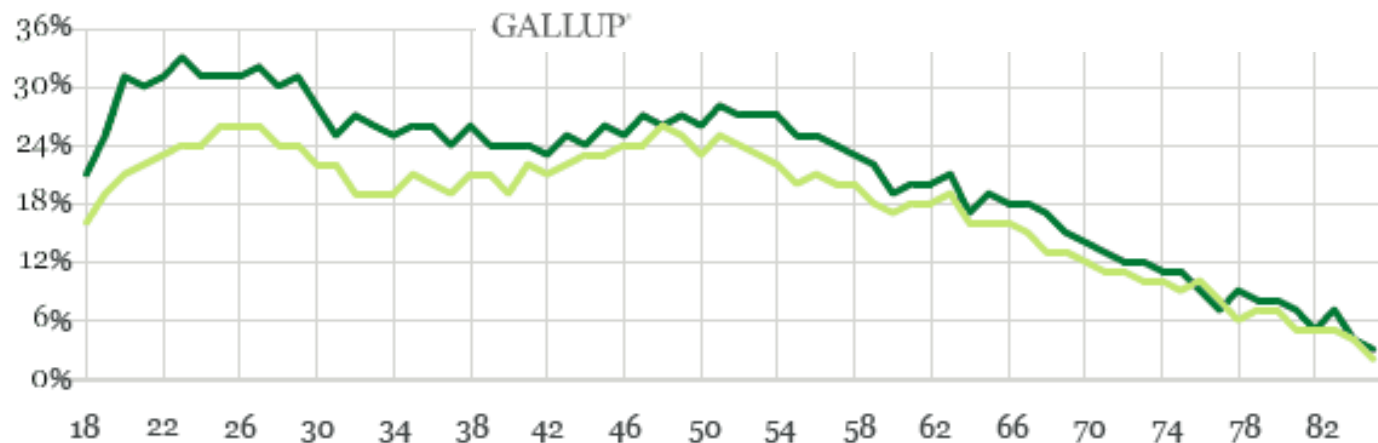
Have you, yourself, smoked any cigarettes in the past week? (% yes shown)



## Smoking by Gender

% Who smoke

Men Women

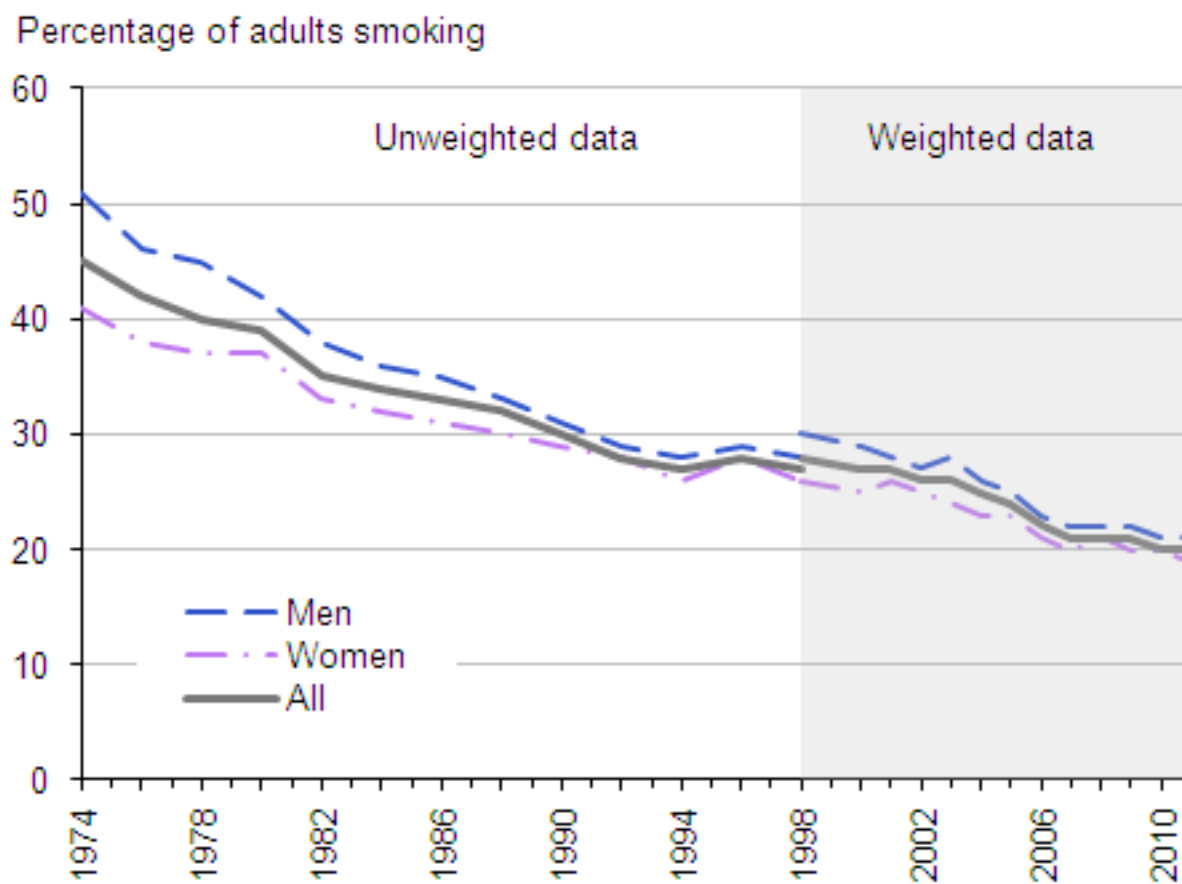


2009

Gallup-Healthyways Well-Being Index

GALLUP

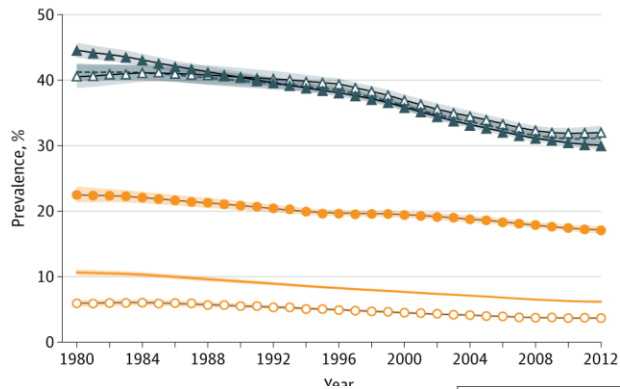
# Smoking - UK



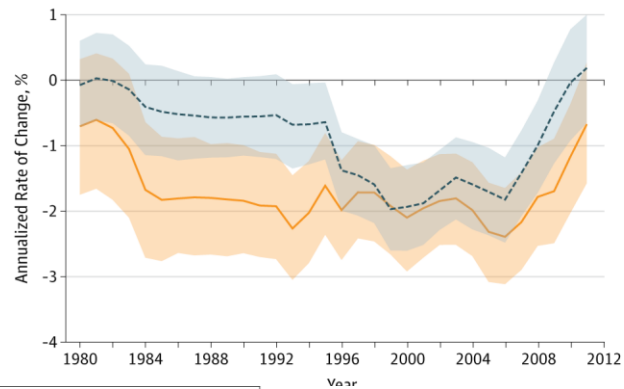
# Smoking – Global (Ng et al., JAMA, 2014)



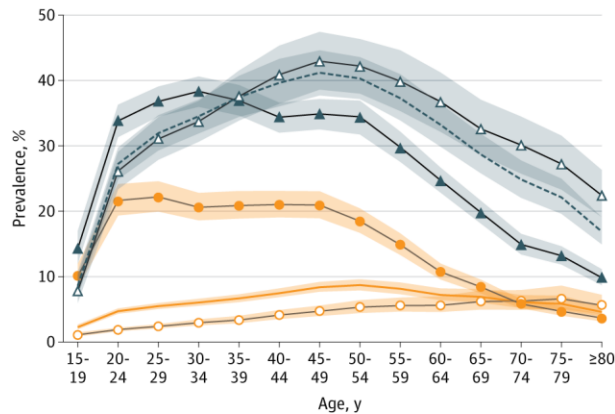
**A** Prevalence of daily smoking by year



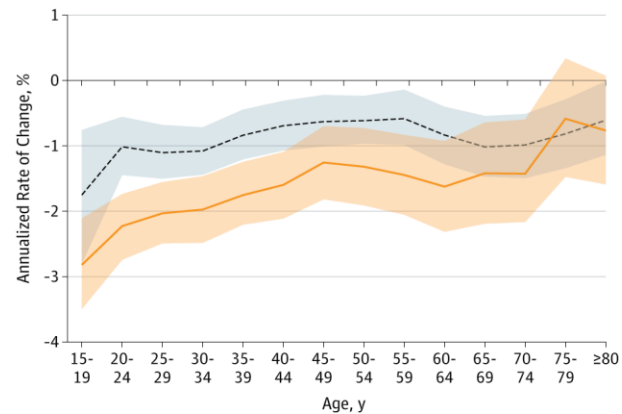
**B** Annualized rate of change in prevalence of daily smoking by year



**A** Prevalence of daily smoking in 2012 by age



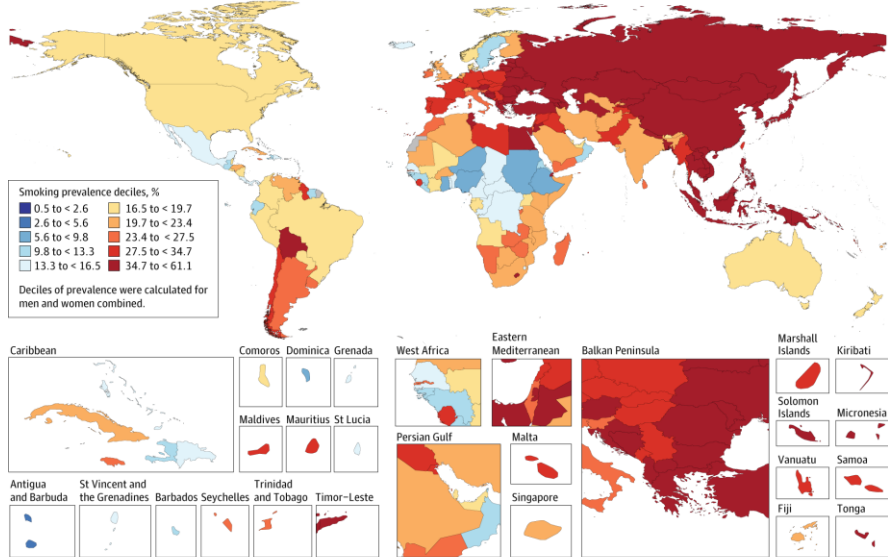
**B** Annualized rate of change in prevalence of daily smoking, 1980-2012, by age



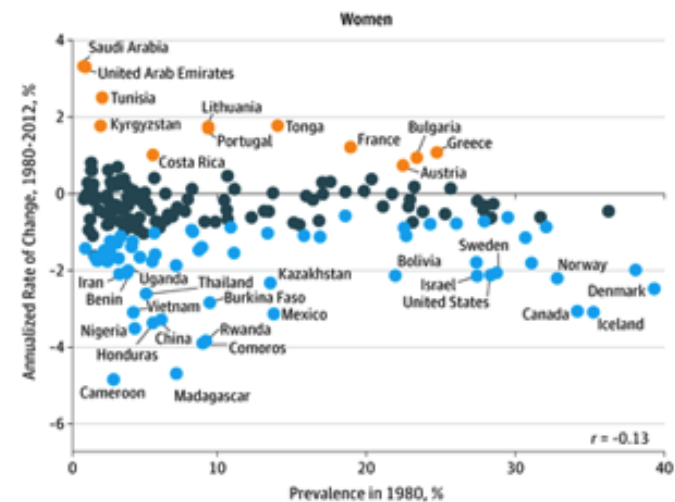
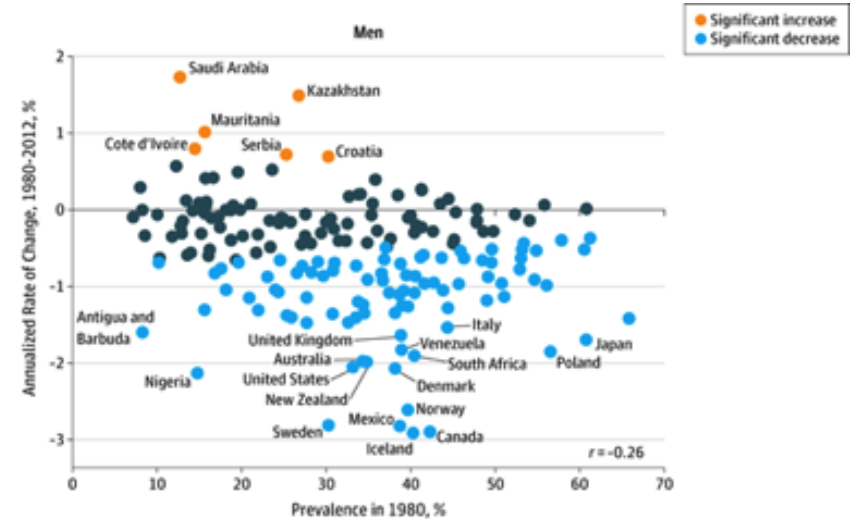
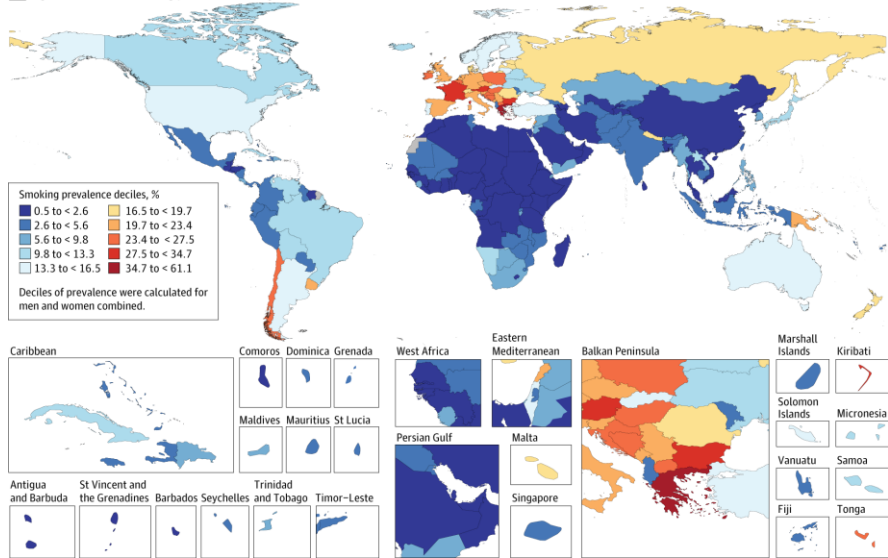


# Smoking – Global (Ng et al., JAMA, 2014)

A Age-standardized smoking prevalence among men, 2012



B Age-standardized smoking prevalence among women, 2012



# Why do people smoke?

- Start
  - Social learning (modeling)
  - Peer pressure
    - 95% begin in teen years
    - Know smoking is dangerous but say will stop
- Continue
  - Genetic (?)
  - Dependence (nicotine-regulation)
  - Reinforcement (peers, feeling good, performance)

# Treatments for Smoking

- Nicotine-replacement therapy
- Aversion therapies
- Self-management strategies
- Multi-modal approaches

Relapse rate = 70-80% after 1 year

- Factors
  - Abstinence-violation effect
  - Weight gain (2 pounds)
  - Social support
  - Intrinsic motivation (better than extrinsic)
  - Stress

# Helping Smokers

- 5 As (willing to quit)
  - Ask about tobacco use
  - Advise to quit
  - Assess willingness to make a quit attempt
  - Assist in quit attempt
  - Arrange follow-up
- 5 Rs (unwilling to quit)
  - Relevance
  - Risks
  - Rewards
  - Roadblocks
  - Repeat

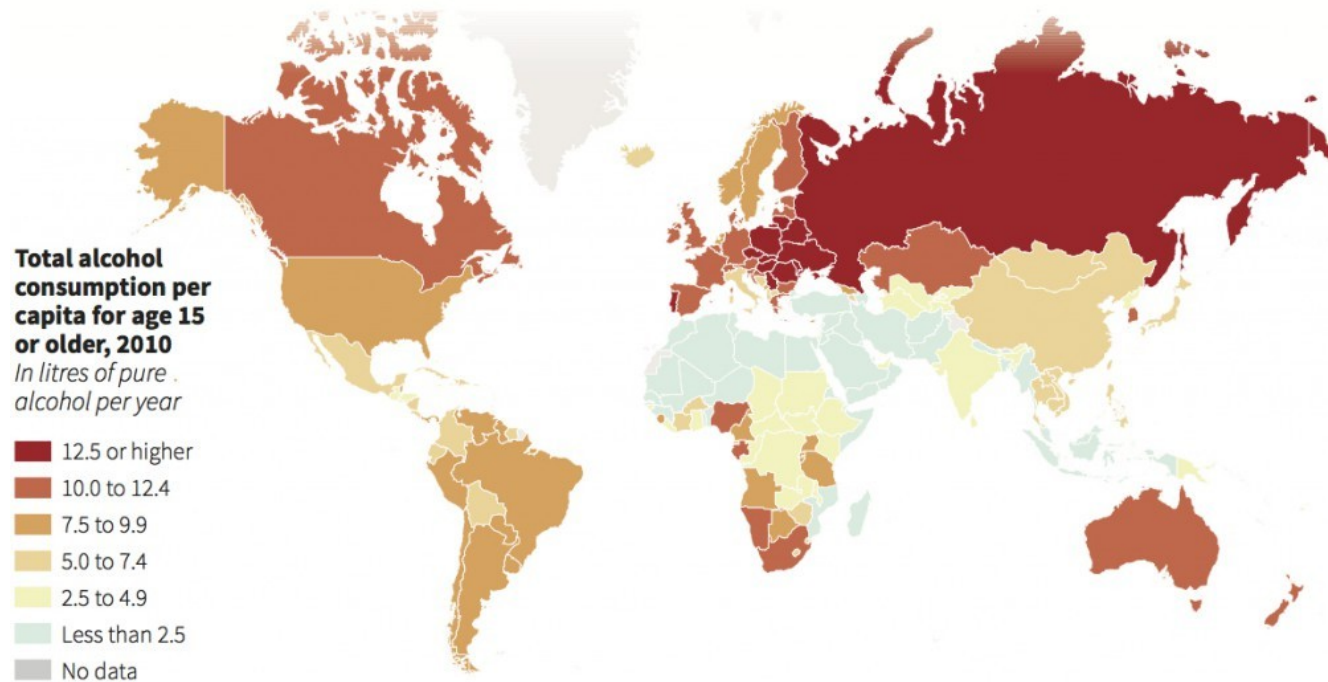
# Alcohol Consumption

- The majority of adults have drunk alcohol in the past year
- Men are more likely to drink alcohol than women
- Men are more likely to have drunk on five or more days in the past week than women
- Men aged 16-24 drink the most
- There are no sex differences in the 24-35 age range
- About 70% of adults drink alcohol at least occasionally
  - about 10% are 'problem drinkers' (health damage)
  - About 5% are 'alcoholic' (alcohol dependence)
- Two vulnerable times
  - Teenage years
  - Late middle age

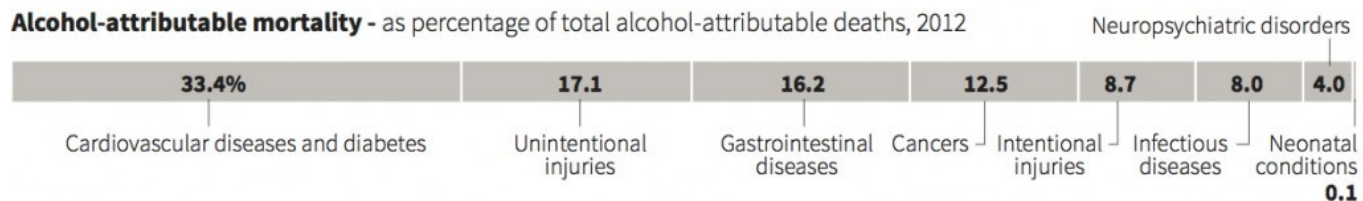
# Alcohol Consumption - Global

## World alcohol consumption

More than 3 million people died from alcohol consumption in 2012, for reasons ranging from cancer to violence, the World Health Organisation said as it called on governments to do more to limit the damage.

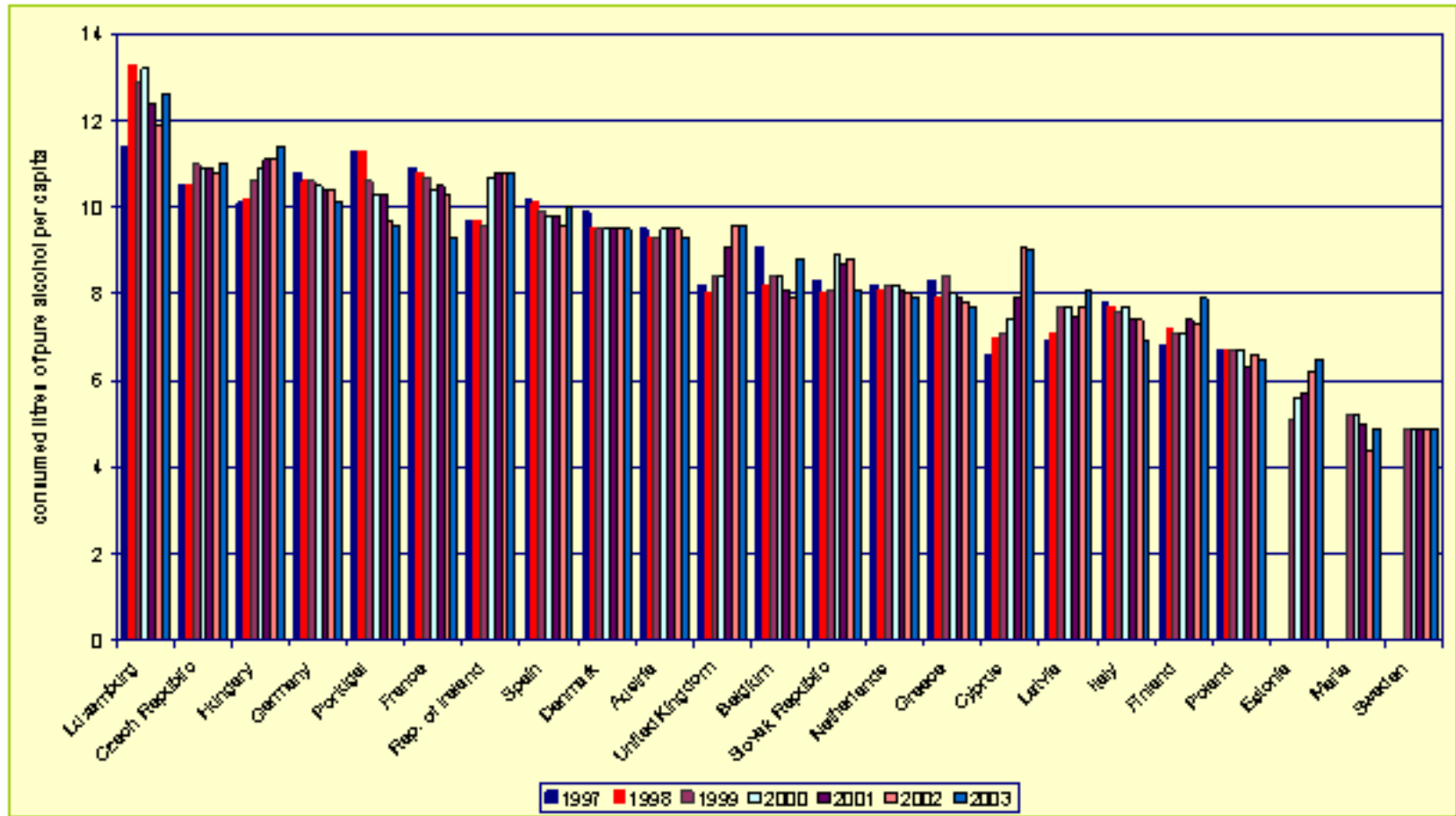


**Alcohol-attributable mortality** - as percentage of total alcohol-attributable deaths, 2012



Source: Global status report on alcohol and health 2014, World Health Organisation

# Alcohol Consumption - EU



# Why do people drink?

- Start
  - Social learning (modeling)
  - Peer pressure
- Continue
  - Dependence
  - Reduce social anxiety
  - Tension relief
  - Reinforcement

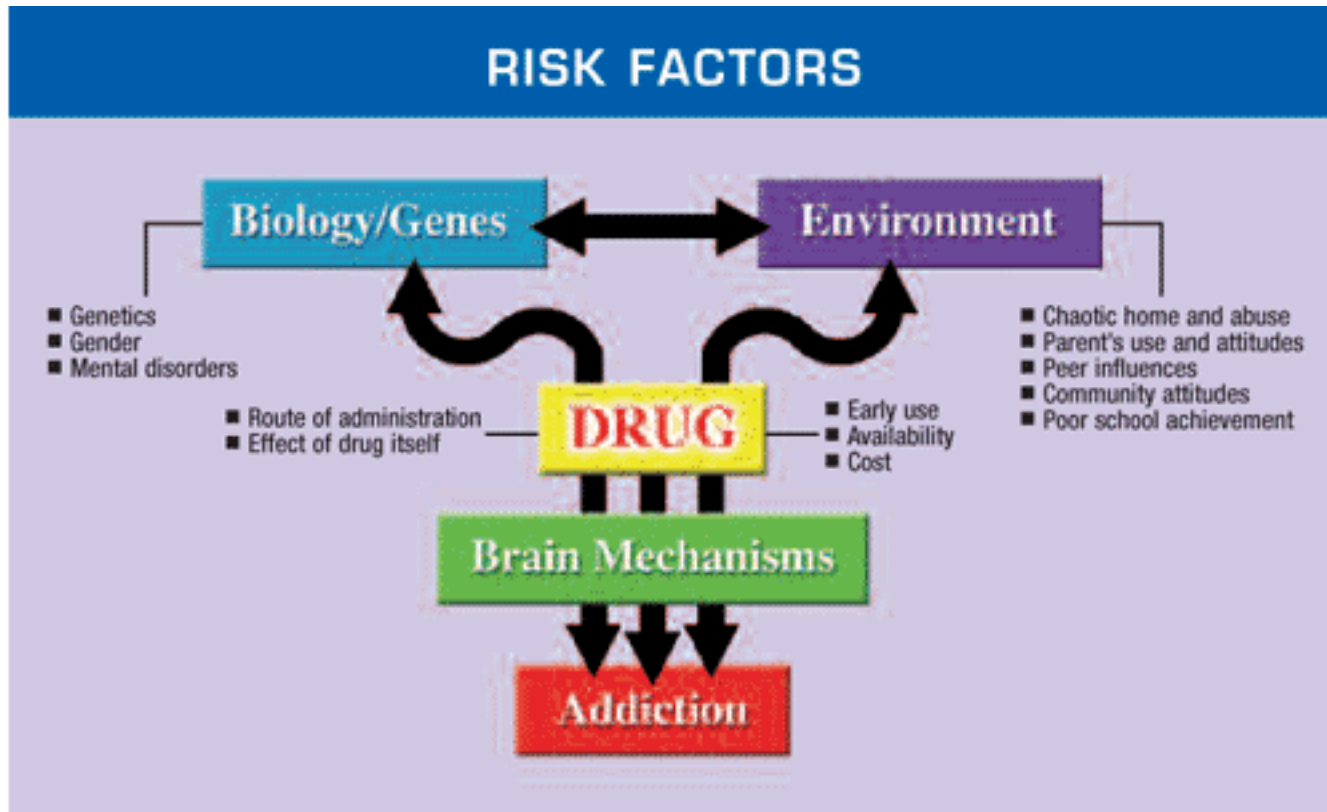


# Addictive Behavior

- Psychological theories
  - Social learning perspective
    - (1) classical conditioning; (2) operant conditioning; (3) observational learning; (4) cognitive processes
- Biological theories
  - Disease perspective
    - Addiction
- Social theories
  - Social reinforcement
  - Social identity

# Addictive Behavior

- Results of the interaction of person factors and the environment

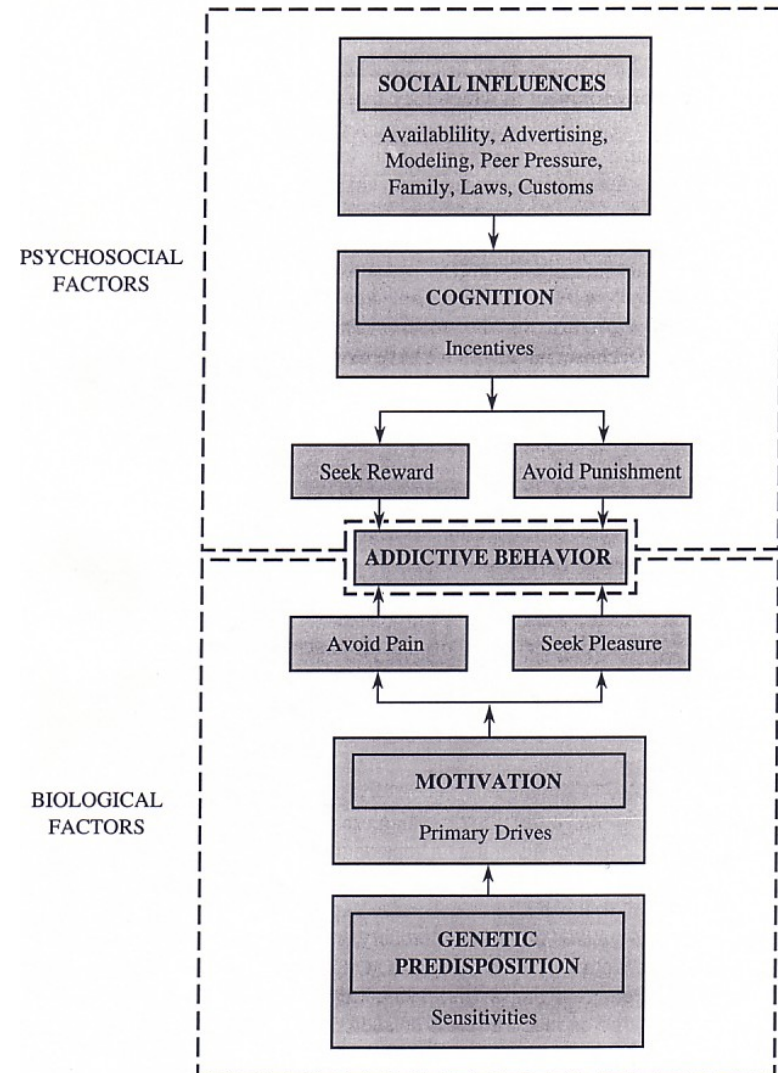


# Addictive Behavior

## Treatments for Alcohol Abuse

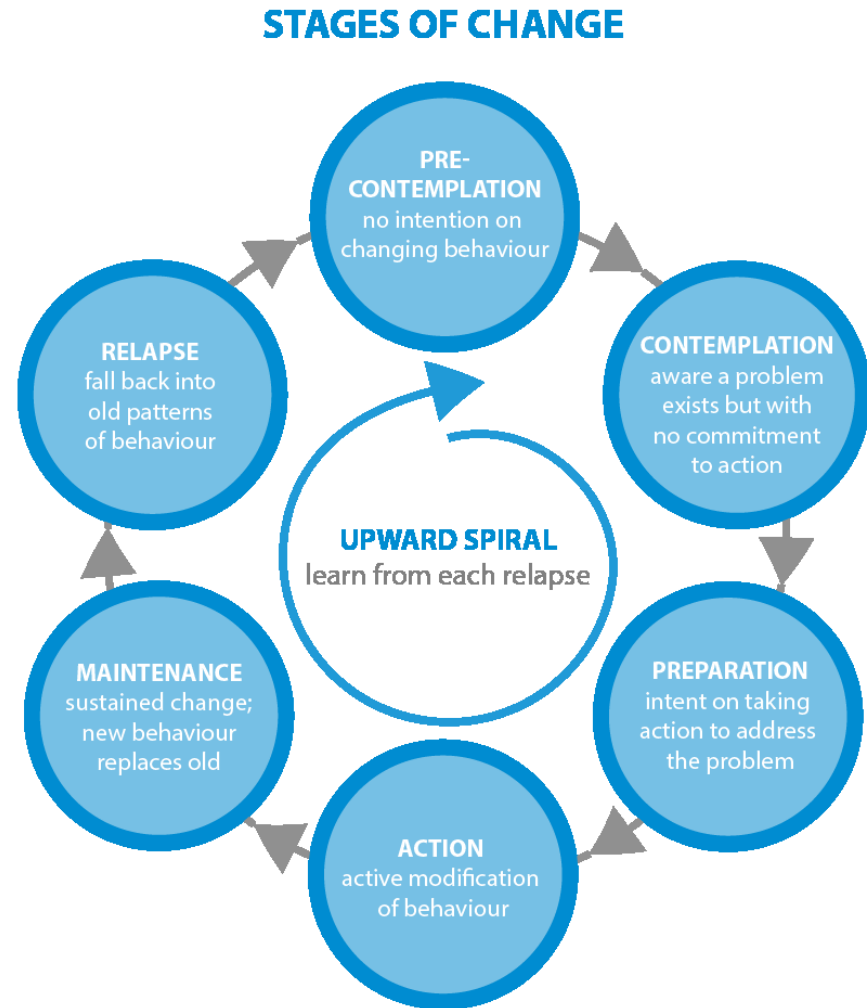
- Detoxification
- Alcoholics Anonymous
- Psychotherapy
- Aversion therapies

Figure 8.1-1 A BIOPSYCHOSOCIAL MODEL OF ADDICTION



# Addictive Behavior

- Stage-based models used widely in addiction treatment programs
- Relapse prevention a coping strategies key parts of addiction treatment programs



# Discussion

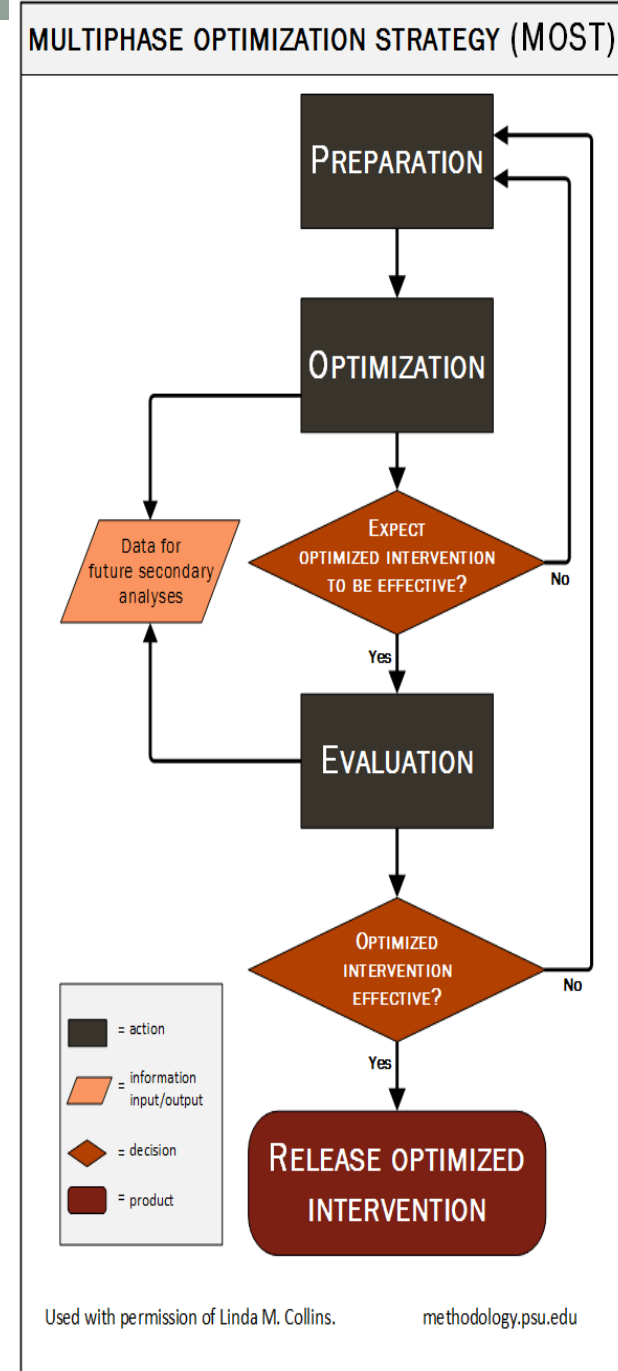
- Piper et al. (2016)

# MOST

- **M**ultiphase **O**ptimization **S**trategy
- Inspired by engineering principles
- Framework for development, optimization, and evaluation of behavioral/biobehavioral interventions (BBIs)
- Designing BBIs that meet criteria for
  - **Effectiveness** (does it do more good than harm?)
  - **Efficiency** (does it avoid waisting time, money, and other valuable resrouces?)
  - **Economy/Scalability** (does it offer a good value and can it be implemented widely with fidelity?)
  - ....that is *optimization criteria*

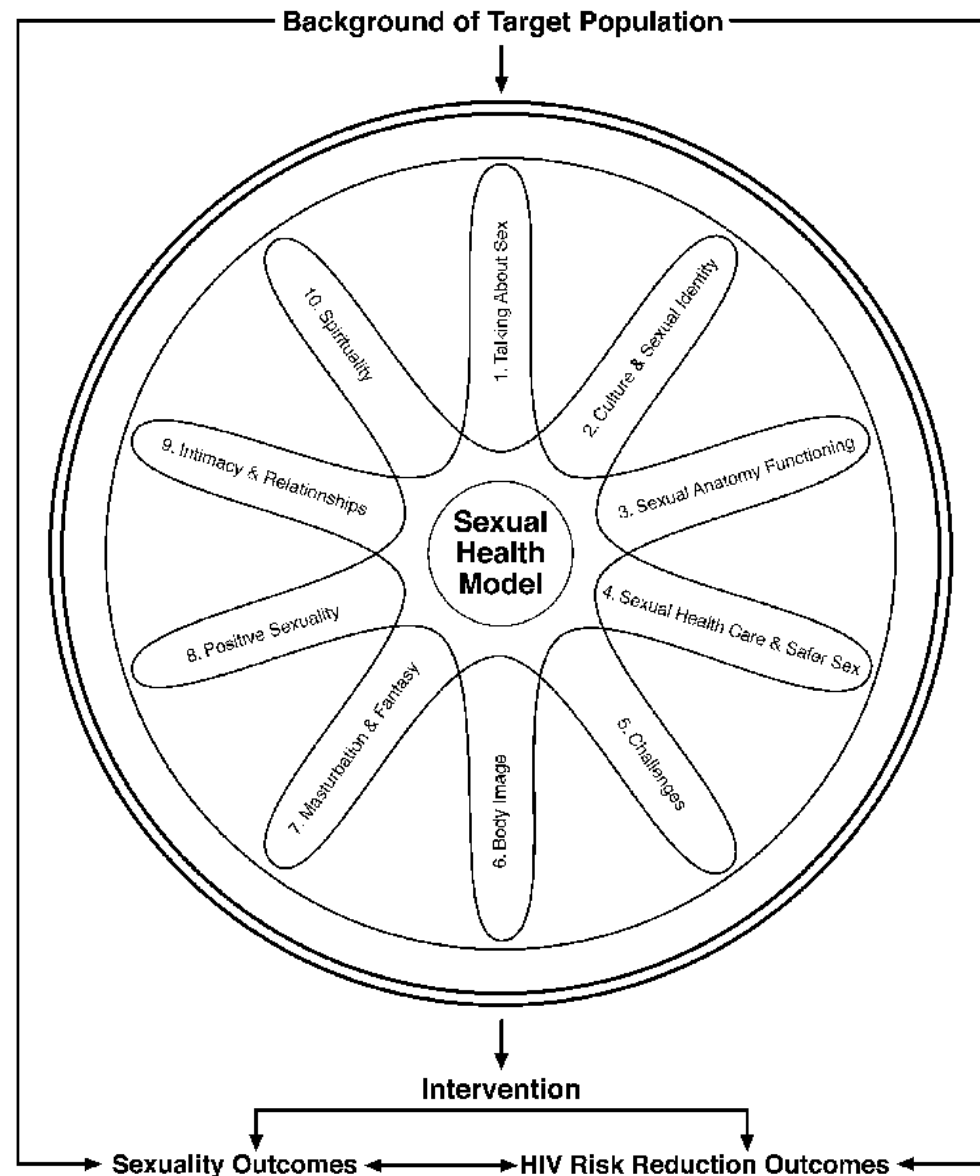
# MOST

- Which combination of intervention components is the most effective?
  - Content
  - Adherence
  - Fidelity
- Factorial or fractional factorial experiments
  - Main effects
  - Interaction/synergistic effects



# Sexual Behavior

- Discussion about sexual behavior has evolved from focus on its biological functions, to focus on pleasure, to focus on sex as risk behavior for STDs and unplanned pregnancy
- Challenging behavior to study because it involves
  - Intrapersonal factors
  - Interpersonal factors
    - Sex as interaction; role negotiation
  - Situational factors



Robinson et al. (2002)



# Discussion

- Billings et al. (2015)

# Physical Activity and Diet

# Diet

## HEALTHY EATING PLATE

Use healthy oils (like olive and canola oil) for cooking, on salad, and at the table. Limit butter. Avoid trans fat.



The more veggies—and the greater the variety—the better. Potatoes and french fries don't count.

VEGETABLES

Eat plenty of fruits of all colors.

FRUITS



**STAY ACTIVE!**

© Harvard University



Drink water, tea, or coffee (with little or no sugar). Limit milk/dairy (1-2 servings/day) and juice (1 small glass/day). Avoid sugary drinks.

WHOLE GRAINS

Eat whole grains (like brown rice, whole-wheat bread, and whole-grain pasta). Limit refined grains (like white rice and white bread).

HEALTHY PROTEIN

Choose fish, poultry, beans, and nuts; limit red meat; avoid bacon, cold cuts, and other processed meats.



Harvard School of Public Health  
The Nutrition Source

Harvard Medical School  
Harvard Health Publications



# Diet

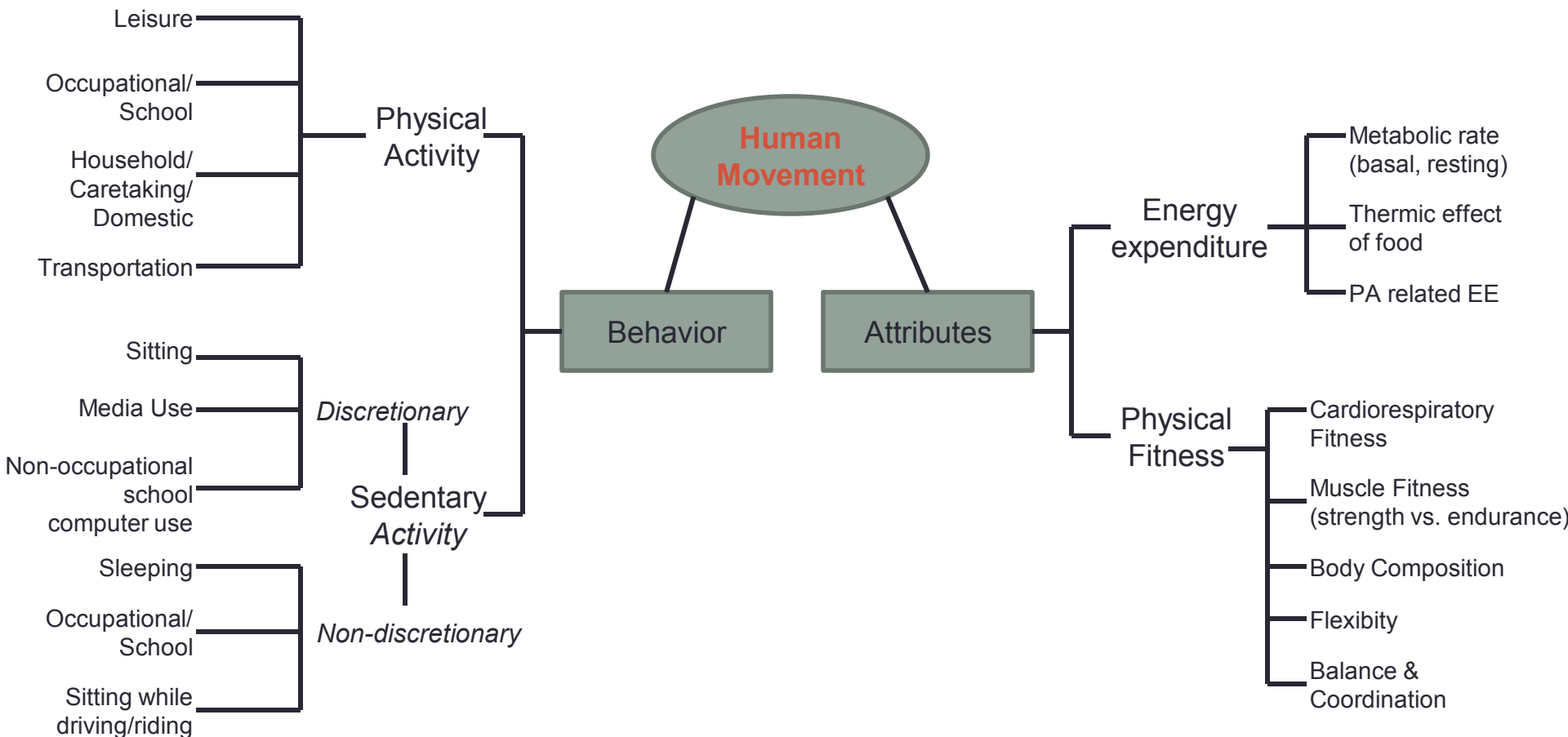
- Factors impacting eating behavior
  - Exposure
  - Social learning (peers, parents, media)
  - Associative learning (rewarding eating behavior, food as reward)
  - Parental control
- Theories of eating behavior (TPB, SCT)
- Weight preoccupation, body dissatisfaction and body image
- Dieting vs. Overeating
- Intense debate over the most appropriate diet

# Discussion

- Carfora et al. (2016)

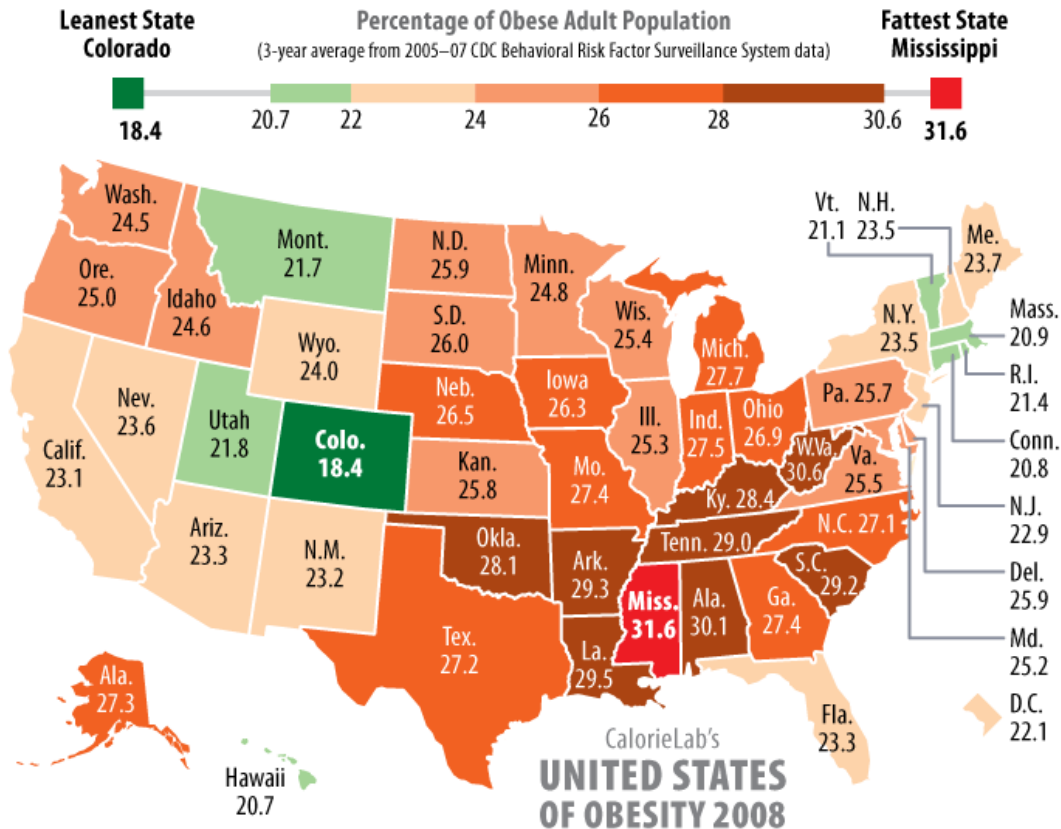
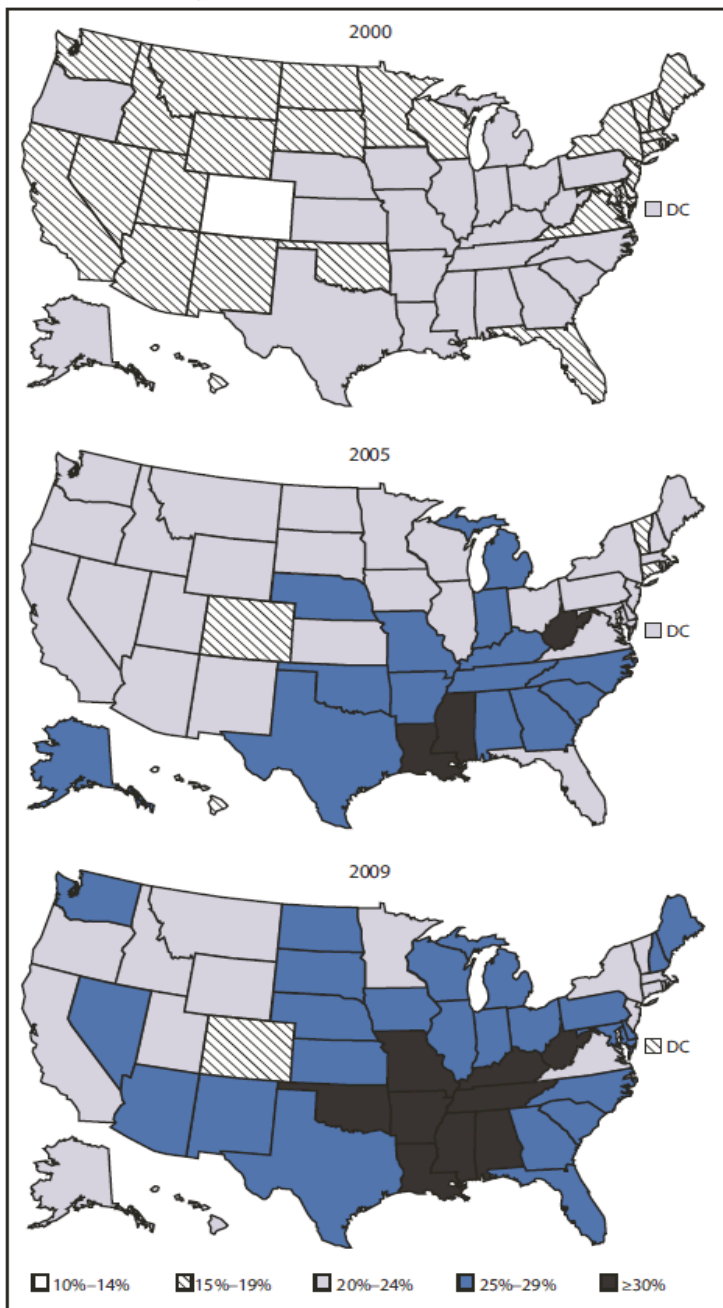
# Physical Activity

## Conceptual Human Movement Framework



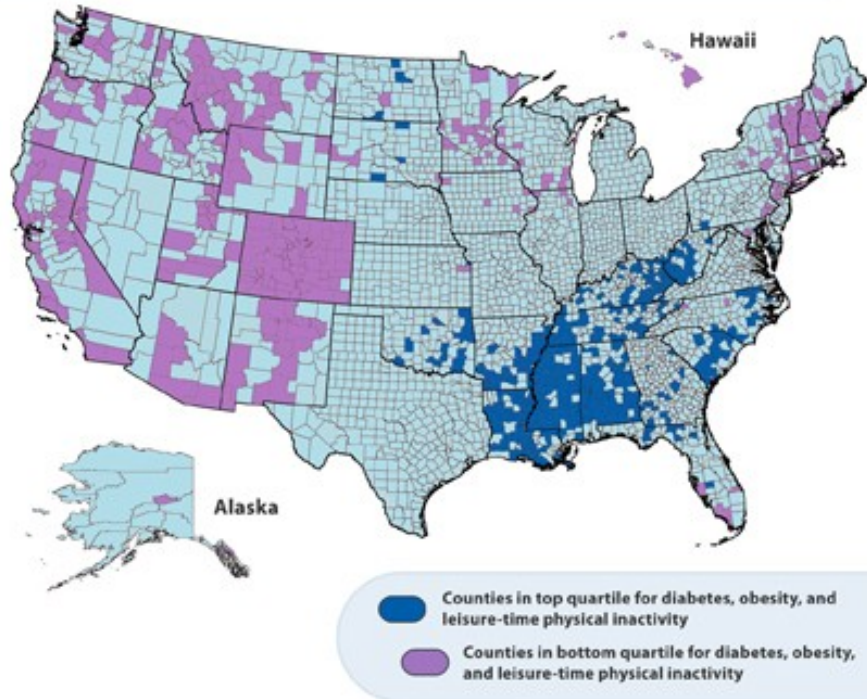
# Obesity Prevalence Among U.S. Adults

## BRFSS, 2000, 2005, 2009

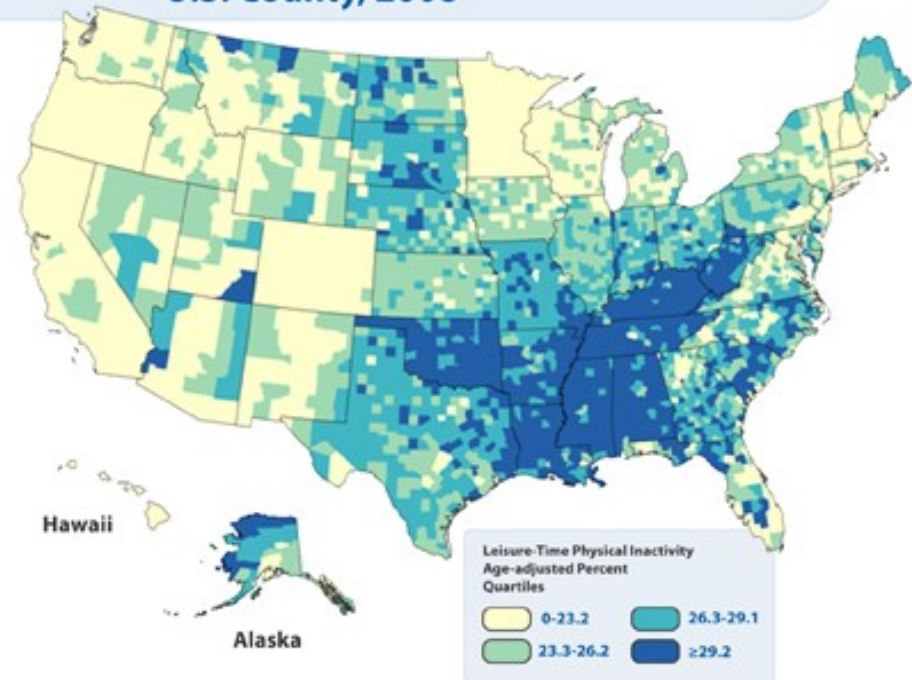


*Can physical activity save us from the obesity epidemic?*

### U.S. Counties in Top and Bottom 25% for Diabetes, Obesity, and Leisure-Time Physical Inactivity, 2008

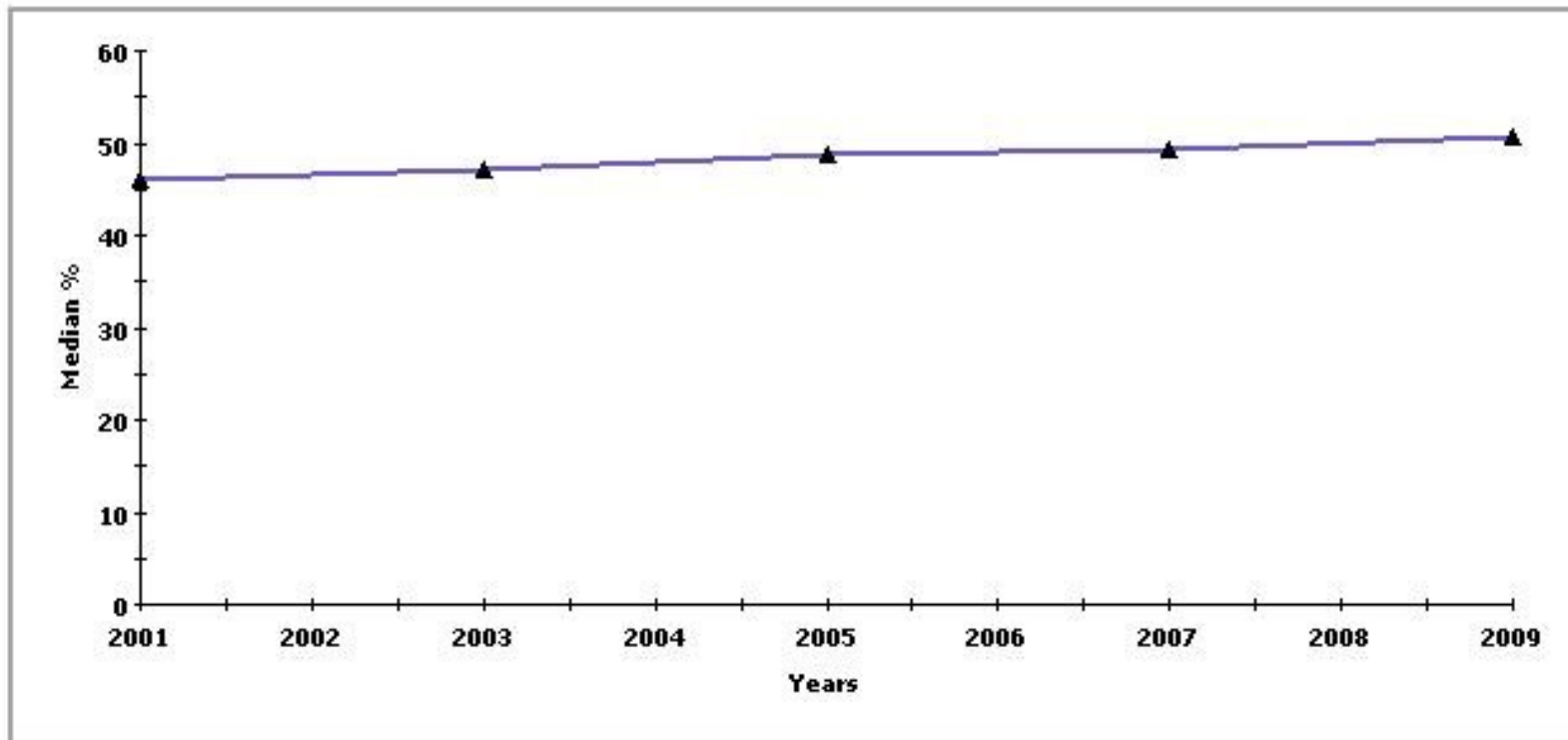


### Leisure-Time Physical Inactivity by U.S. County, 2008



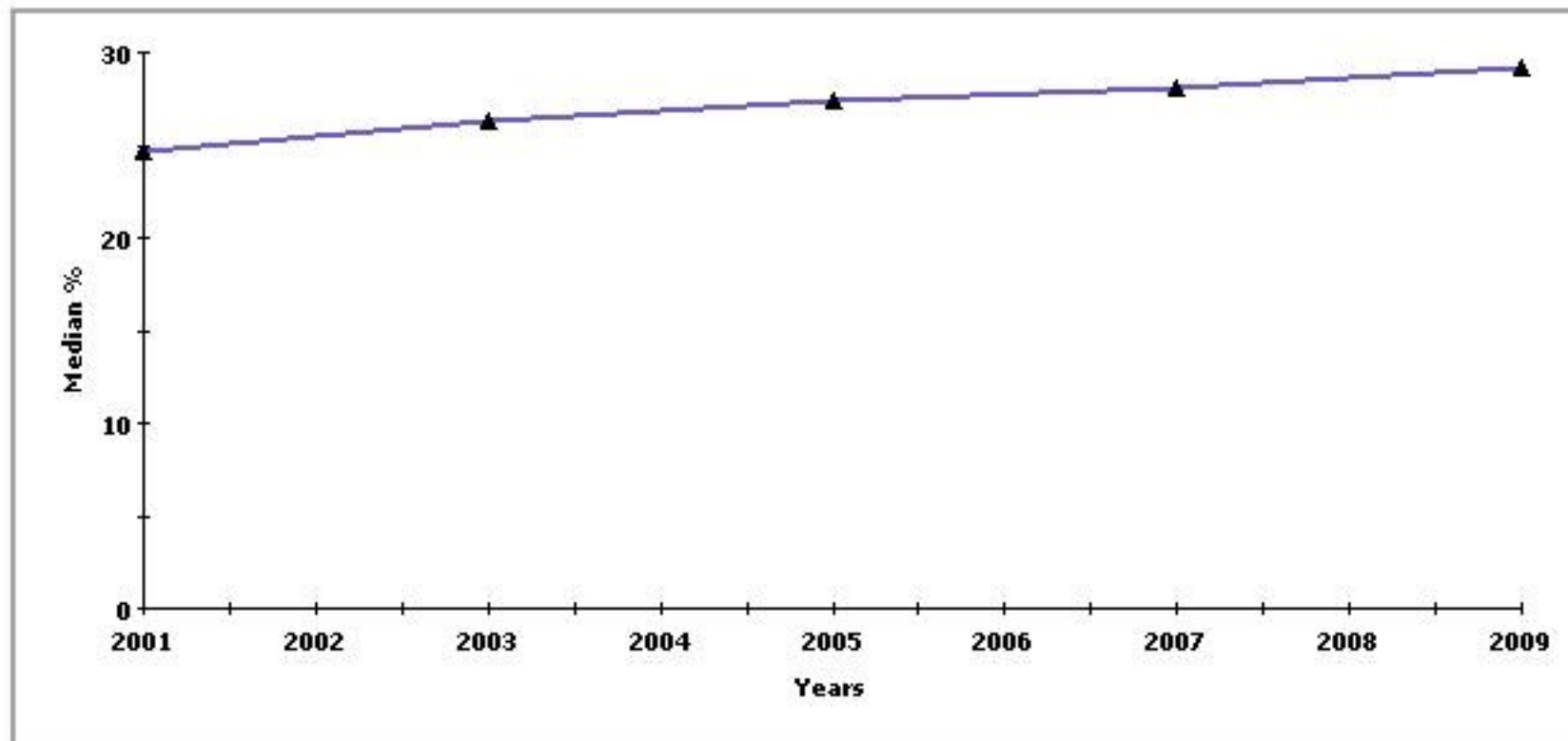


## Moderate physical activity Nationwide (States, DC, and Territories) - All Available Years Response = Yes



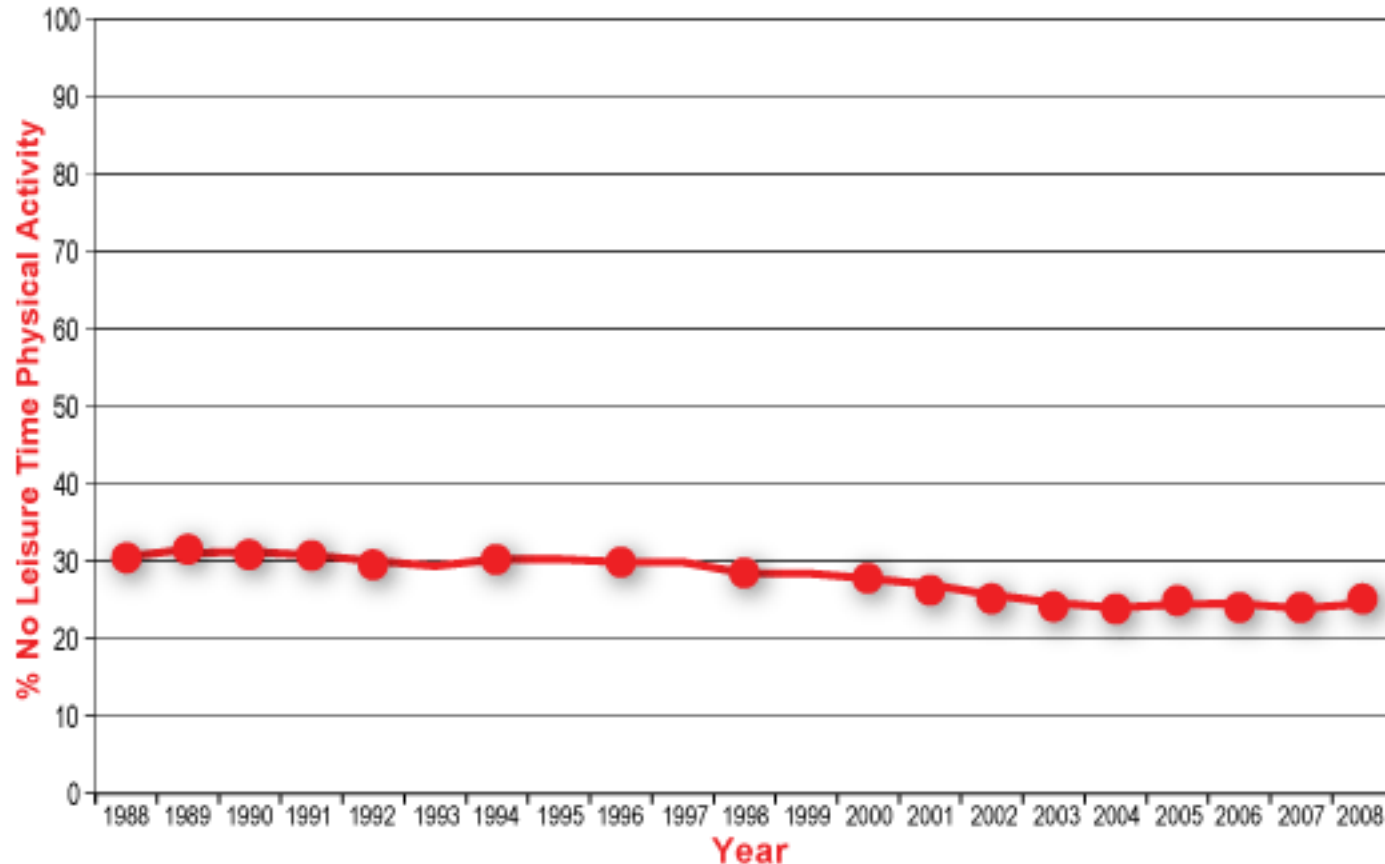
National Center for Chronic Disease Prevention & Health Promotion  
Behavioral Risk Factor Surveillance System

# Vigorous physical activity Nationwide (States, DC, and Territories) - All Available Years Response = Yes



National Center for Chronic Disease Prevention & Health Promotion  
Behavioral Risk Factor Surveillance System

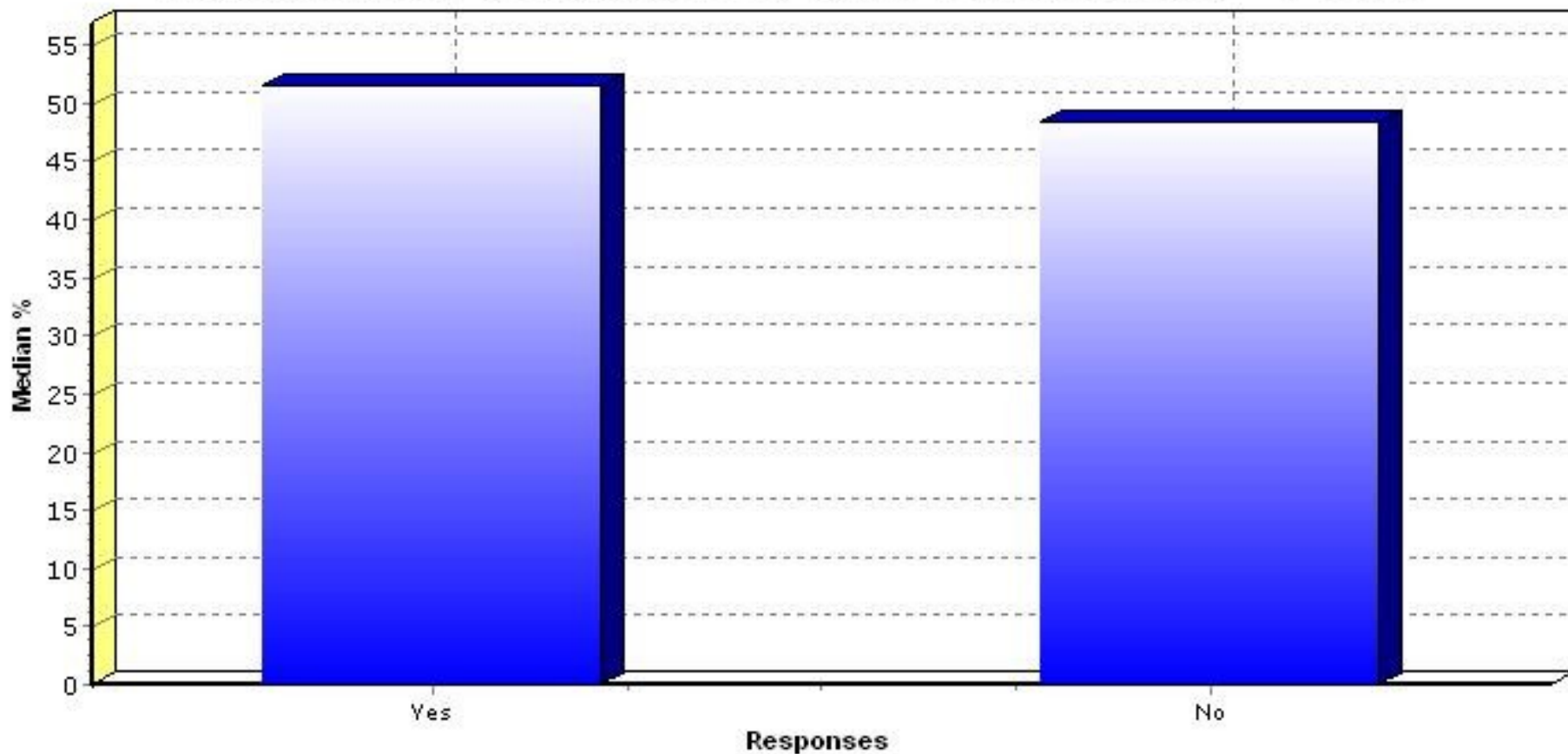
# 1988–2008 No Leisure-Time Physical Activity Trend Chart



National Center for Chronic Disease Prevention & Health Promotion  
Behavioral Risk Factor Surveillance System

## Participated in 150 minutes or more of Aerobic Physical Activity per week

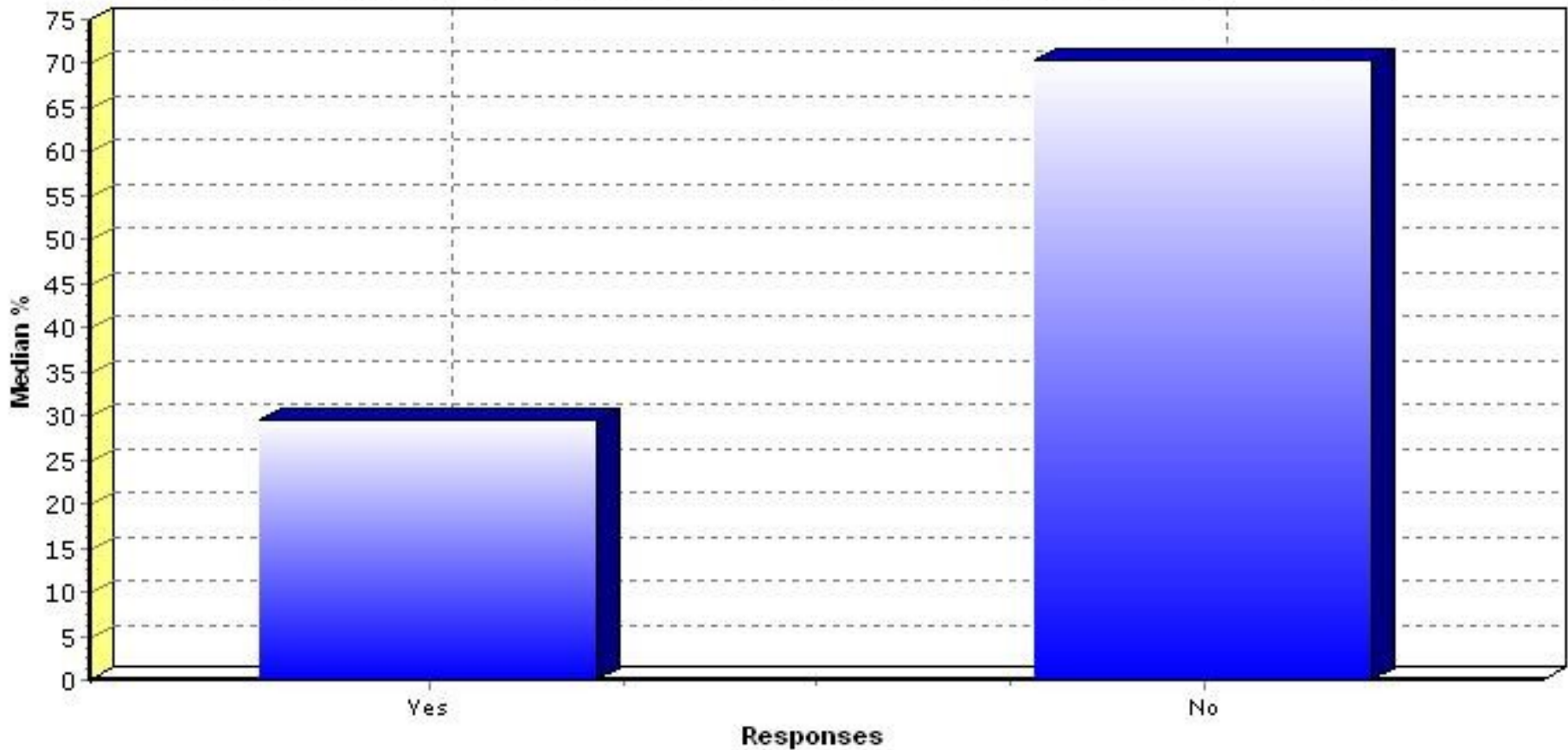
### Physical Activity Nationwide (States, DC, and Territories) - 2011



NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION & HEALTH PROMOTION  
Behavioral Risk Factor Surveillance System

# Participated Muscle Strengthening exercises more than twice per

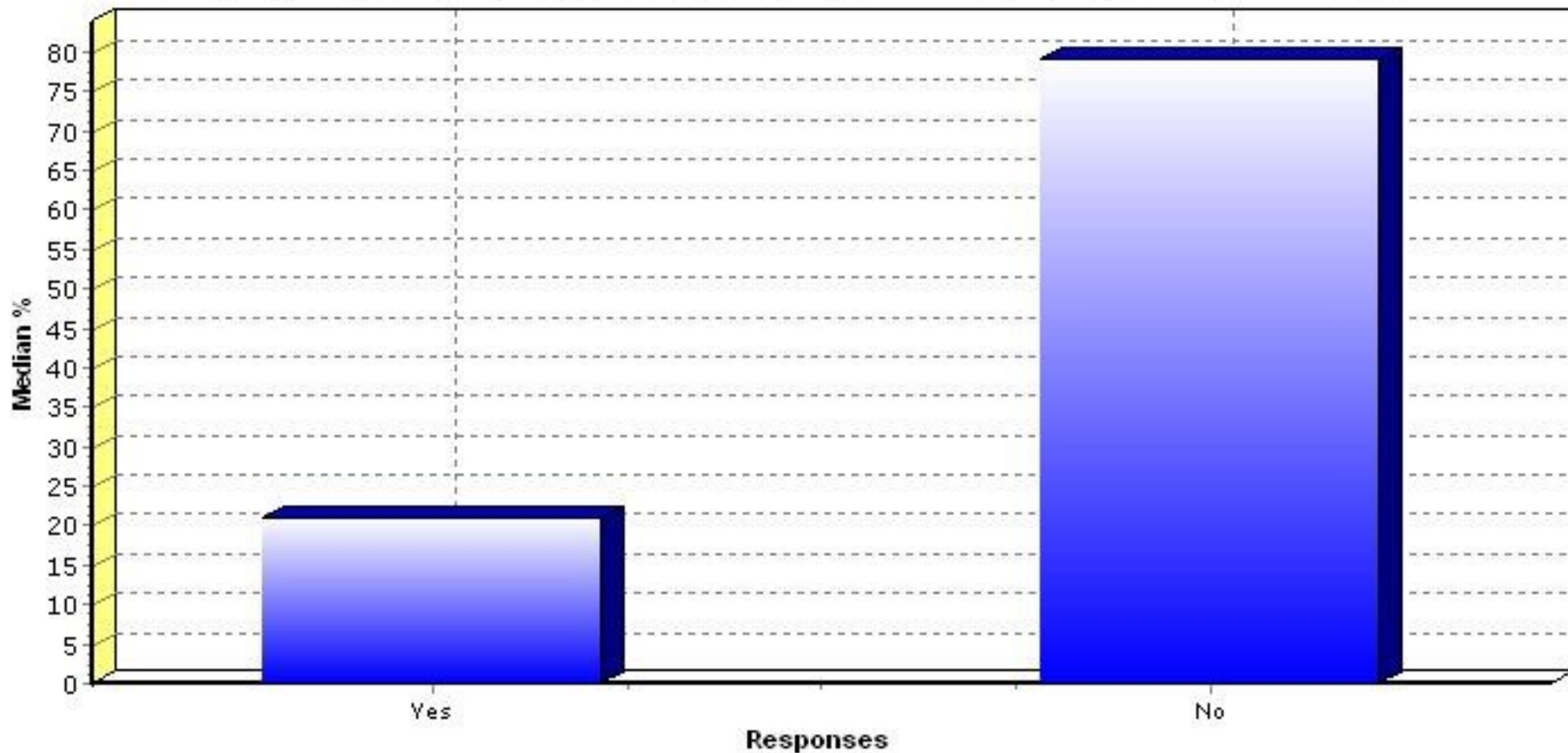
## Physical Activity Nationwide (States, DC, and Territories) - 2011



National Center for Chronic Disease Prevention & Health Promotion  
Behavioral Risk Factor Surveillance System

# Participated in enough Aerobic and Muscle Strengthening exercises to meet guidelines

## Physical Activity Nationwide (States, DC, and Territories) - 2011



National Center for Chronic Disease Prevention & Health Promotion  
Behavioral Risk Factor Surveillance System

# Objective Physical Activity Surveillance (Accelerometry)















*Troiano et al. (2008)*

- 42% of children ages 6-11 yr obtain the recommended 60 min x d(-1) of physical activity
- only 8% of adolescents achieve this goal
- Among adults, adherence to the recommendation to obtain 30 min x d(-1) of physical activity is less than 5%.



Why do people not exercise?



INTERVENTION	TASK FORCE FINDING
<b>Campaigns and informational approaches</b>	
Community-wide campaigns	
Stand-alone mass media campaigns	
Classroom-based health education focused on providing information	
<b>Behavioral and social approaches</b>	
Individually adapted health behavior change programs	
Social support interventions in community settings	
Family-based social support	
Enhanced school-based physical education	
College-based physical education and health education	
Classroom-based health education to reduce TV viewing and video game playing	
<b>Environmental and policy approaches</b>	
Community-scale urban design and land use policies	
Creation of or enhanced access to places for physical activity combined with informational outreach activities	
Street-scale urban design and land use policies	
Transportation and travel policies and practices	
Point-of-decision prompts to encourage use of stairs	

# Individually-adapted PA interventions

- Key elements
  - Goal setting & self-monitoring progress towards goals
  - Social support
  - Positive reinforcement (self-rewards, positive self-talk)
  - Self-regulation skills (problem solving, developing skills to prevent relapse)
- Kahn et al. (2002)
- Foster et al. (2005) – Cochrane review
  - Stricter criteria for selection of intervention studies (RCTs)
  - Smaller but positive effects
  - Highlighted usefulness of telephone and printed educational materials

# Multiple Behavior Change Research

- Efforts to promote two or more health behaviors
- The interrelationships among health behaviors and interventions designed to promote change in more than one health behavior at a time
- Presents a unique set of challenges
  - theoretical, methodologic, intervention, statistical, and funding issues

# Rationale for MHBC Research

*Approximately half of all causes of mortality in the United States are linked to social and behavioral factors such as smoking, diet, alcohol use, sedentary life-style, and accidents. Yet less than 5% of the approximately \$1 trillion spent annually on health care in the United States is devoted to reducing risks posed by these preventable conditions. Behavioral and social interventions therefore offer great promise to reduce disease morbidity and mortality, but as yet their potential to improve the public's health has been relatively poorly tapped.*

*— Institute of Medicine*

# Rationale for MHBC Research

- The major causes of morbidity and premature mortality in the US (heart disease, cancer, and stroke) influenced by multiple health risk behaviors (including smoking, alcohol abuse, physical inactivity, and poor diet)
- In the US, only 3% of adults meet all four health behavior goals of being a nonsmoker, having a healthy weight, being physically active, and eating 5 or more fruits and vegetables a day (Reeves & Rafferty, 2005)

# Rationale for MHBC Research – cont.

- Clustering of unhealthy behaviors
  - In the US, the majority of adults meet criteria for two or more risk behaviors (Fine et al., 2004; Pronk et al., 2004)
- 92% of smokers exhibit at least one additional risk behavior (Fine et al., 2004; Klesges et al., 1990; Pronk et al., 2004)
- 9 out of 10 overweight women at least two eating or activity risk behaviors (Sanchez et al., 2008)

## Rationale for MHBC Research – cont.

- Success in changing one or more lifestyle behaviors may increase self-efficacy to improve risk behaviors  
individuals have low motivation to change
  - Gateway behavior to overall healthy lifestyle?
- Limited contact opportunities for health promotion – should aim for interventions that could simultaneously improve multiple risk behaviors
- Interventions targeted at single risk behaviors, even if effective, will be limited in their impact

# Methodological Issues in MHBC

- Design issues
  - How many behaviors to target at once?
  - Specific combinations of specific behaviors? Are some more compatible than others?
  - Differential motivation to change different behaviors
  - Implications for timing? Introduce behaviors at the same time or sequentially?



# Hyman et al. (2007)

- Is sequential presentation of stage of change–based counseling to stop smoking, reduce dietary sodium level, and increase physical activity by at least 10 000 pedometer steps per week more effective than simultaneous counseling?
- African Americans (N=289) with hypertension, aged 45 to 64 years, initially non-adherent to the 3 behavioral goals, were randomized:
  - (1) 1 in-clinic counseling session on all 3 behaviors every 6 months, supplemented by motivational interviewing by telephone for 18 months;
  - (2) a similar protocol that addressed a new behavior every 6 months;
  - (3) 1-time referral to existing group classes (“usual care”).

**The primary end point was the proportion in each arm that met at least 2 behavioral criteria after 18 months.**

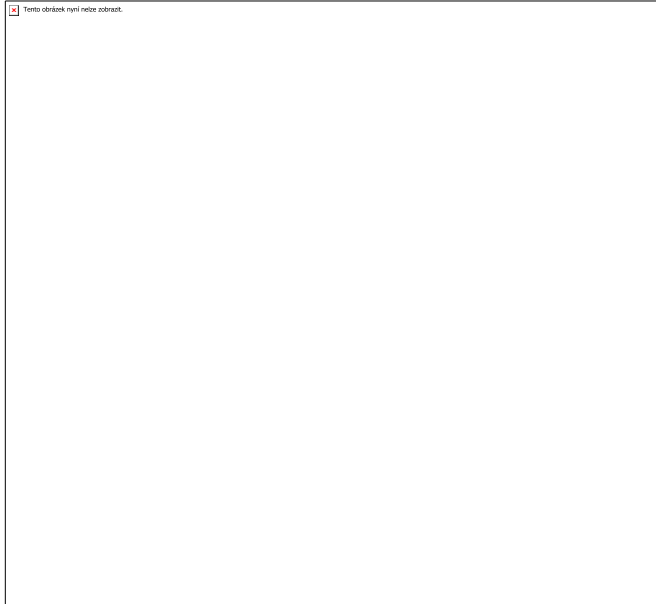
# Hyman et al. (2007) - results

- At 18 months, only 6.5% in the simultaneous arm, 5.2% in the sequential arm, and 6.5% in the usual-care arm met the primary end point
- Results for single behavioral goals consistently favored the simultaneous group
  - At 6 months, 29.6% in the simultaneous, 16.5% in the sequential, and 13.4% in the usual-care arms had reached the urine sodium goal
  - At 18 months, 20.3% in the simultaneous, 16.9% in the sequential, and 10.1% in the usual care arms were urine cotinine negative

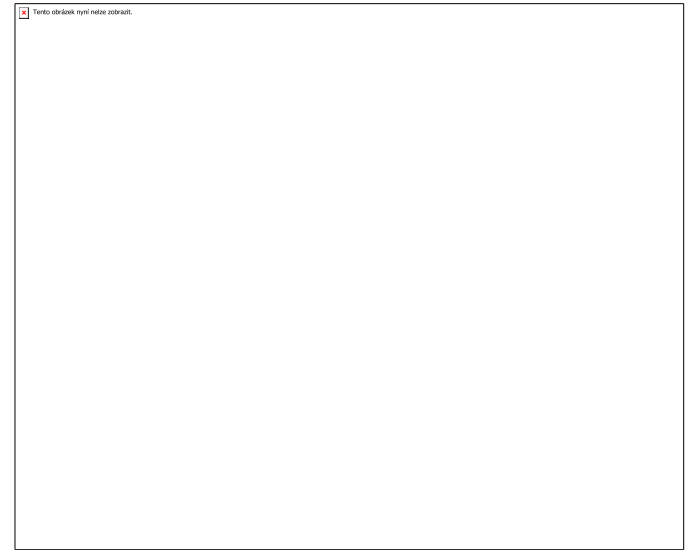
# King et al. 2013

- Four intervention groups: a sequential exercise-first group, a sequential diet-first group, a simultaneous group, and a control group
- 12 months interventions; 4 months in between sequential behaviors
- Telephone-based counseling (SCT, TTM); control received stress management advice

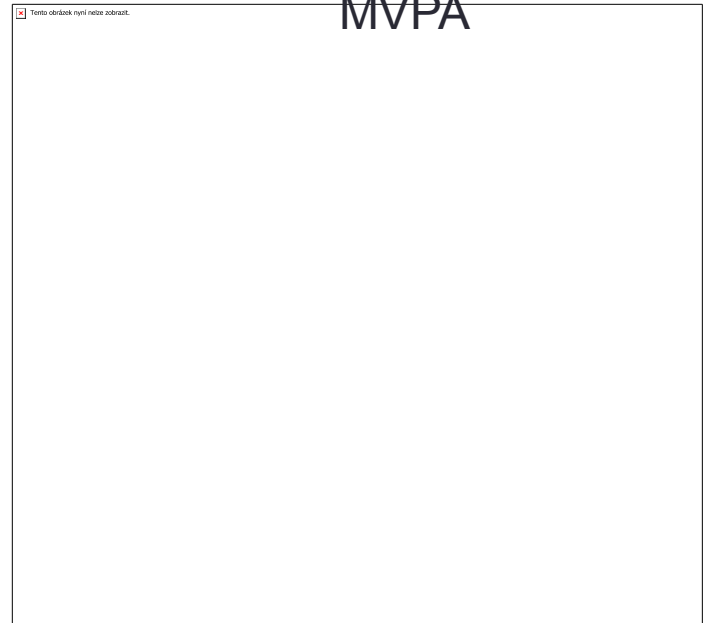
## Fruit & Vegetable Intake



## Calorie Intake from Sat. Fat



MVPA



- The behaviors presented first, showed greater improvement in sequential interventions (suppression effect of “diet first” on physical activity)
- In simultaneous group, changes in both behaviors comparable, the size of the effect similar to that of “first behavior” in the sequential group

# Methodological Issues in MHBC

- Measurement issues
  - Separate or composite measures?
- Data analysis
- Theory testing across behaviors
- Participant burden

# Behavior Change from the Perspective of Motivational Interviewing

*Motivational interviewing is a directive, client-centered counseling style for eliciting behavior change by helping clients to explore and resolve ambivalence.*

Source: <http://www.motivationalinterview.org/>

Miller WR, et al. Motivational Interviewing, 2nd ed. Guilford Press; 2002.

Berger B. Motivational interviewing helps patients confront change. Available at:[http://www.uspharmacist.com/oldformat.asp?url=newlook/files/Phar/nov99relationships.cfm&pub\\_id=8&article\\_id=450](http://www.uspharmacist.com/oldformat.asp?url=newlook/files/Phar/nov99relationships.cfm&pub_id=8&article_id=450).

# The Spirit of Motivational Interviewing

- Collaborate with the patient
- Evoke their readiness to take action (elicit “change talk”)
- Develop patient’s autonomy to take responsibility for their own health

**Behavior change can be facilitated  
but not coerced.**

# Strategies for Successful Interaction with Patients

## Elicit-Provide-Elicit

- Menu of Strategies

## The Five Principles

- READS

## Helpful Tools

- Readiness Rulers
- The Envelope

Rollnick S, et al. *Health Behavior Change: A Guide For Practitioners*. Churchill Livingstone; 2003.  
Berger B. Motivational interviewing helps patients confront change. Available at:  
[http://www.uspharmacist.com/oldformat.asp?url=newlook/files/Phar/nov99relationships.cfm&pub\\_id=8&article\\_id=450](http://www.uspharmacist.com/oldformat.asp?url=newlook/files/Phar/nov99relationships.cfm&pub_id=8&article_id=450)



# Strategies for Successful Interaction with Patients

## ELICIT-PROVIDE-ELICIT

- The good things and bad things
- What do they like and dislike about the proposed changes?
- What is their representation of the illness and its treatment?
- Do they agree with the NP/MD?
- Do they believe they can do what is asked? What will help?
- What are the barriers?
- **IS THE PATIENT READY FOR THE CHANGE?**

# Five Principles of MI

- Express empathy
- Develop discrepancy
- Avoid argumentation
- Roll with resistance
- Support self-efficacy

# Building Motivation

- Explore ambivalence and build motivation
  - (1) Open-ended questions
  - (2) Reflective listening
  - (3) Affirmations
  - (4) Summaries
  - (5) Elicit self-motivational statements (change talk)

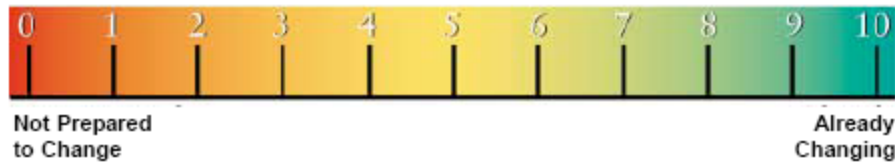


# Readiness to Change: Eliciting Change Talk

## Readiness Ruler

On the line below, mark where you are now on this line that measures your change in \_\_\_\_\_.

Are you not prepared to change, already changing, or somewhere in the middle?



“If I handed you an envelope, what would the message inside have to say to get you to \_\_\_\_\_?”

# Building Motivation

- Goal is to get patient/client to articulate:
  - The steps I plan to take are:
  - Challenges that may interfere:
  - How I will handle these challenge
  - I'll know my plan is working if:

# MHBC Challenges

- Timing of treatment
- Measuring changes in multiple behaviors
- Theory testing across behaviors
- Participant burden

# Some Statistics

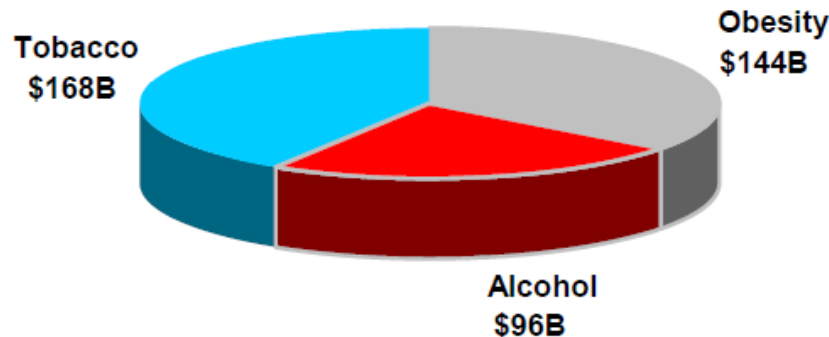
(Lightwood & Glantz, 2007)

- 1% absolute reduction in smoking prevalence (AMIs and strokes)
- In the first year, there would be  $924 \pm 679$  (mean  $\pm$  SD) fewer hospitalizations for AMI and  $538 \pm 508$  for stroke, resulting in an immediate savings of  $\$44 \pm 26$  million
- A 7-year program that reduced smoking prevalence by 1% per year would result in a total savings of  $\$3.20 \pm 0.59$  billion in costs, and would prevent 13,100 deaths resulting from AMI/stroke.

# Some Statistics

(The Lewin Group Review, 2009)

- The midpoint of the cost-savings estimates is \$408 billion per year, equivalent to 17% of 2008 national health expenditures (NHE)
- The range of expected savings from the respective studies is \$264 billion to \$552 billion per year and includes several significant studies by the CDC and NIH





# Hyman et al. (2007) – results

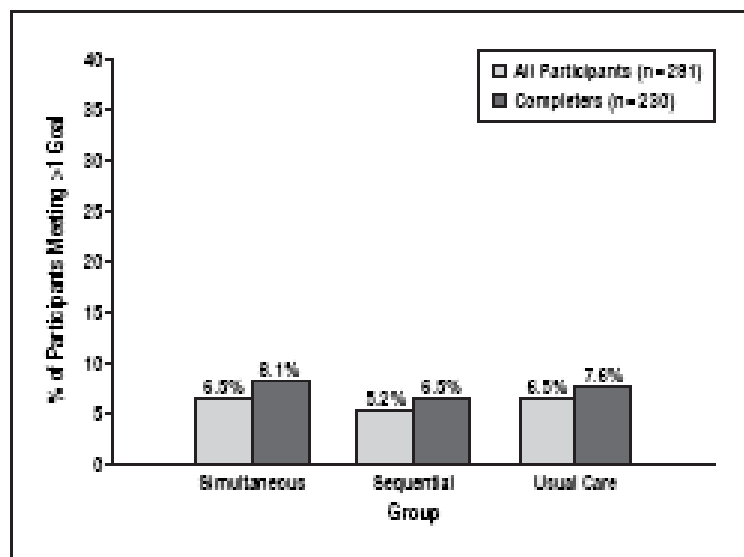


Figure 2. Proportion of each group that met more than 1 behavioral goal at 18 months (primary end point). All statistical contrasts resulted in  $P > .05$ . In the intention-to-treat analysis,  $P = .99$  for the simultaneous vs the usual-care group,  $P = .72$  for the sequential vs the usual-care group, and  $P = .70$  for the simultaneous vs the sequential group. The  $P$  values for the contrasts involving completers were of similar magnitude.

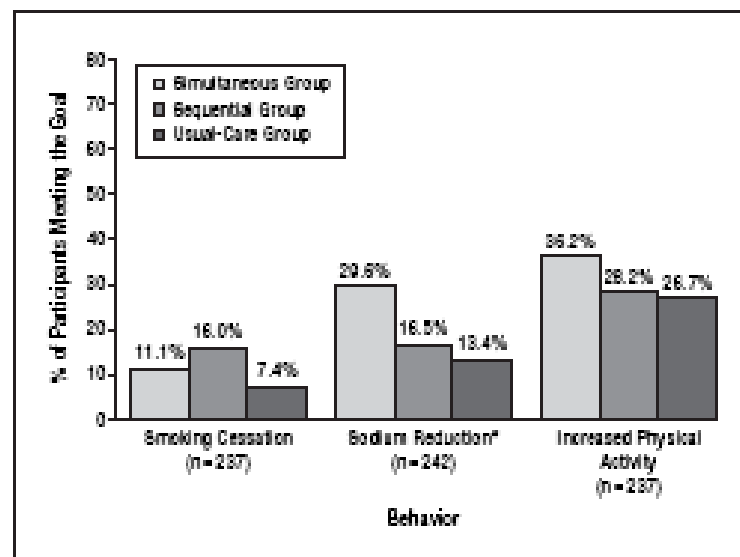


Figure 3. Proportion of each group that adhered to the goal at 6 months after the introduction of the behavior. In the sequential group, the measurement corresponding to the 6-month postintroduction point, rather than chronological follow-up, was used. The number of measurements available for each behavior at the 6-month postintroduction visit is noted. The asterisk indicates that  $P = .01$  for the simultaneous group vs the usual-care group and  $P = .046$  for the simultaneous group vs the sequential group.

# Hyman et al. (2007) – results

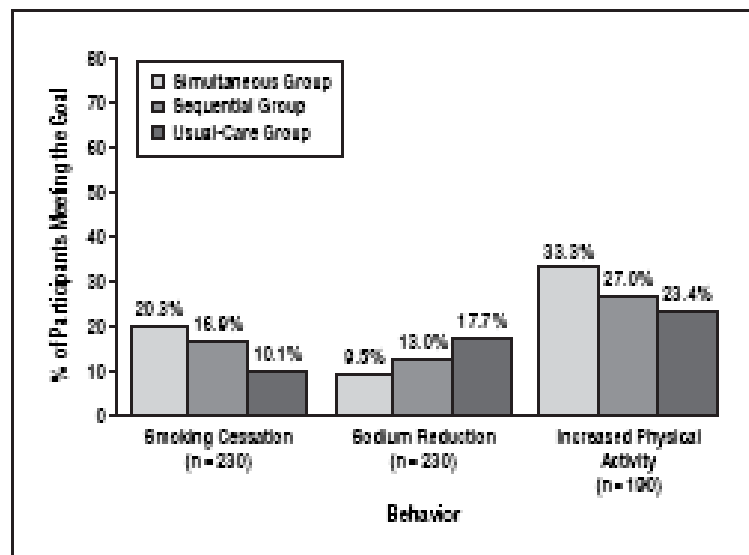


Figure 4. Proportion of each group that adhered to the goal at 18 months after the introduction of the behavior. The number of participants who provided pedometer measurements was less than that of participants who provided urine specimens for cotinine and sodium measurements. None of the individual group contrasts reached a significance level of  $\leq .05$ , although  $P = .06$  for the simultaneous group vs the usual-care group and  $P = .08$  for overall trend in smoking cessation.

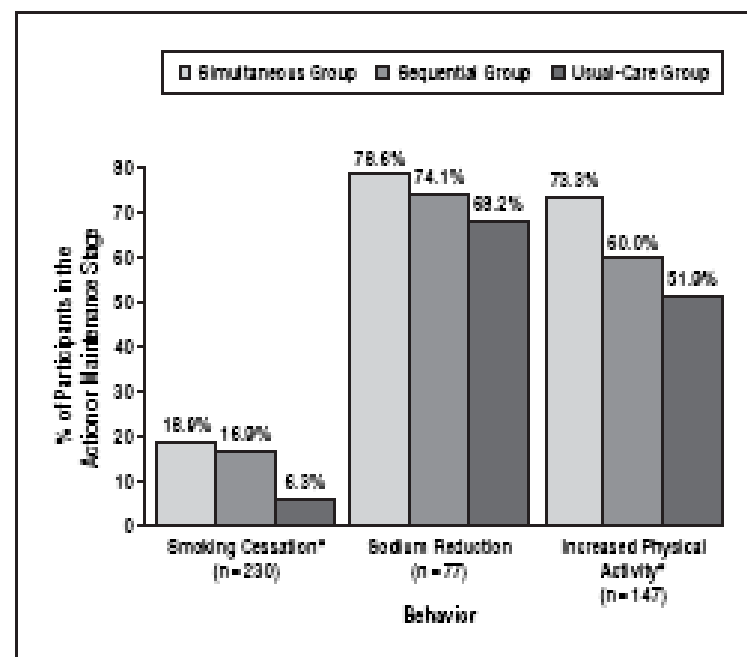


Figure 5. Effect of interventions on stage of change for each behavior. The asterisk indicates behaviors with a significant treatment effect: smoking cessation,  $P = .02$  for the simultaneous group vs the usual-care group,  $P = .04$  for the sequential group vs the usual-care group, and  $P = .74$  for the simultaneous group vs the sequential group; sodium reduction,  $P = .41$  for the simultaneous vs the usual-care group,  $P = .65$  for the sequential vs the usual-care group,  $P = .70$  for the simultaneous vs the sequential group; and physical activity increase,  $P = .03$  for the simultaneous group vs the usual-care group,  $P = .41$  for the sequential vs the usual-care group, and  $P = .17$  for the simultaneous vs the sequential group. The denominator for each comparison varies depending on the proportion of subjects in each stage at baseline.