

Motivating Behavior Change

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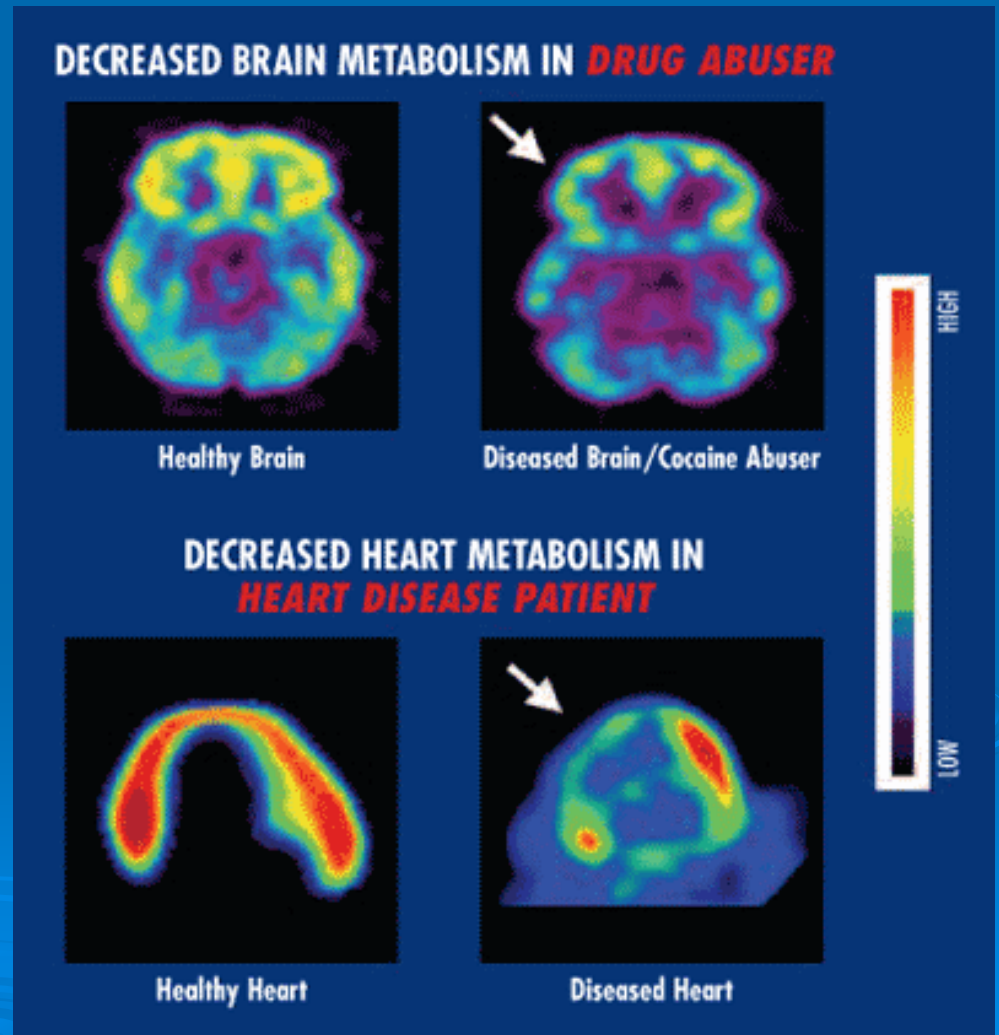
Arizona State University

The background of the slide is a solid blue color. In the bottom right corner, there are several faint, concentric circles that resemble ripples in water, creating a decorative effect.

Functional Magnetic Resonance Imaging (fMRI)

Addiction is a chronic, relapsing brain disease that is characterized by compulsive drug seeking and use, despite harmful consequences

NIDA, 2008



Motivating Behavior Change

➤ So, what can we do about it?

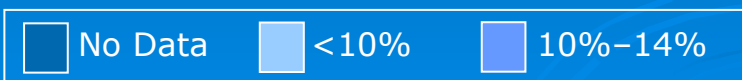
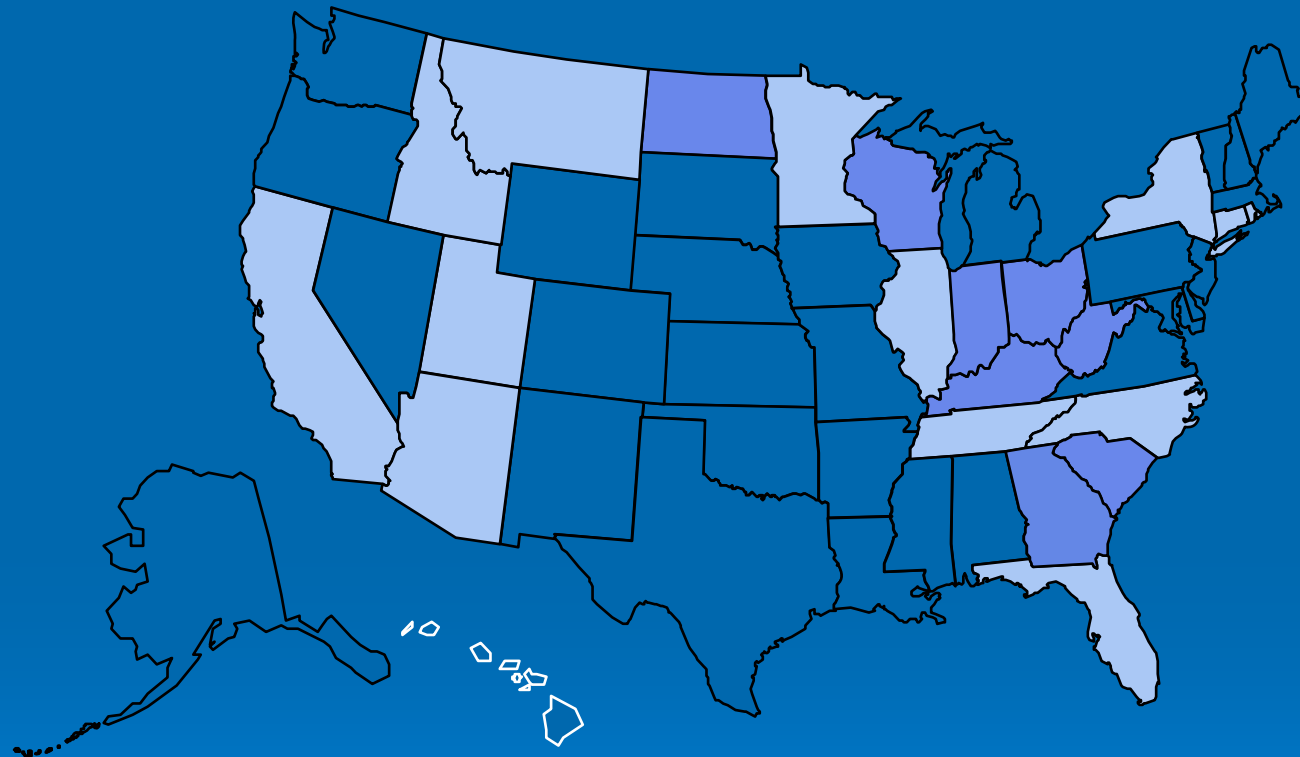
Background

- What is health behavior?
 - Behavior that significantly contributes to our present or future physical and mental health
- Examples:
 - Choosing healthy foods
 - Abstaining from tobacco, alcohol, & drugs
 - Exercising regularly
 - Using seatbelts
 - Following traffic regulations

Obesity Trends* Among U.S. Adults

BRFSS, 1985

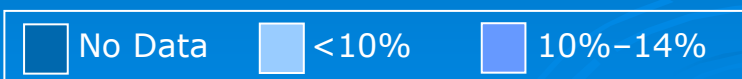
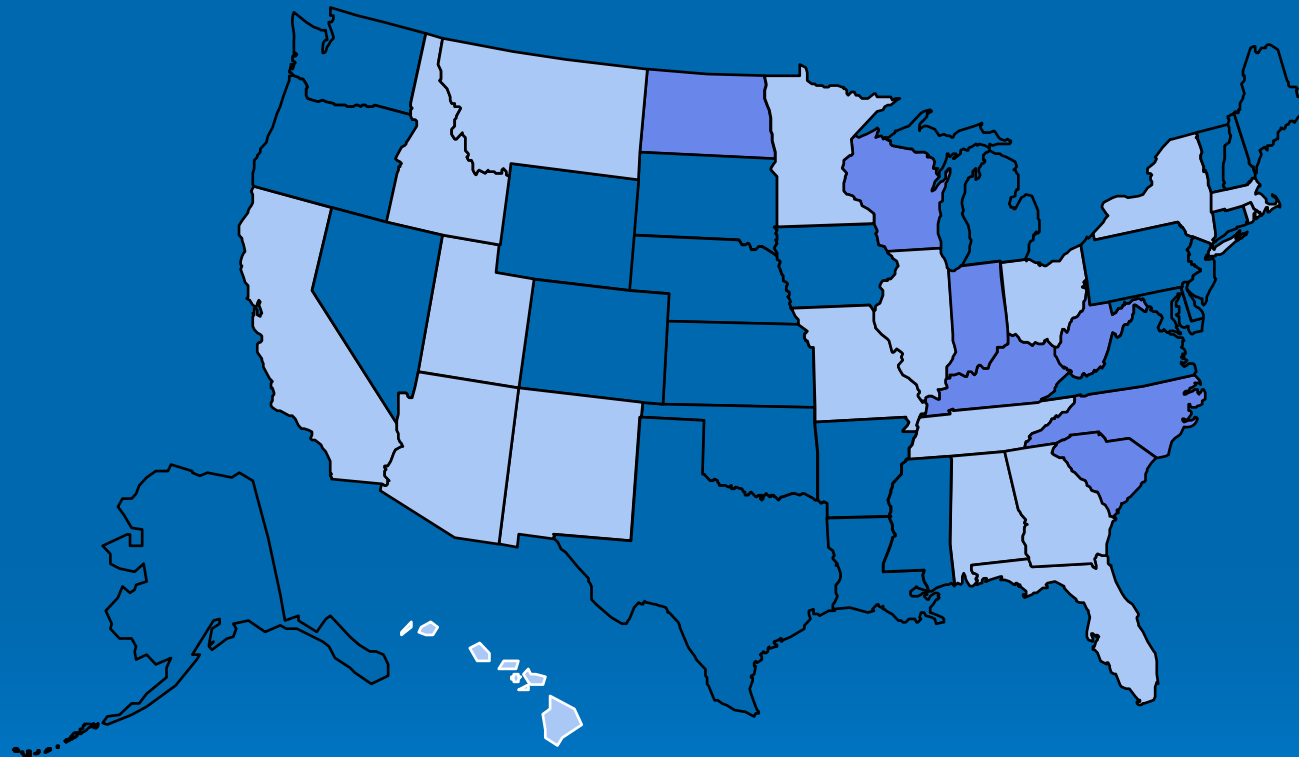
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Obesity Trends* Among U.S. Adults

BRFSS, 1986

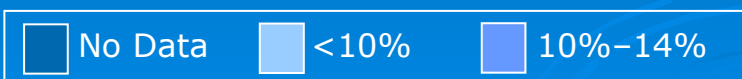
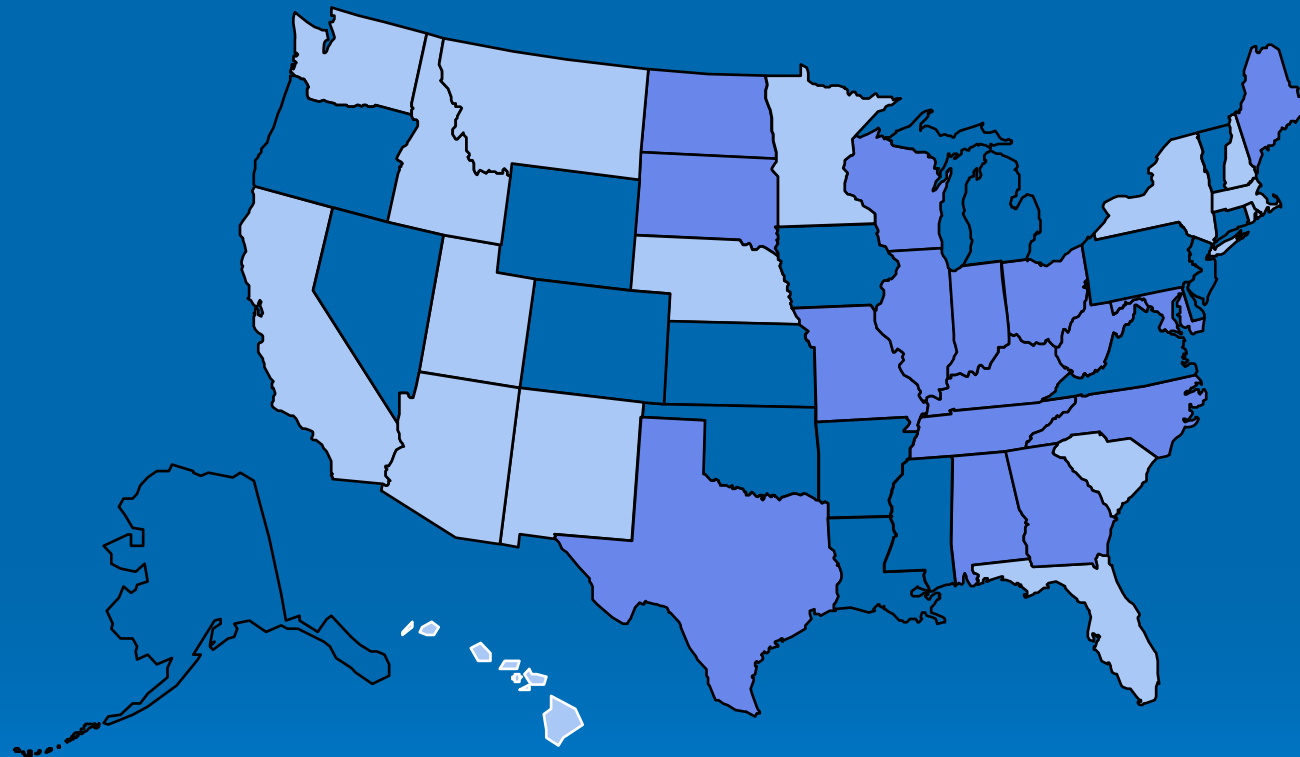
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Obesity Trends* Among U.S. Adults

BRFSS, 1987

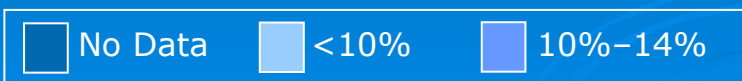
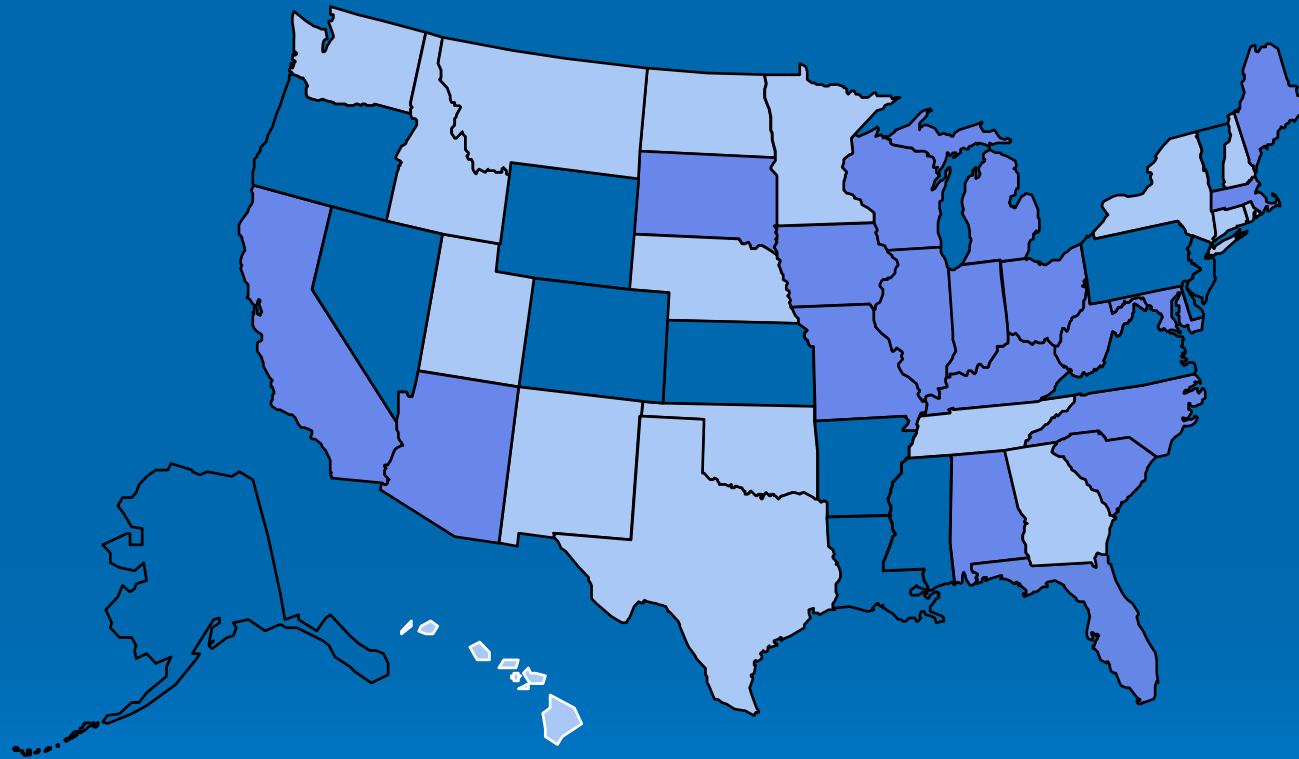
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Obesity Trends* Among U.S. Adults

BRFSS, 1988

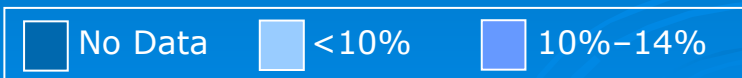
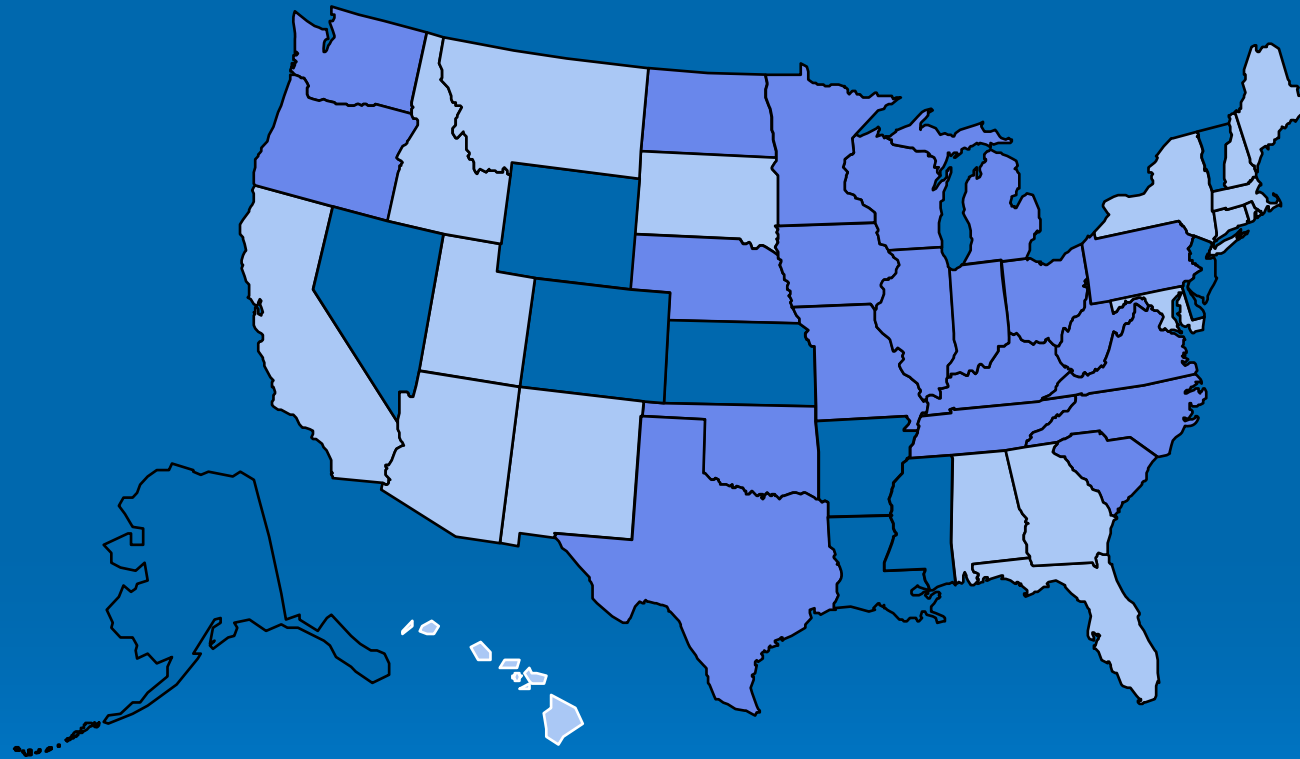
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Obesity Trends* Among U.S. Adults

BRFSS, 1989

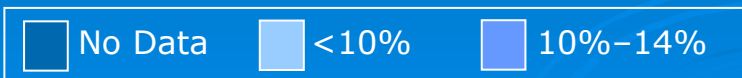
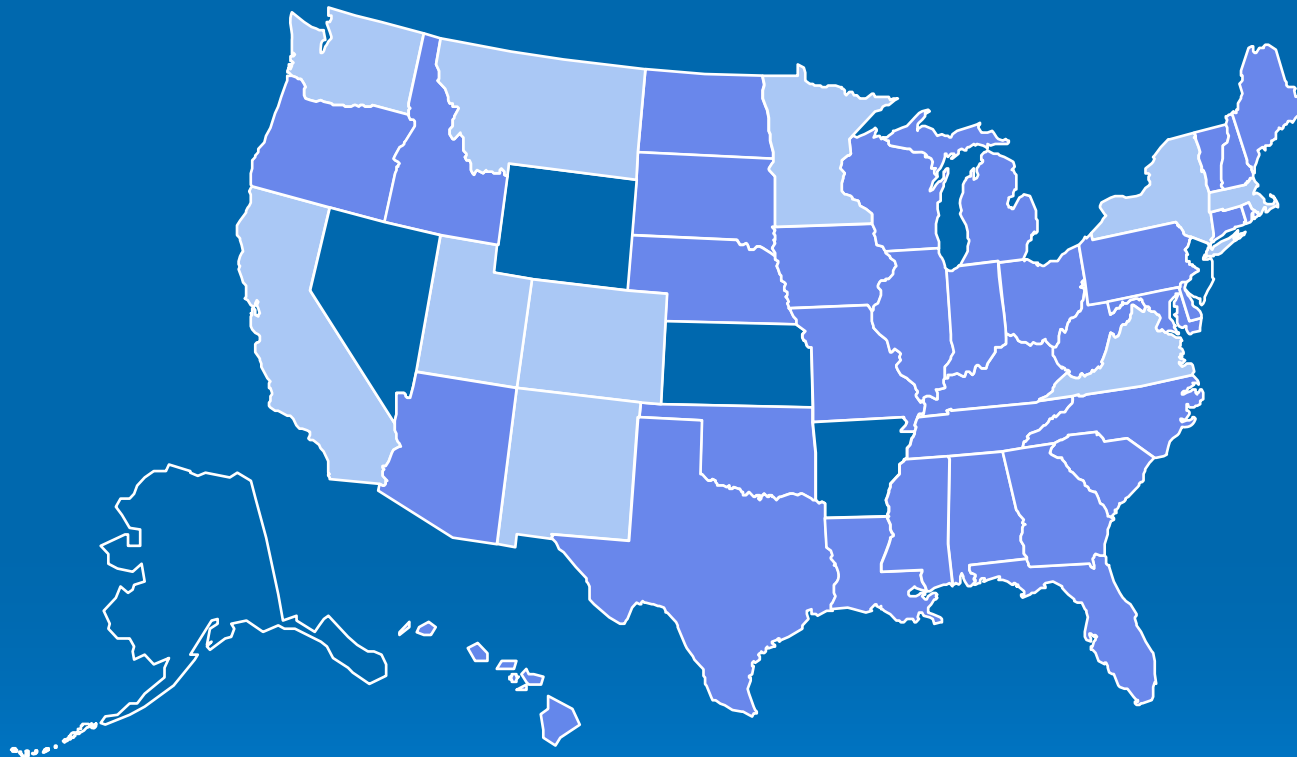
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Obesity Trends* Among U.S. Adults

BRFSS, 1990

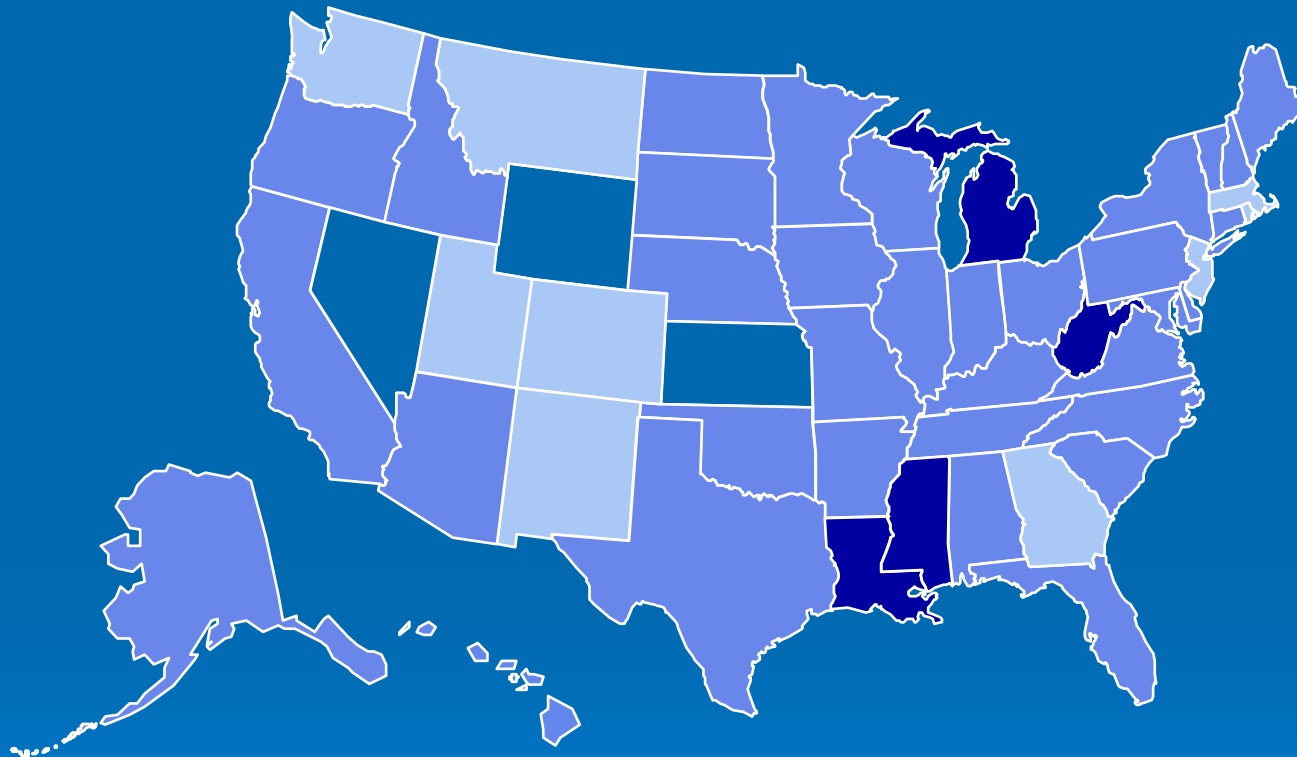
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Obesity Trends* Among U.S. Adults

BRFSS, 1991

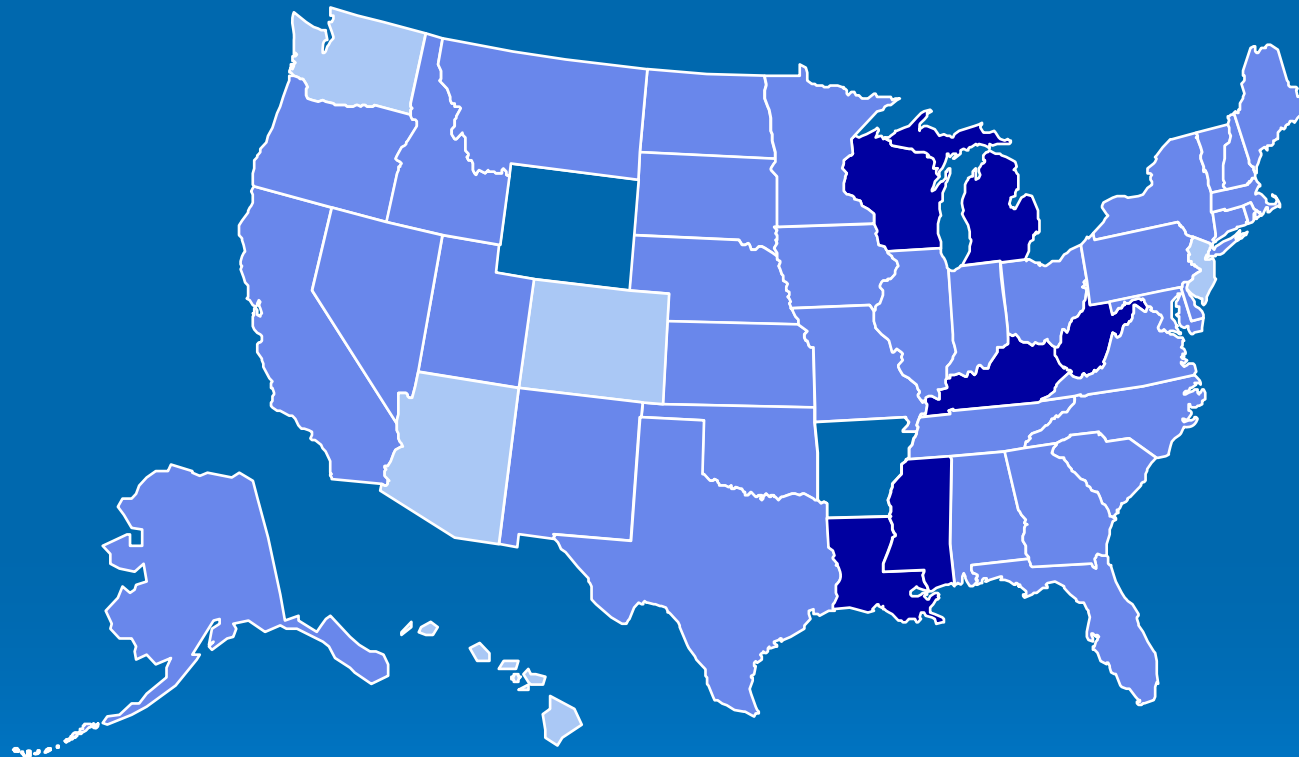
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Obesity Trends* Among U.S. Adults

BRFSS, 1992

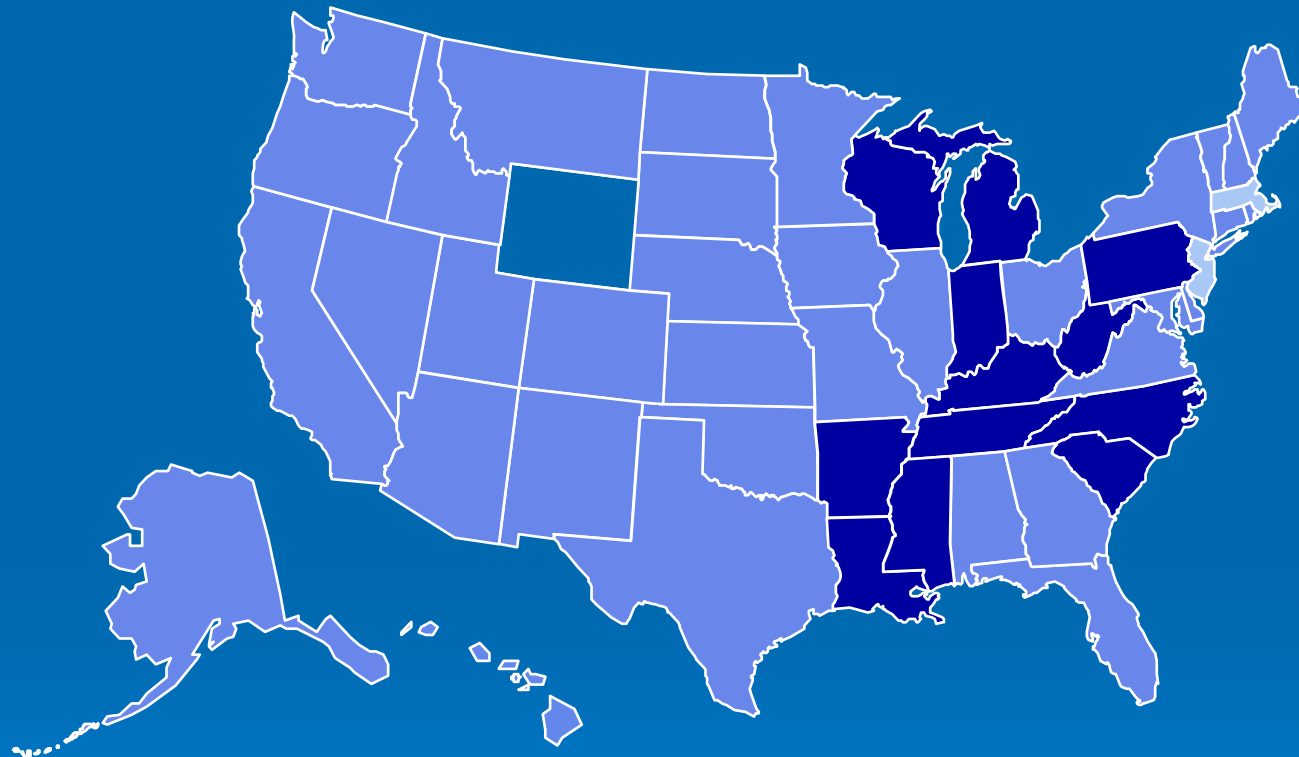
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Obesity Trends* Among U.S. Adults

BRFSS, 1993

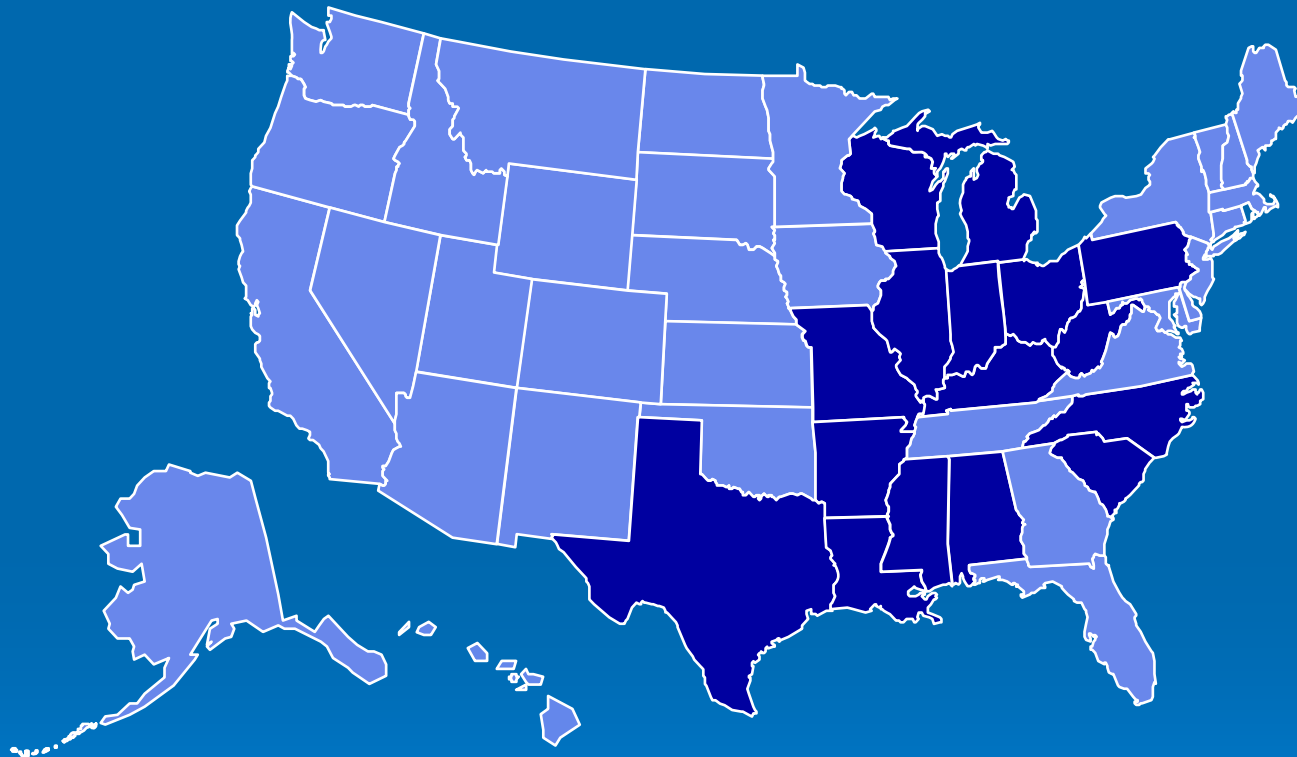
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Obesity Trends* Among U.S. Adults

BRFSS, 1994

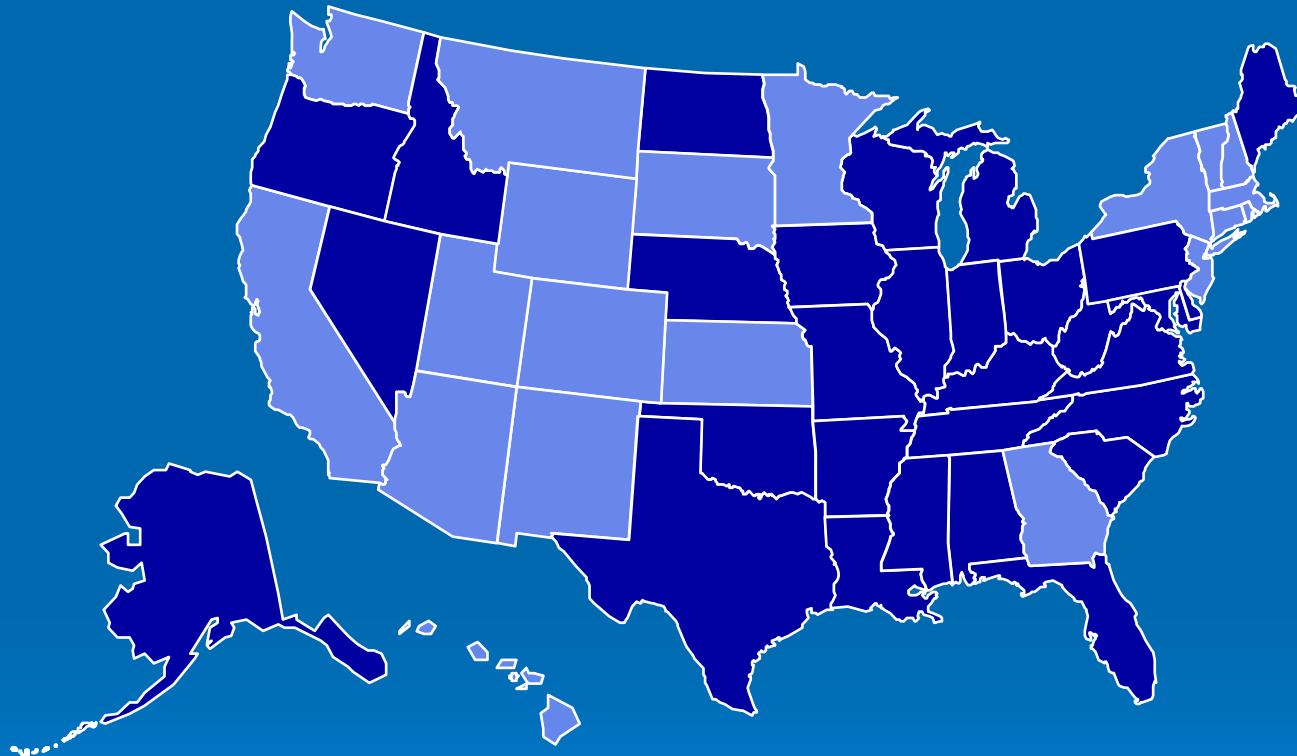
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Obesity Trends* Among U.S. Adults

BRFSS, 1996

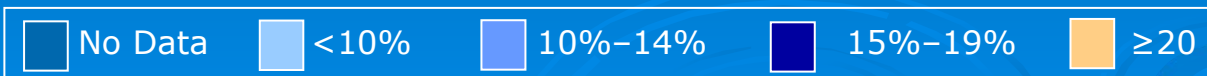
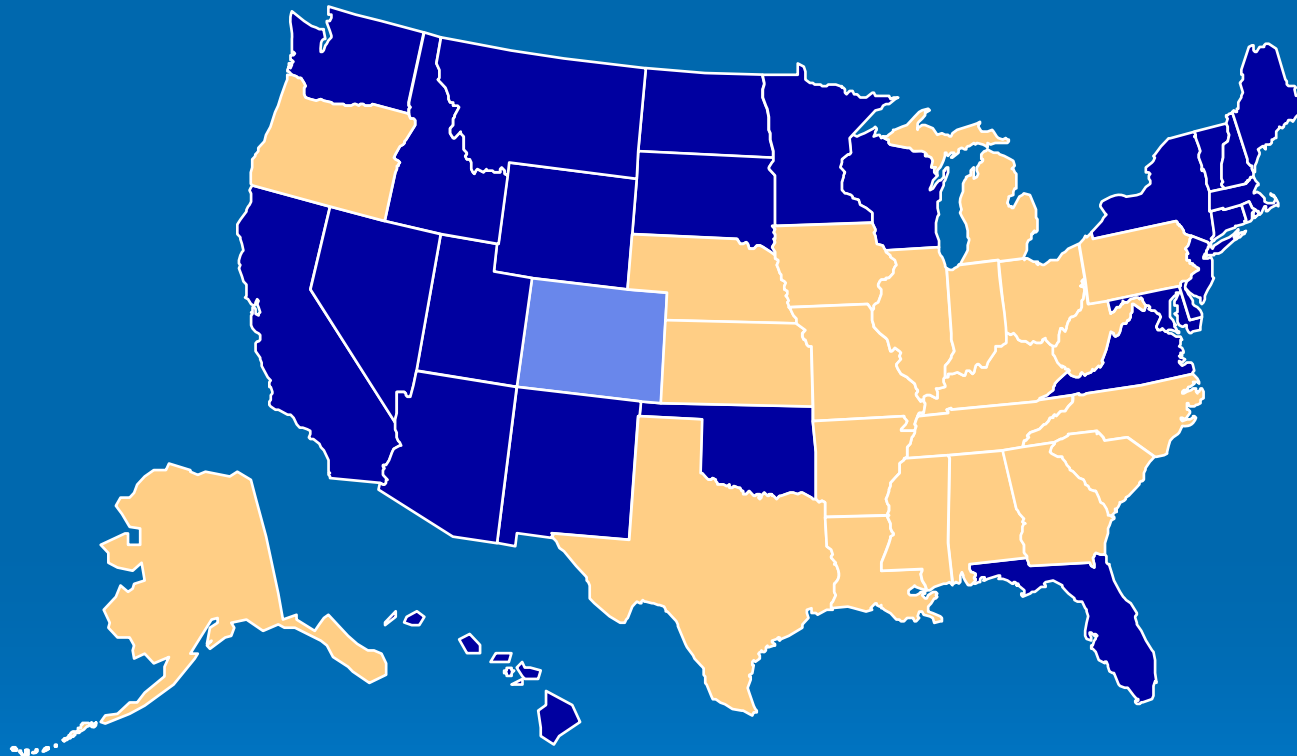
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5' 4" person)



Obesity Trends* Among U.S. Adults

BRFSS, 2000

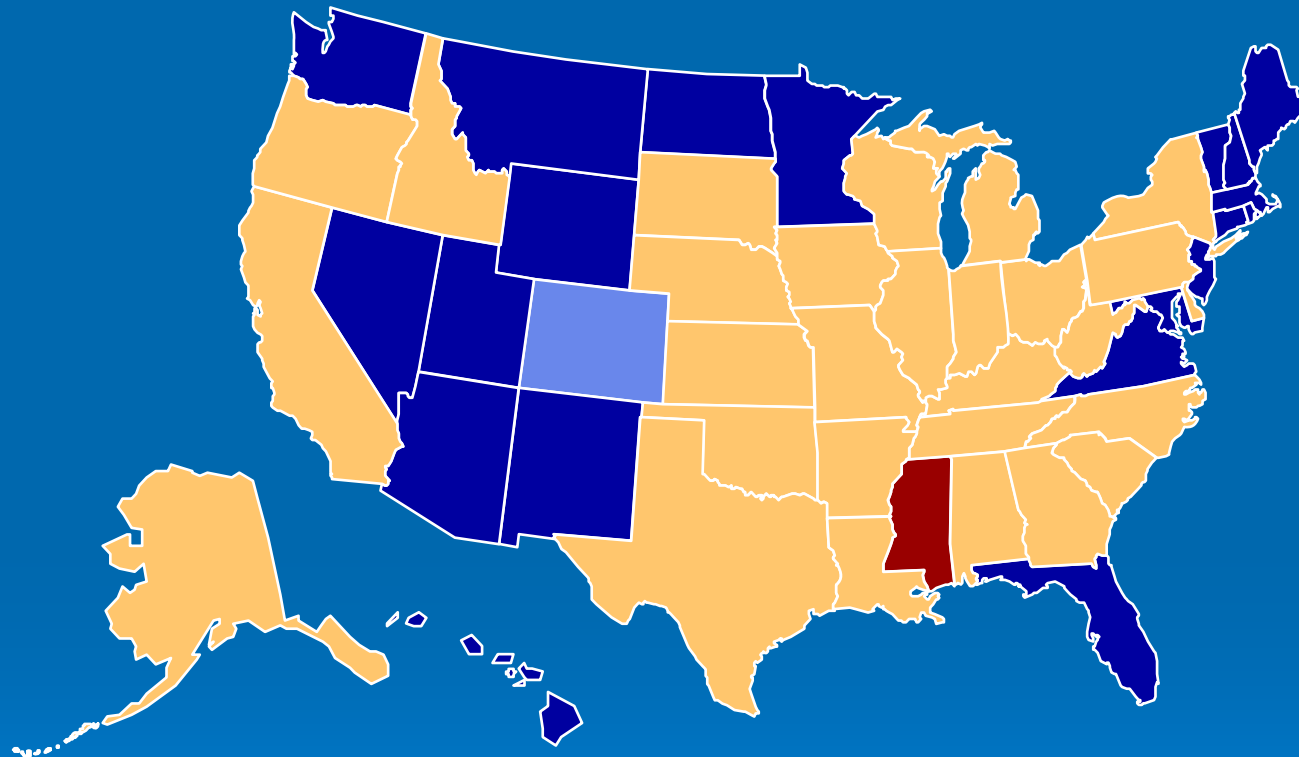
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Obesity Trends* Among U.S. Adults

BRFSS, 2001

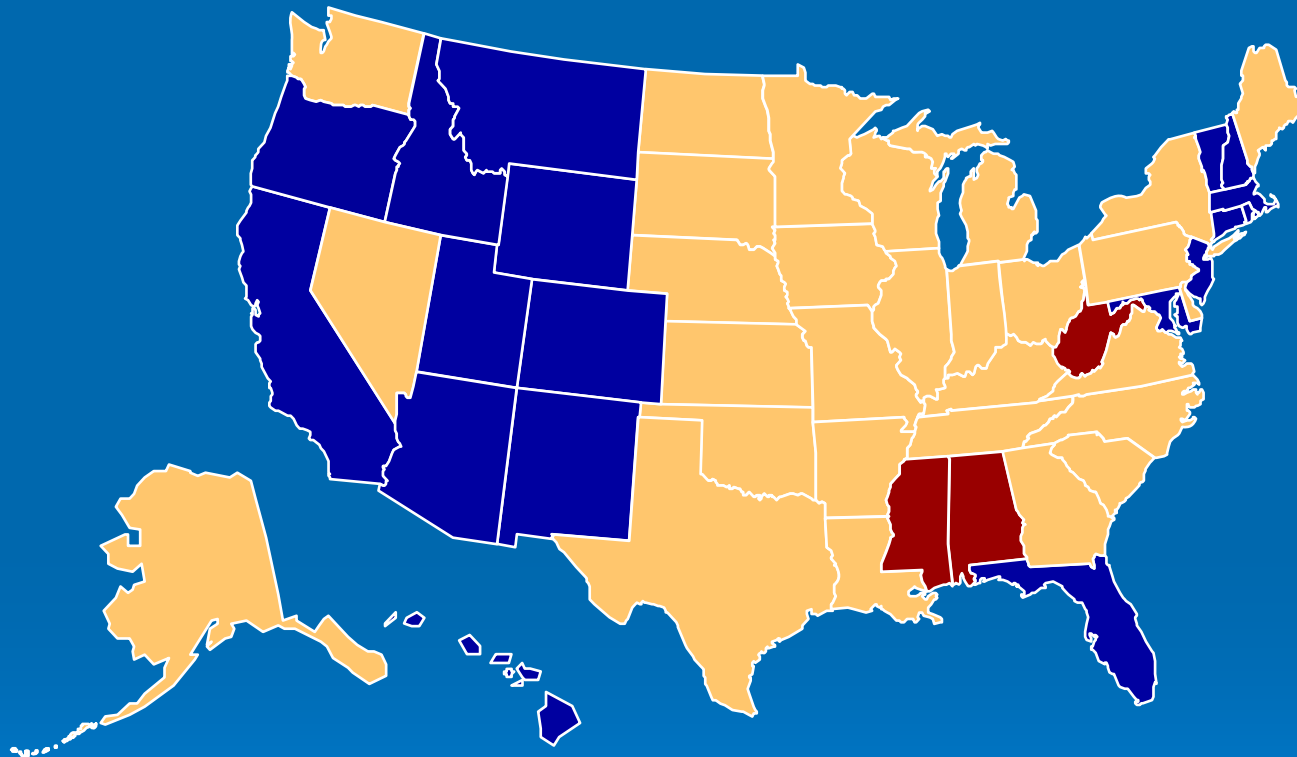
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Obesity Trends* Among U.S. Adults

BRFSS, 2002

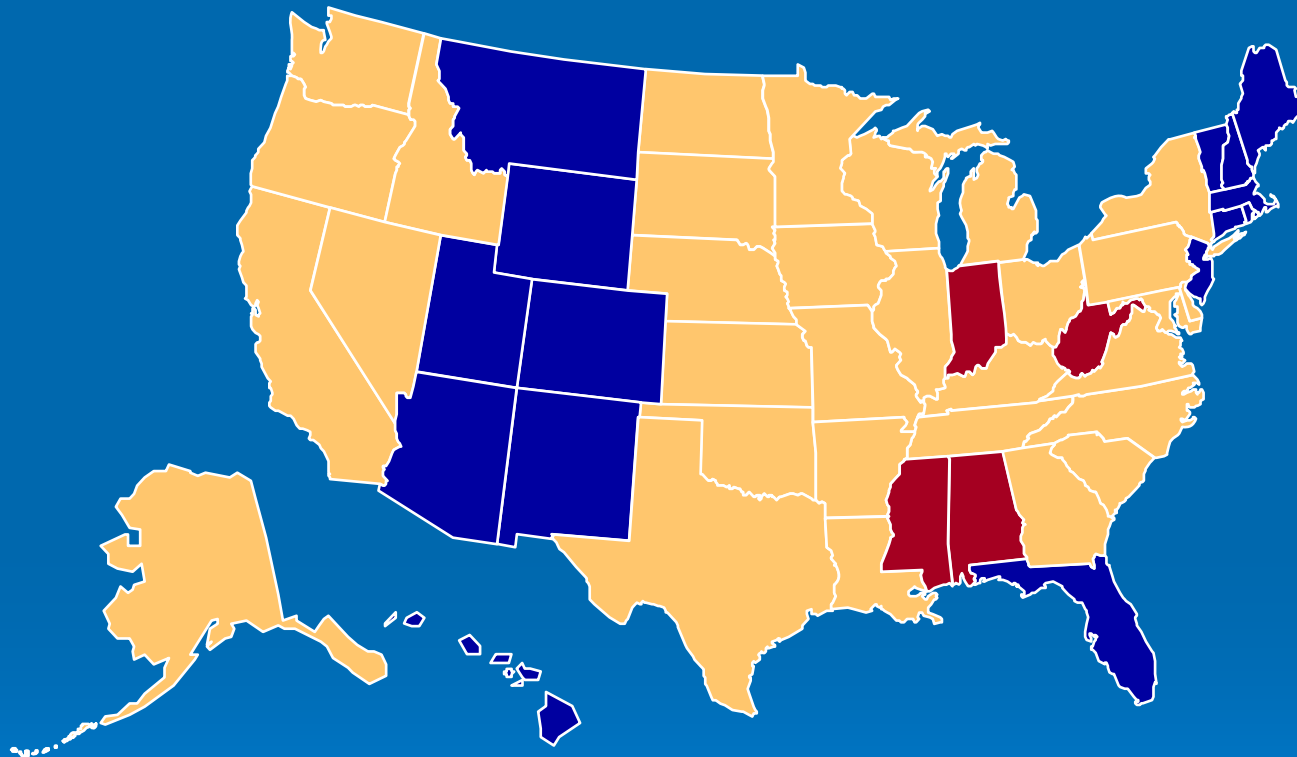
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Obesity Trends* Among U.S. Adults

BRFSS, 2003

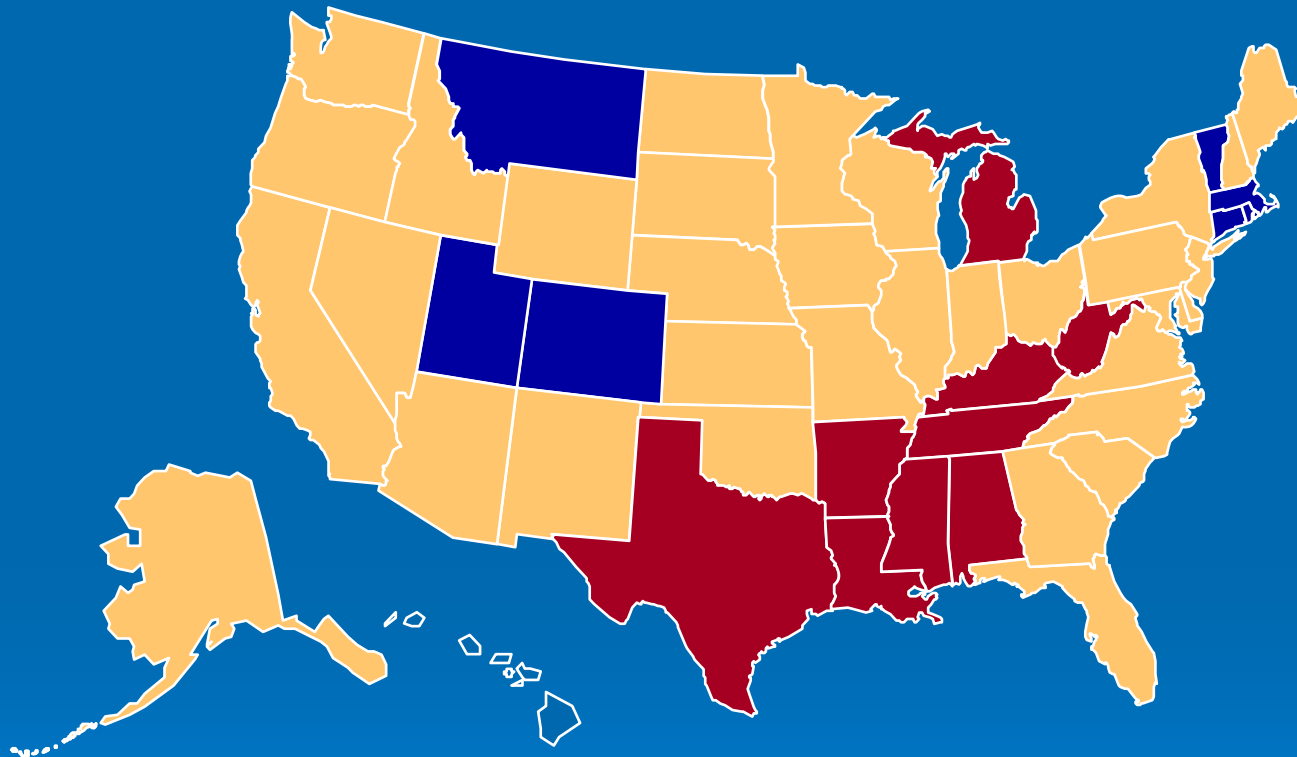
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Obesity Trends* Among U.S. Adults

BRFSS, 2004

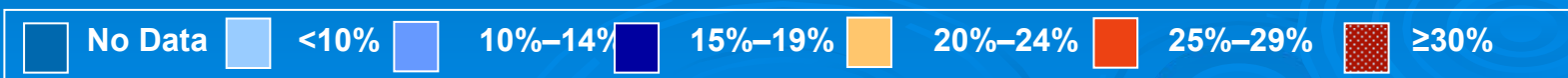
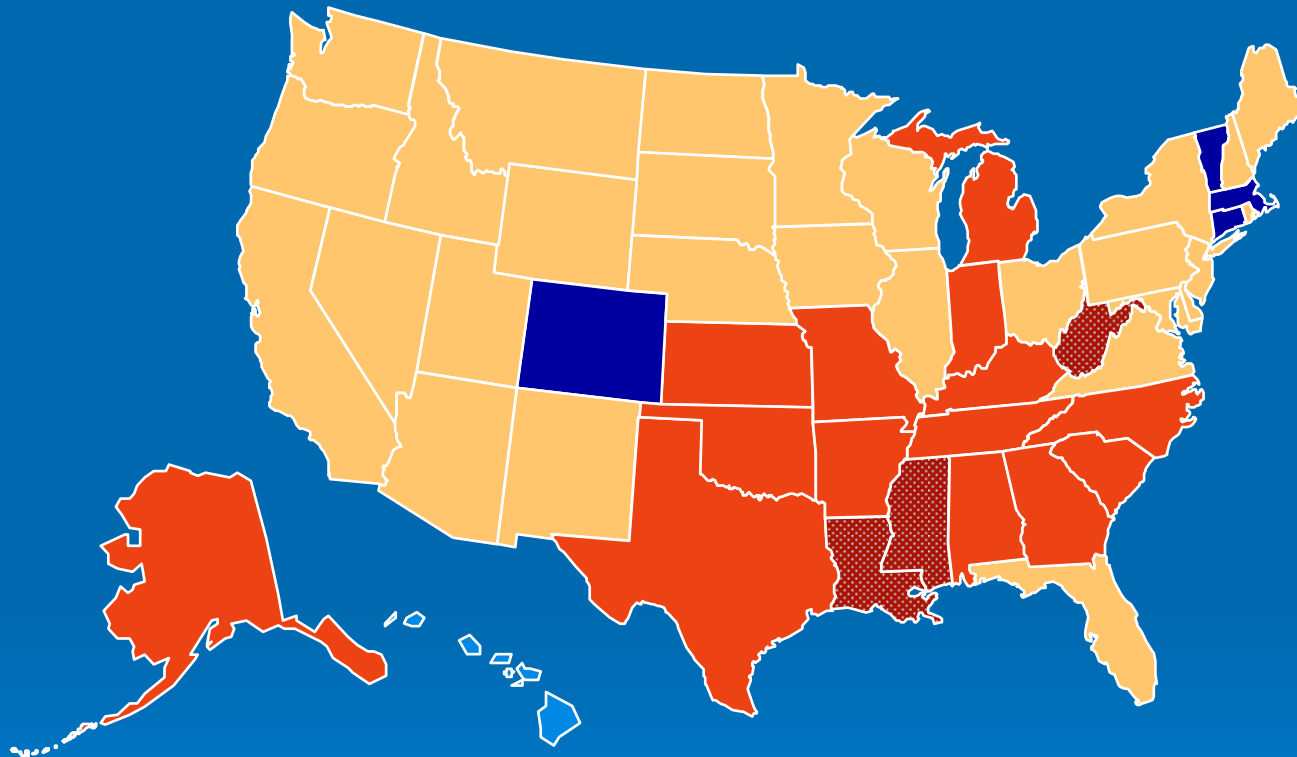
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Obesity Trends* Among U.S. Adults

BRFSS, 2005

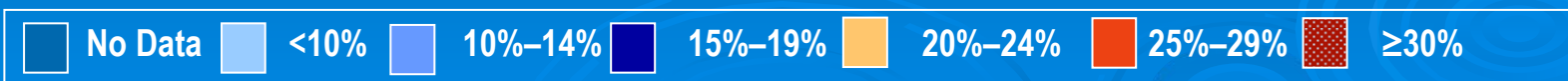
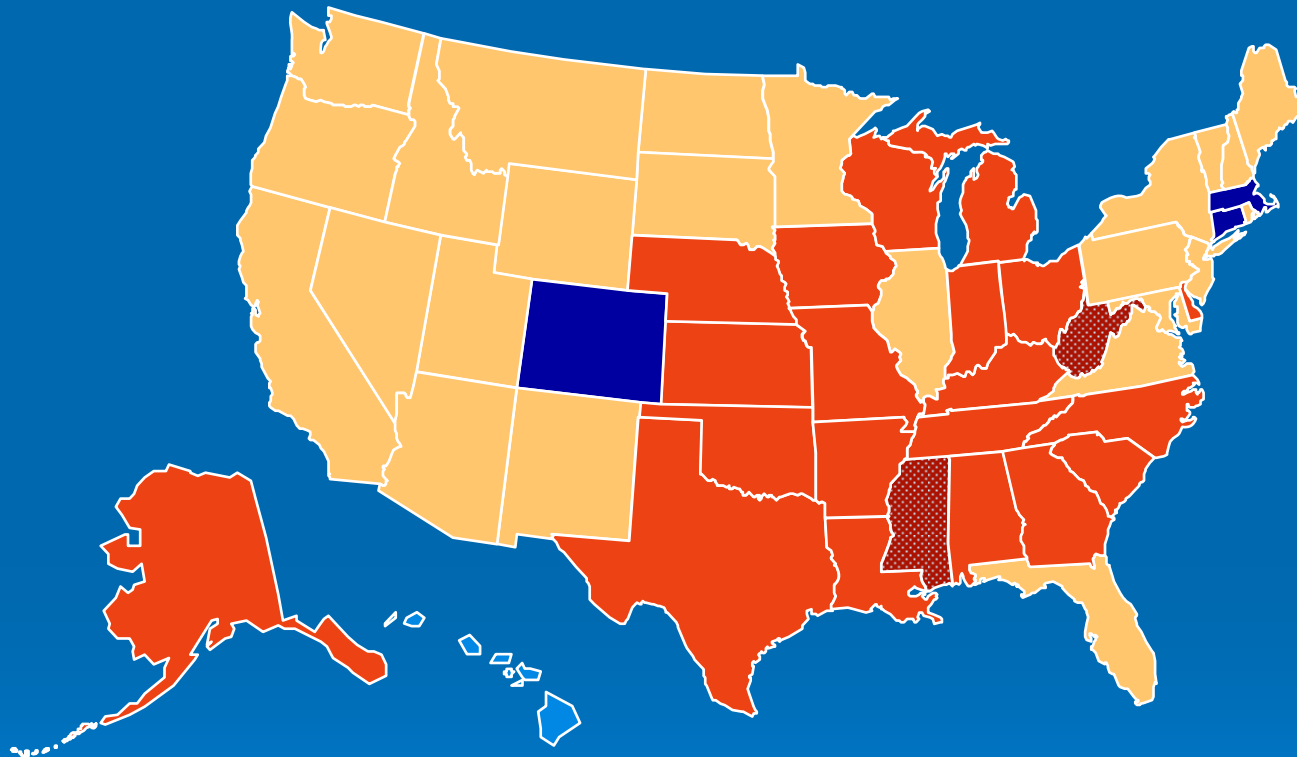
(*BMI ≥ 30 , or ~ 30 lbs. overweight for 5' 4" person)



Obesity Trends* Among U.S. Adults

BRFSS, 2006

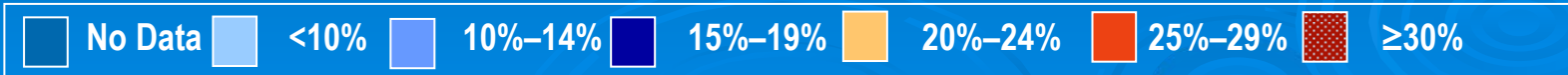
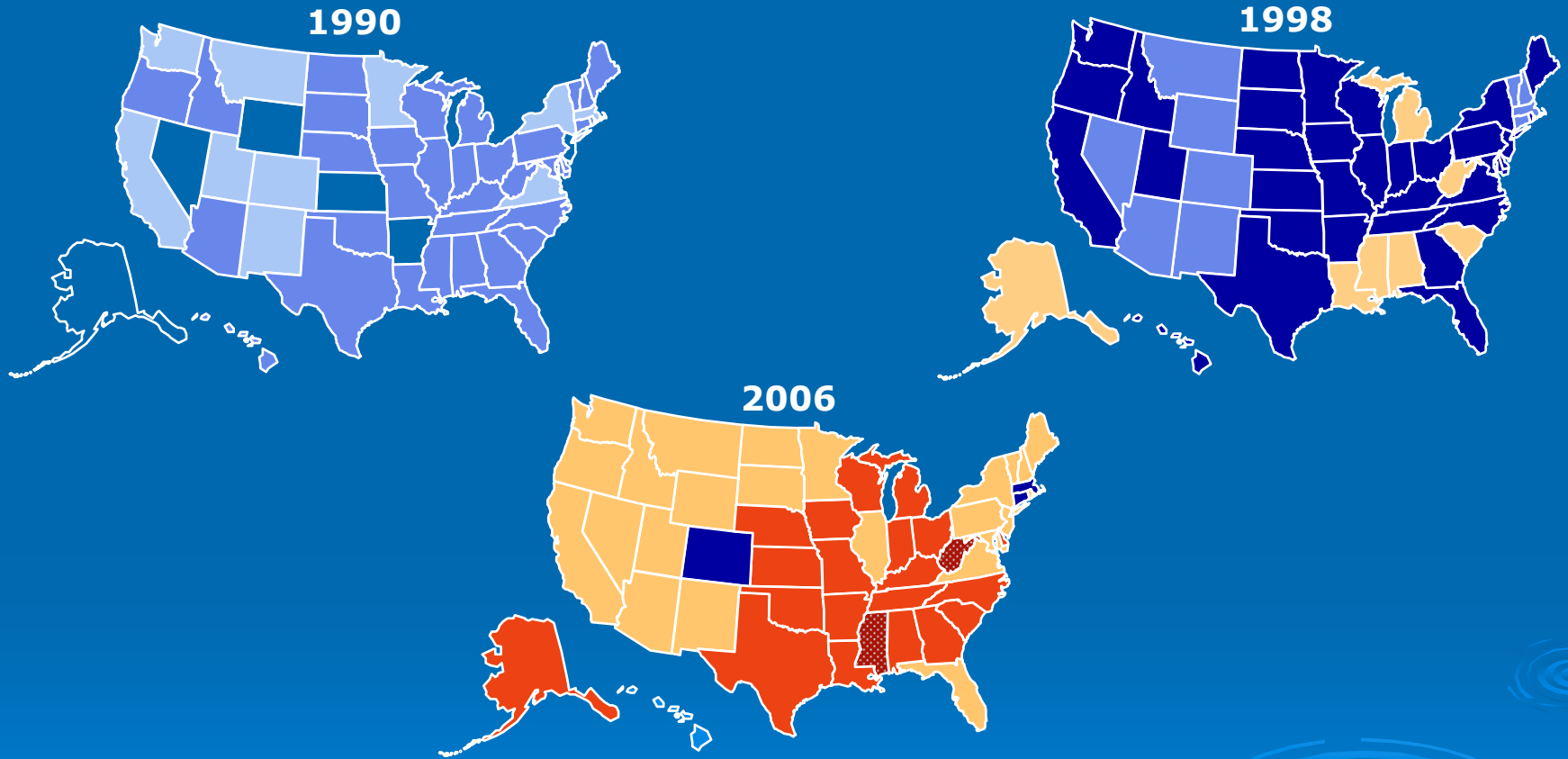
(*BMI ≥ 30 , or ~ 30 lbs. overweight for 5' 4" person)



Obesity Trends* Among U.S. Adults

BRFSS, 1990, 1998, 2006

(*BMI ≥ 30 , or about 30 lbs. overweight for 5'4" person)



Citations

Behavioral Risk Factor Surveillance System

- Source: BRFSS, CDC.
- Source: Mokdad A H, et al. JAMA 1999;282:16.
- Source: Mokdad A H, et al. JAMA 2001;286:10.
- Source: Mokdad A H, et al. JAMA 2003;289:1.

<http://www.cdc.gov/nccdphp/dnpa/obesity/trend/maps/>

- A similar process is taking place in many developed and developing countries

- Why is that happening?
- Complex interactions of factors
 - Genetics/Biology
 - Family/Personal History
 - Economic Factors
 - Physical/Social Environment
 - Communications
 - Psychological

- Drug use and dependence are similarly complex problems

Behavior is a function of:

➤ Genetic Makeup

- Sex
- Race
- Predispositions

➤ Personality

- Intelligence
- Impulsiveness
- History of Mental Disorders

➤ Individual History

- Age
- Family (Parents, Child Abuse, Neglect)
- Economic Status
- Education
- Crime (Incarceration)

➤ Current Environment

- Economy
- Employment
- Friends & Family, Neighborhood
- Legal

➤ Physiological States

- Medical Status
- Drug Dependence

➤ Behavioral Factors

- Self-Control Skills
- Social Skills
- Self-Esteem
- Motivation to Change

Obesity and Drug Abuse

1. Both have important behavioral components
2. Both are characterized by the compulsive consumption of substances
3. Consuming those substances has immediate pleasurable consequences
4. Consuming those substances has immediate imperceptible negative consequences which mediate negative health & psychological consequences in the future

Obesity and Drug Use

5. The behaviors involved are very resistant to change
6. When behaviors change there is a high risk of lapse and relapse
7. Both conditions are frequently associated with psychological problems related to low self-esteem and low self-efficacy

- **Some factors cannot be changed:**
- **Genetic Background**
 - Sex
 - Race
 - Predispositions (Addiction, Health/Mental Health)
- **Personality**
 - Intelligence
 - Impulsiveness
 - History of Mental Disorders
- **Individual History**
 - Age
 - Economic Status
 - Education
 - Family (Parents, Child Abuse, Neglect)
 - Crime (Incarceration)

But some can be changed:

- Current Environment
 - Economic Status
 - Employment Status
 - Relations with Friends & Family
 - Legal Status
- Physiological States
 - Medical/Mental Health Status
 - Drug Dependence
- Behavioral Factors
 - Self-Control Skills
 - Social Skills
 - Self-Esteem
 - Motivation to Change

Drug Abuse is Multidimensional

- Moral
- Legal
- Economic
- Epidemiologic
- Health
- Behavioral

Drug Abuse is Multidimensional

- Moral
- Legal
- Religious
- Economic
- Epidemiologic
- Health
- **Behavioral Framework**

Approaches to Behavior Change

- Pharmacotherapy
- Psycho-Social
 - Cognitive Restructuring
 - Motivational Interviewing
 - Positive psychology
 - Behavioral
 - Community Reinforcement
 - Contingency Management
 - Cognitive-Behavioral
 - Matrix
 - 12-Step
 - Other

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- We focus on drug use as a behavioral phenomenon
- Drug abuse comprises a large number of learned behaviors
- Learning involves the appearance of new behaviors as well as the reduction or elimination of behaviors



July, 2008

<http://www.writingcave.com/graphics/exorcist.jpg>



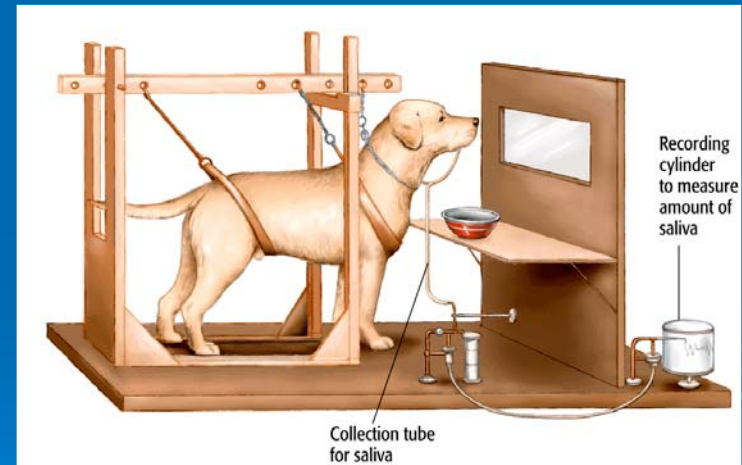
July, 2008

<http://www.littlefolkspuzzle.com/catalog/1350-30PCFLOORPUZZLE-KITTEN.JPG>

Learning Mechanisms

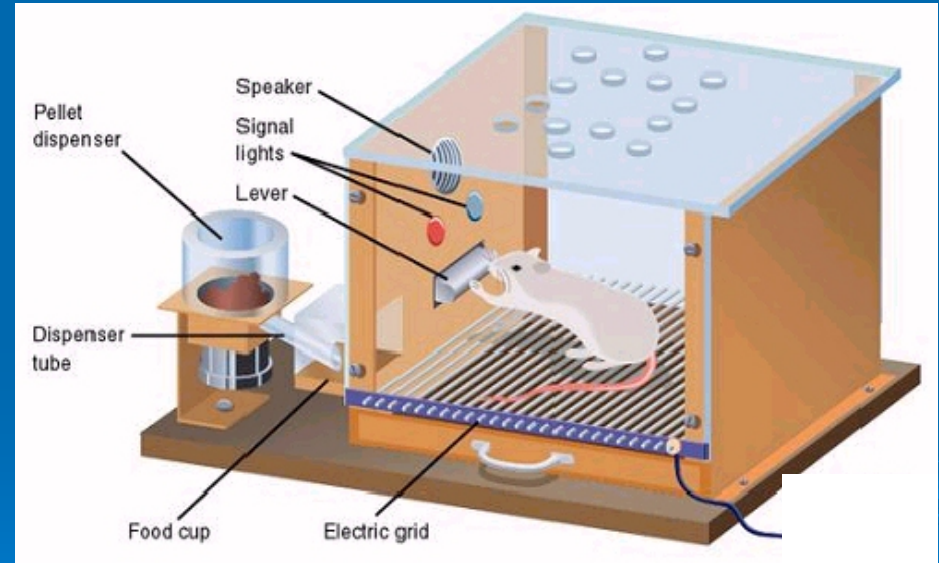
➤ Respondent or Classical Conditioning

- Pavlov
- Events in the environment acquire new functions
 - Bell → Salivation
 - Images → Fear
 - Faces → Joy
 - Words → Sensations
- Drug craving is classically conditioned



Learning Mechanisms

➤ Operant Conditioning



<http://www.messybeast.com/intelligence.htm>

http://www.scottsdalecc.edu/ricker/psy101/readings/section_3/images/skinner_box.jpg

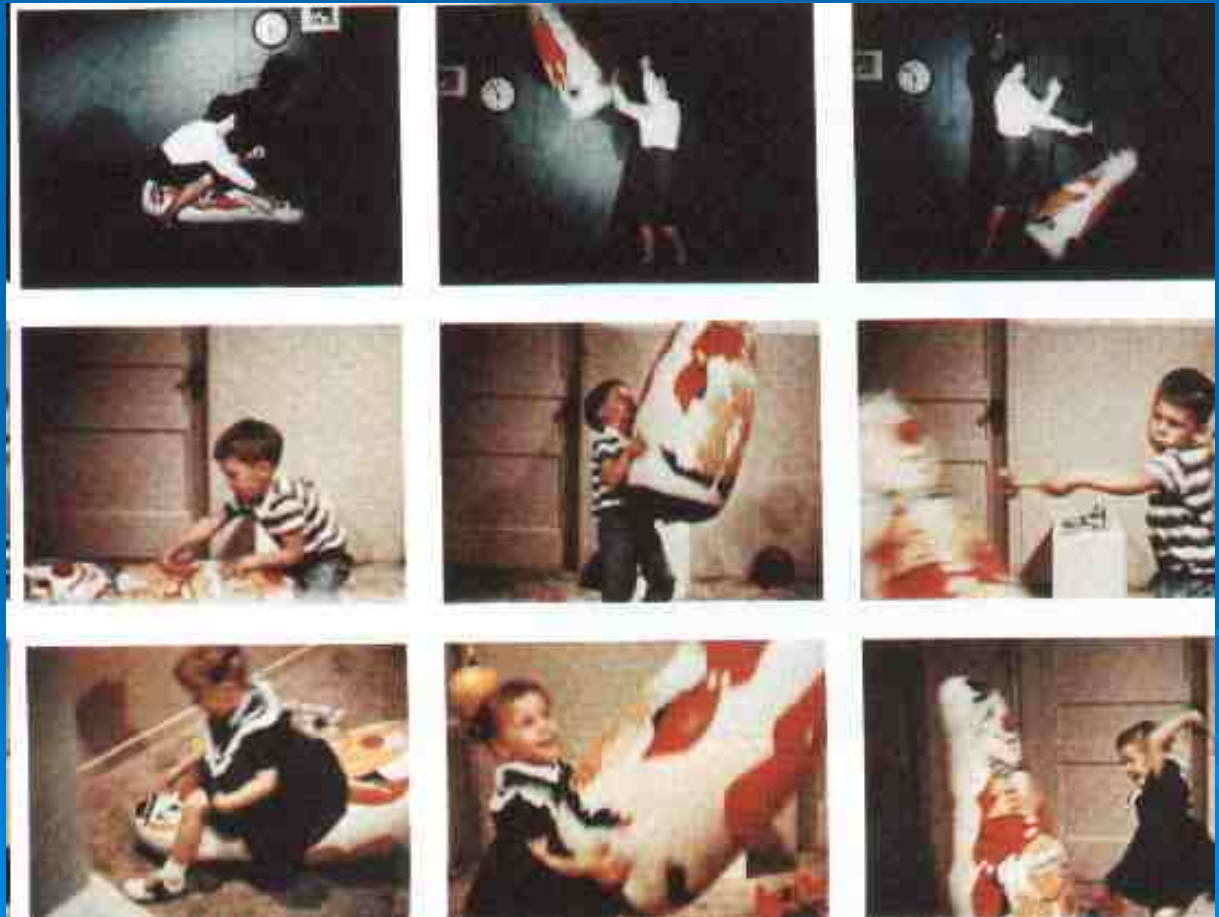
Learning Mechanisms

➤ Operant Conditioning

- Thorndike, Skinner
- The consequences of our behavior affect its future occurrence
- Reinforcement --- Punishment
- Most human behavior is operant behavior
- Eating and using drugs are operant behaviors

Learning Mechanisms

➤ Social Learning



Learning Mechanisms

➤ Social Learning

- Bandura
- We learn by imitation
- Models show both the behavior and its consequences
- Social behavior
 - Sex Roles
 - Playing
 - Attitudes
 - Values
 - Beliefs

Learning Mechanisms

➤ Cognitive Learning

- Premack, Sidman
- We learn symbols by semantic association
- $A=B$, $B=C$, then $A=C$
 - Conditional discrimination
 - Inference
 - Hypothesis deduction



Learning Mechanisms

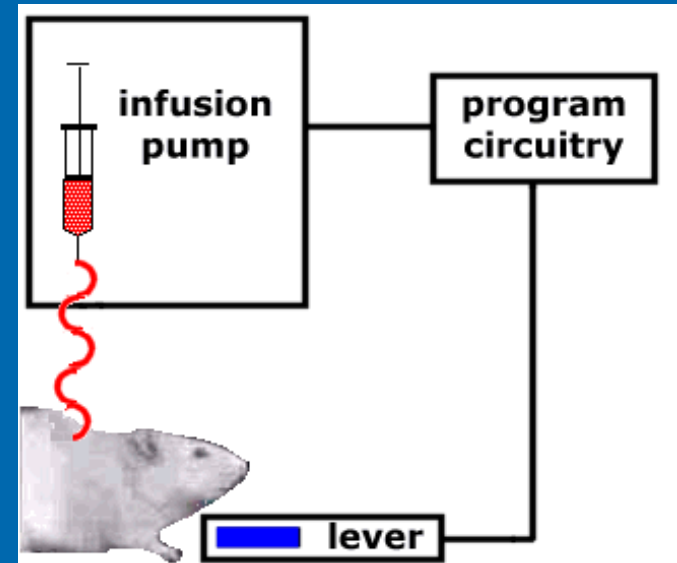
- All four known learning mechanisms participate in most human behavior
- We can focus on specific mechanisms or characteristics of the target behaviors
- **Learning is a constantly ongoing process**

Drug Use as Behavior

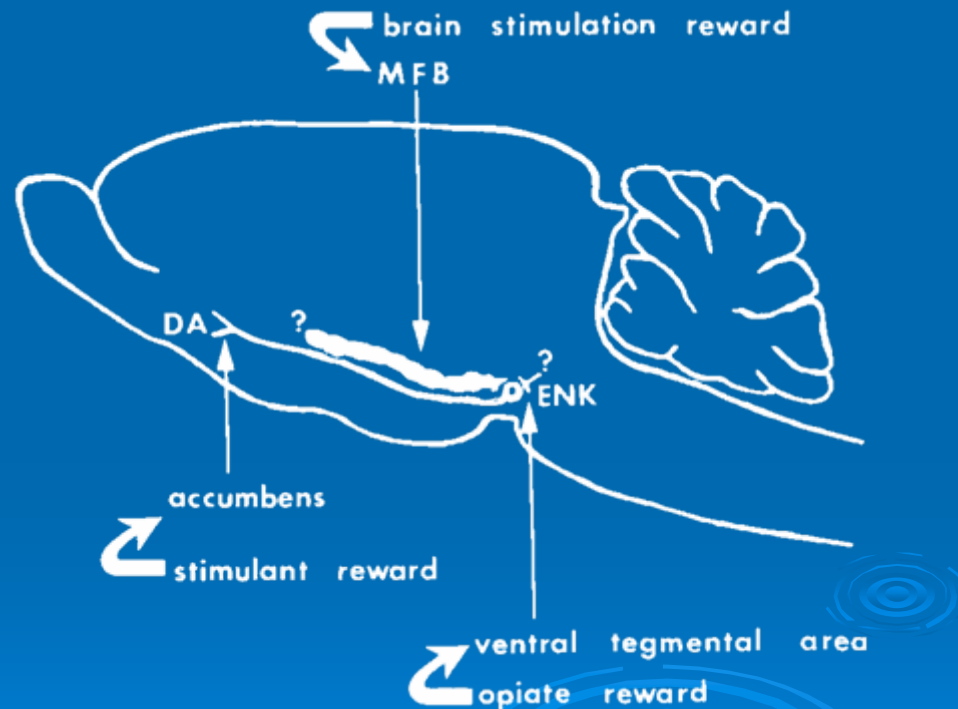
- Drug taking, drug seeking, drug buying/selling, are operant behaviors
- Operant behaviors are strongly influenced by their consequences
- Reward not only feels good, but it strengthens neural connections that make learning possible
- What is the evolutionary advantage to having reward mechanisms?

Drug Use as Behavior

- Drugs have reinforcing effects
 - If given the opportunity, laboratory animals would self-administer many of the drugs used by humans (Schuster & collaborators 1960s)
 - These studies proved that drugs act as reinforcers, just like food, water and sex

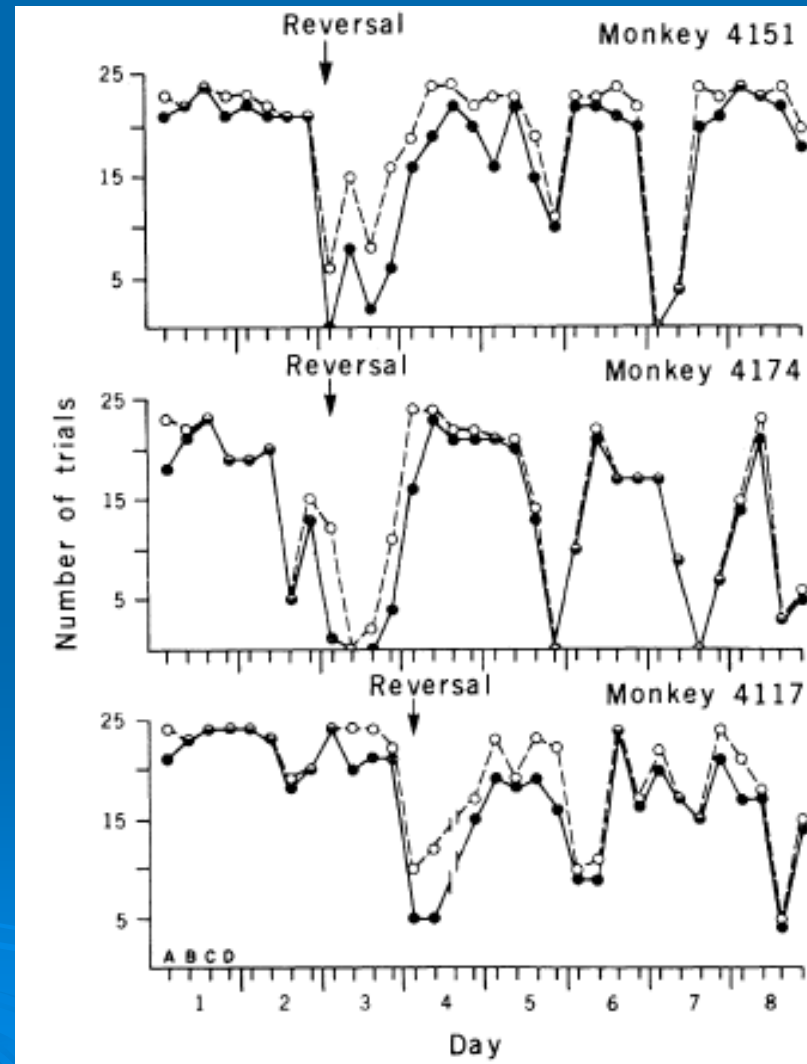


- The brain has specialized pathways that mediate reward and motivation
- Direct electrical stimulation of the medial forebrain bundle (MFB) produces intensely rewarding effects
- Psychomotor stimulants and opiates can also activate this reward system by their pharmacological actions in the nucleus accumbens and ventral tegmental area, respectively.



Drug Use as Behavior

- Studies by Aigner and Balster (1978) showed that when rhesus monkeys are given the choice between food and cocaine, they tend to choose cocaine almost exclusively, resulting in weight loss and increased toxicity



Drug Use as Behavior

- If drugs can be such powerful reinforcers as to compete with food in a hungry animal, what can possibly be done to change drug-taking behavior?

Drug Use as Behavior

- Nader and Woolverton (1991) showed in a similar choice model that increasing the magnitude of food, a non-drug reinforcer, decreases cocaine self-administration



Drug Use as Behavior

- When the amount of food available as the alternative to drug was held constant while the dose of cocaine was varied, the frequency of drug choices and total drug intake increased in a dose-related fashion
- When the amount of food available was increased while the dose of cocaine was held constant, the frequency of drug choices and total drug intake decreased (Nader and Woolverton (1991))

Drug Use as Behavior

- In other words, the reinforcing value of drugs is relative to the availability and magnitude of alternative reinforcers
- These results helped explain why not everyone who tries drugs becomes a compulsive drug user
- Alternative reinforcers are food, water, sex for rats
- Food, water, sex, family, friends, job, money, spirituality, and many others for humans

Implications for Therapy

Drug use is affected by the relative value of its consequences,
if we can modify the relative value of drugs then, we can change drug use

How do we do that?

Approaches to Behavior Change

- Pharmacotherapy
- Psycho-Social
 - Cognitive Restructuring
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 - Other

Drug Use as Behavior

- In 1965 Stitzer and other clinical investigators showed that if methadone maintenance take-home doses were made available on condition that patients showed drug-free urine samples, the level of drug abstinence significantly increased
- They demonstrated that take-home methadone doses had important behavioral effects above those of an opioid agonist; they could be effectively used to motivate abstinence from many drugs in MMT patients

Contingency Management

- Since then, take-home methadone doses have been used effectively as reinforcers to:
 - Reduce opioid use
 - Reduce cocaine use
 - Reduce alcohol use
 - Reduce benzodiazepine use
 - Increase attendance to counseling

Drug Use as Behavior

- In general, these results are consistent with the hypothesis that drug use by humans can be decreased by programming alternative positive reinforcers for clinically desirable behavior
- And that is the general strategy used in Contingency Management Programs (CMP)

Drug Use as Behavior

Contingency Management Programs (CMP) facilitate behavior change by arranging alternative positive reinforcers for desirable behaviors

Drug Use as Behavior

Contingency Management Programs (CMP) have been effectively used to

1. Increase retention in treatment
2. Reduce drug use

In addition, CM can be used to change other important behaviors such as family relations, employment status, compliance with medications, psychiatric symptoms, and others

Contingency Management

- CMPs have three basic elements:
 1. The behavior(s) to be changed
 2. The alternative reinforcer(s)
 3. The “contingencies of reinforcement” or rules by which reinforcers will be available

Contingency Management

- Target behaviors must be clearly specified and subject to objective verification
 - Biochemical monitoring
 - Behavior traces
 - Record keeping
- Reinforcers should be selected functionally
- Contingencies should be clear and address both the occurrence and non-occurrence of the target behavior(s)

Contingency Management

- The contingencies should be based on behavior principles
- General Guidelines:
 - Behavioral Contracting
 - Behavior Frequency
 - Successive Approximations
 - Differential Reinforcement
 - Reinforcement Magnitude
 - Immediacy of Consequences
 - Consistency of Consequences

General Guidelines

➤ Behavioral Contracting

- Essential to CMP
- Behavior Contracts specify the target behaviors, reinforcers and contingencies, as well as the times, places, persons, and verification methods involved
- Behavior Contracts should be clearly written and signed by both parties
- Can apply to individuals or groups
- Can be very helpful to therapists

General Guidelines

- Behavior Frequency
 - The baseline frequency of a target behavior must allow for change
 - Beware of floor and ceiling effects

General Guidelines

- **Successive Approximations**
 - Use when the behavior doesn't exist or has very low frequency
 - Break behavior into smaller components
 - Reinforce occurrence of earliest component
 - Gradually increase the requirement for reinforcement until the desired behavior occurs regularly

General Guidelines

- Differential Reinforcement
 - Specify different consequences for the occurrence and non-occurrence of the desired behavior

General Guidelines

- Reinforcement Magnitude
 - In many cases the reinforcing effect is proportional to the reinforcer's magnitude
 - Use increasing magnitude to reinforce more complex behavior
 - Use decreasing magnitude or magnitude reset as consequence for lapses or non-occurrence

General Guidelines

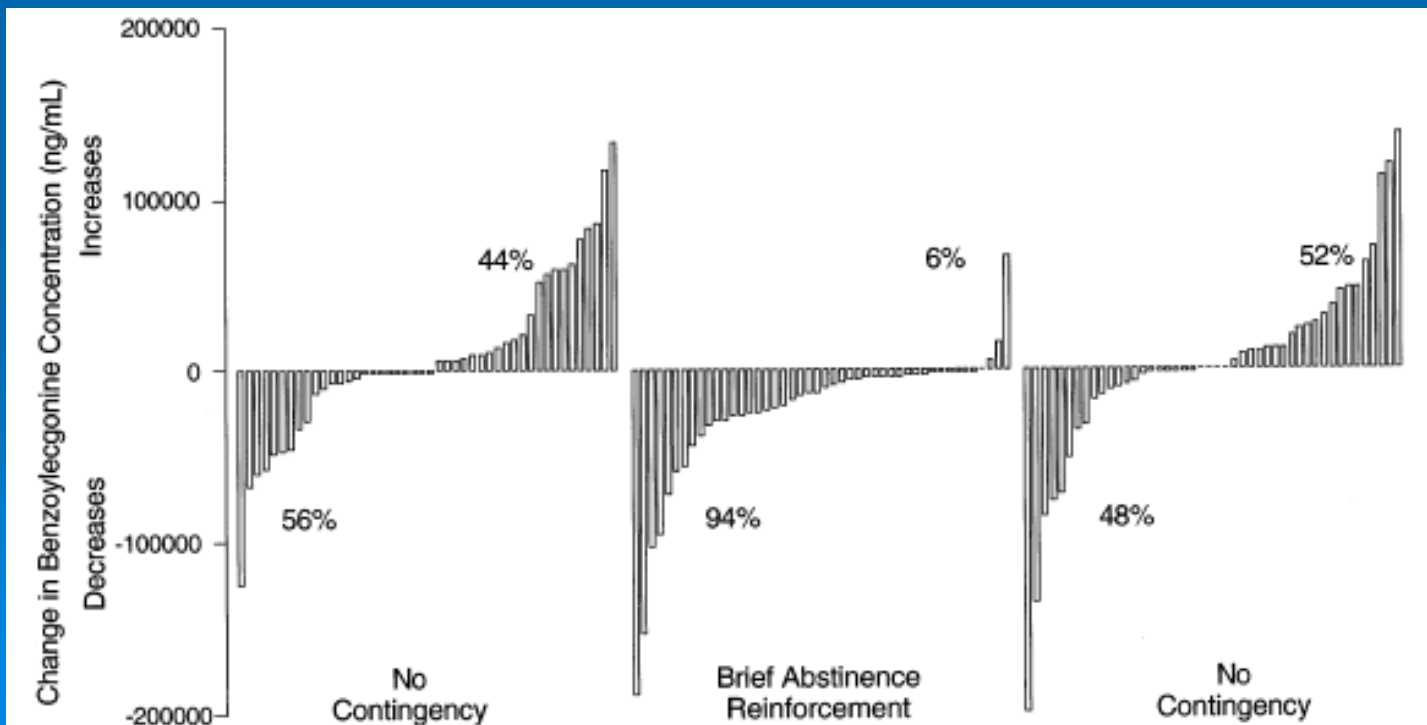
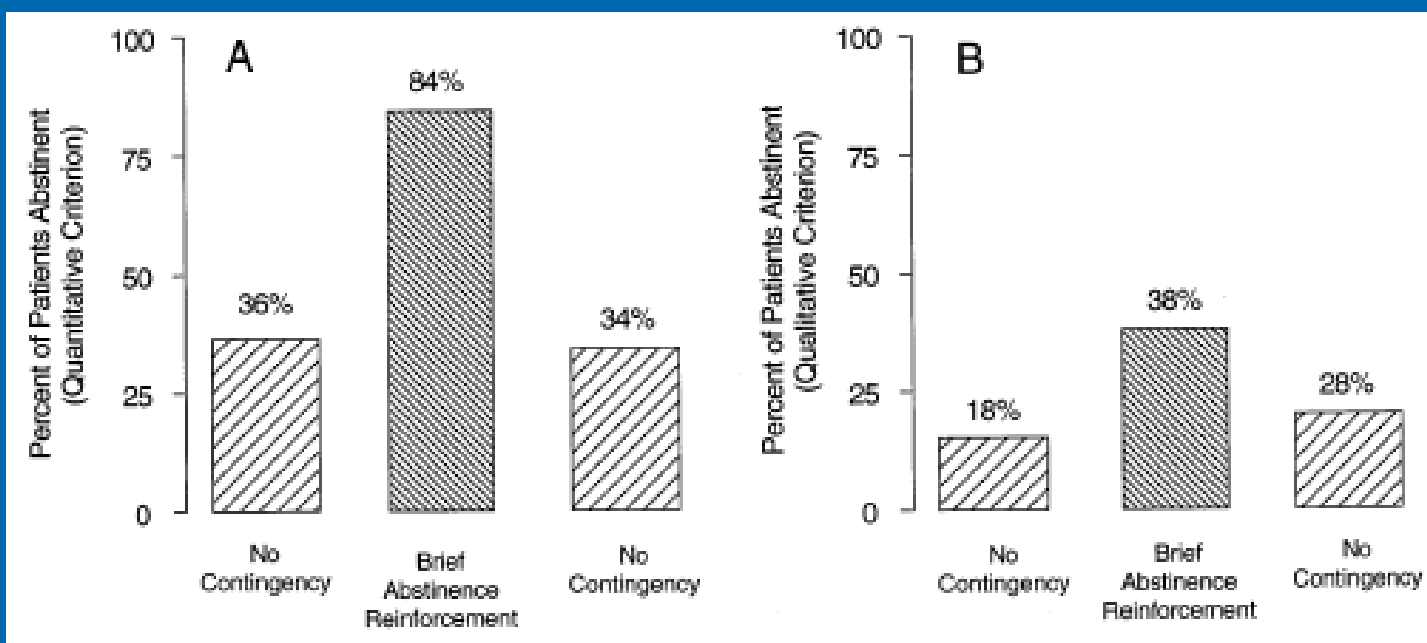
- **Immediacy of Consequences**
 - All consequences should be given as promptly after the behavior as possible
 - If it is not possible to provide immediate consequences, try using tokens or IOUs to mediate the time

General Guidelines

- Consistency of Consequences
 - Above all, consistency in implementing the contingencies as specified in the behavior contract is essential
 - Do not fail to provide consequences as specified in the contract
 - In general, do not include in the contract any clause that cannot be consistently enforced

Target Behaviors

- Abstinance from Drugs
 - Random Screening
 - Days & Number
 - Observed Urine Collection
 - Lab Analysis vs. Kit
 - Drugs Tested
- Attendance to Therapy Sessions
 - Participation



Target Behaviors

➤ Medication Compliance

- TB
- HIV
- Psychiatric
- Methadone, Buprenorphine, Disulfiram, Naltrexone, Bupropion

➤ Verification

- Medication recall
- Urine/Blood/Hair tests
- Pill counts

Target Behaviors

- Compliance with Clinic Regulations
 - Attendance/Timeliness
 - Language
 - Demeanor

Target Behaviors

- Appropriate Social Behavior
- Positive Family/Friend Interactions
- Attendance to AA Meetings
- Attendance to Church
- Attendance to Job Skills Training
- Finding/Keeping a Job

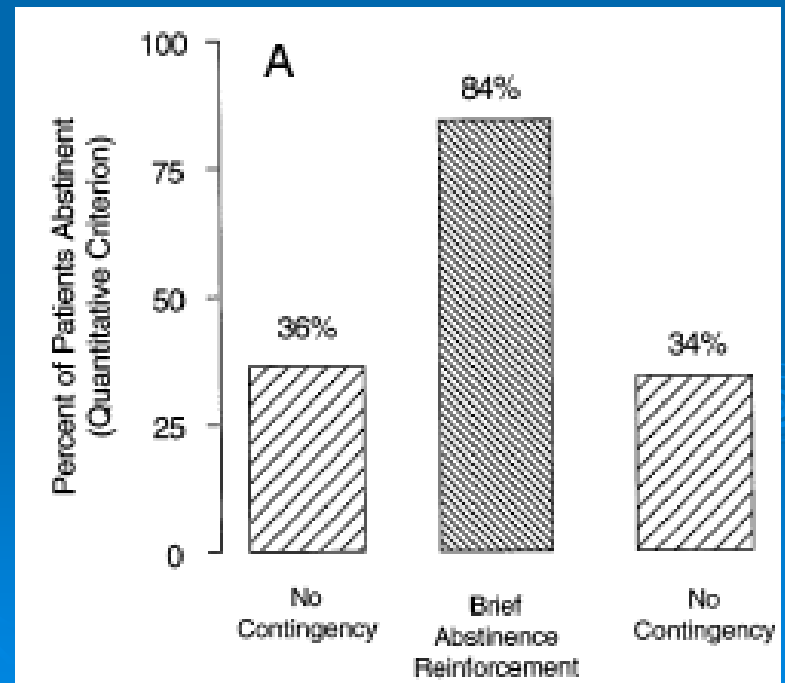
Possible Reinforcers

➤ Clinic Privileges

- Take-home doses
- Parking preferences
- Clinic/Dosing/Meeting hours
- Excused absences

Possible Reinforcers

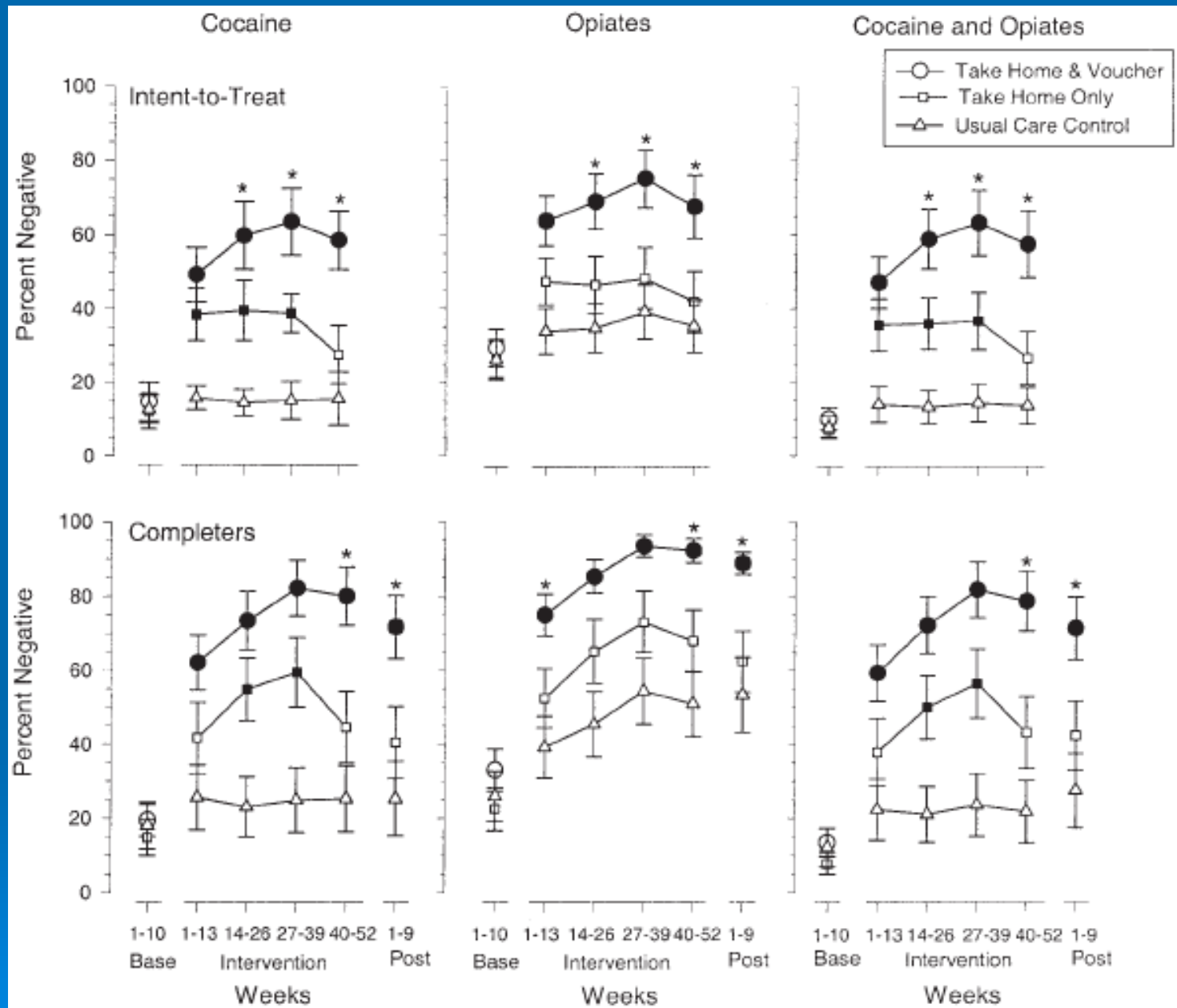
- Cash
- Discounts/Rebates



Possible Reinforcers

➤ Vouchers

- Exchangeable for goods & services
- Increasing value
- Reset in value
- Exchange procedures
- Cost of program
- Possible financing options
 - Grants/ Donations
 - Sheltered employment
 - Employer support



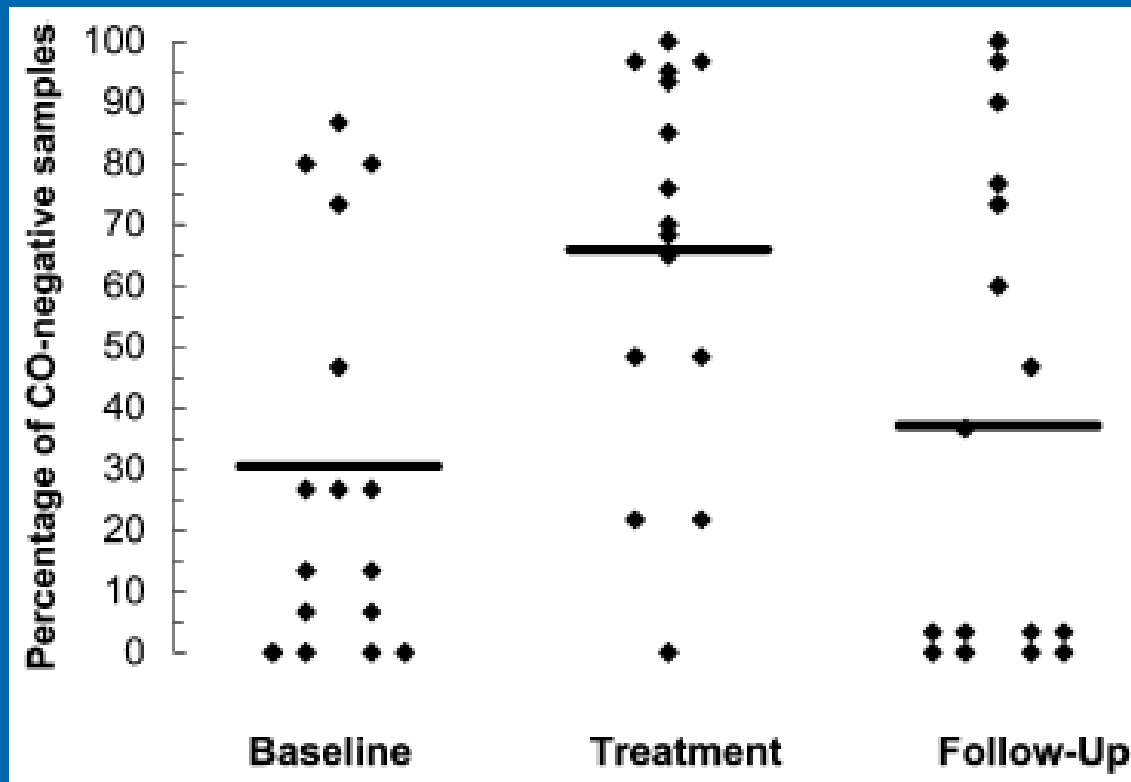


Figure 1. Percentage of CO- and COT-negative samples submitted in each treatment phase. Filled diamonds represent individual means, and bars represent sample means. Significantly more negative samples were submitted during the intervention (65.89%) than during baseline (30.42%) and follow-up (37.10%; both $p < .05$).

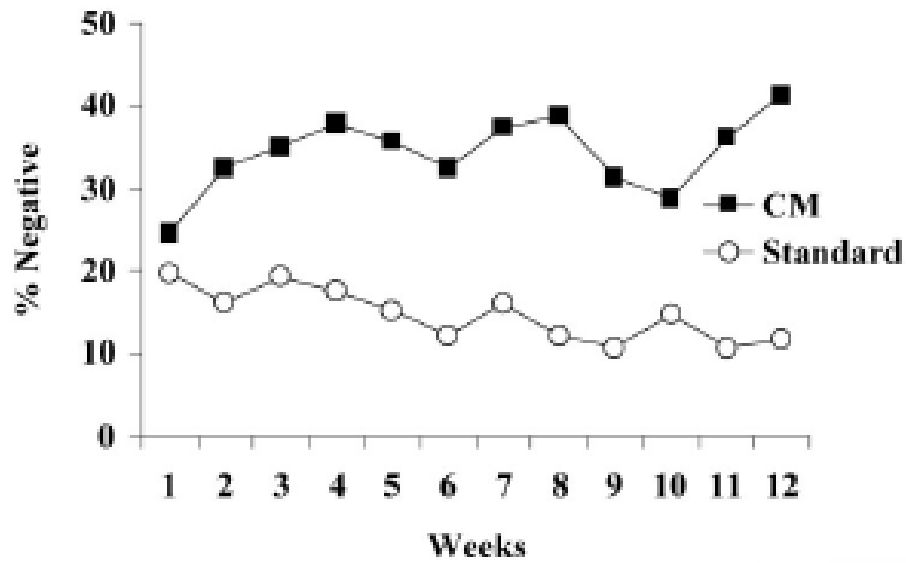
Possible Reinforcers

- Variable Ratio Reinforcement/Prizes
 - The prize bowl
 - 500 slips
 - 250 “Good Job!”
 - 219 Small Prize (\$1)
 - 30 Large Prizes (\$20)
 - 1 Jumbo Prize (\$100)

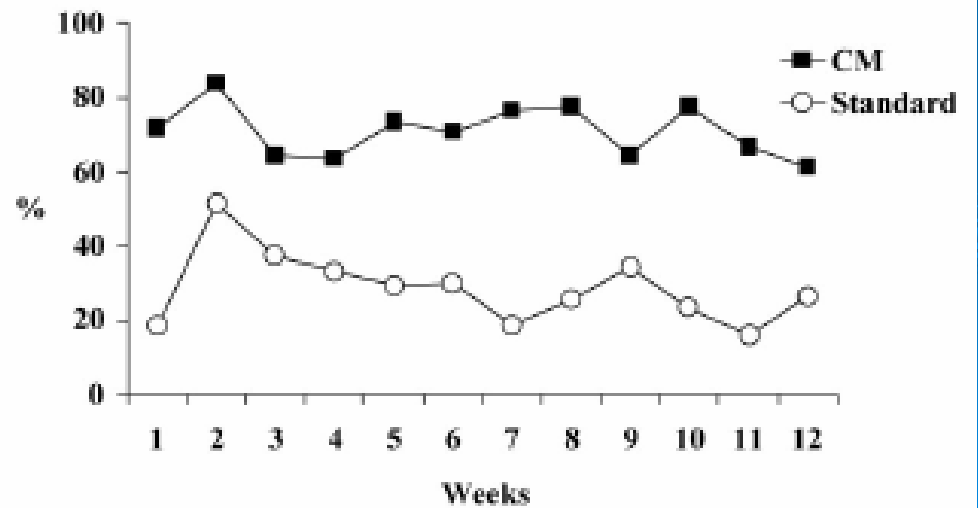
Possible Reinforcers

- Variable Ratio Reinforcement/Prizes
 - The number of draws can be proportional to the behavior up to a preset max
 - Slips returned to bowl after every draw
 - Reset clause

Cocaine abstinence



Group attendance



Designing a CMP

1. Choose a target behavior you can verify
2. Choose a functional reinforcer
3. Apply behavioral principles in designing the contingencies
4. Develop a behavior contract
5. Ensure consistent implementation
6. Keep good records
7. Use results to develop better interventions in the future