Early Childhood Obesity: Concerns, Challenges and Recommendations

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Wake Forest School of Medicine

Faculty Disclosure Information

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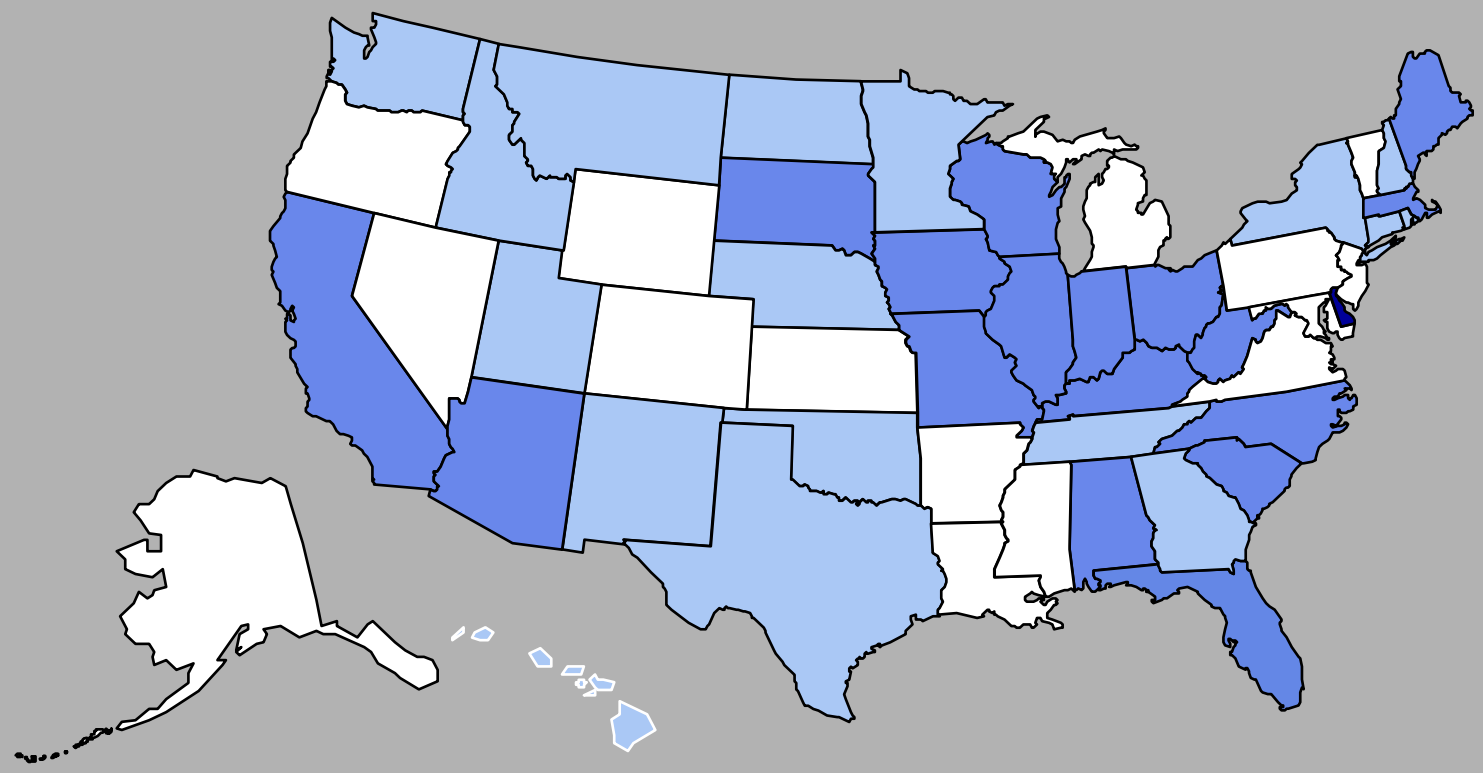
"I do not intend to discuss an unapproved/investigative use of a commercial product/device in my presentation.

Obesity Trends* Among U.S. Adults

BRFSS, 1988

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” person)

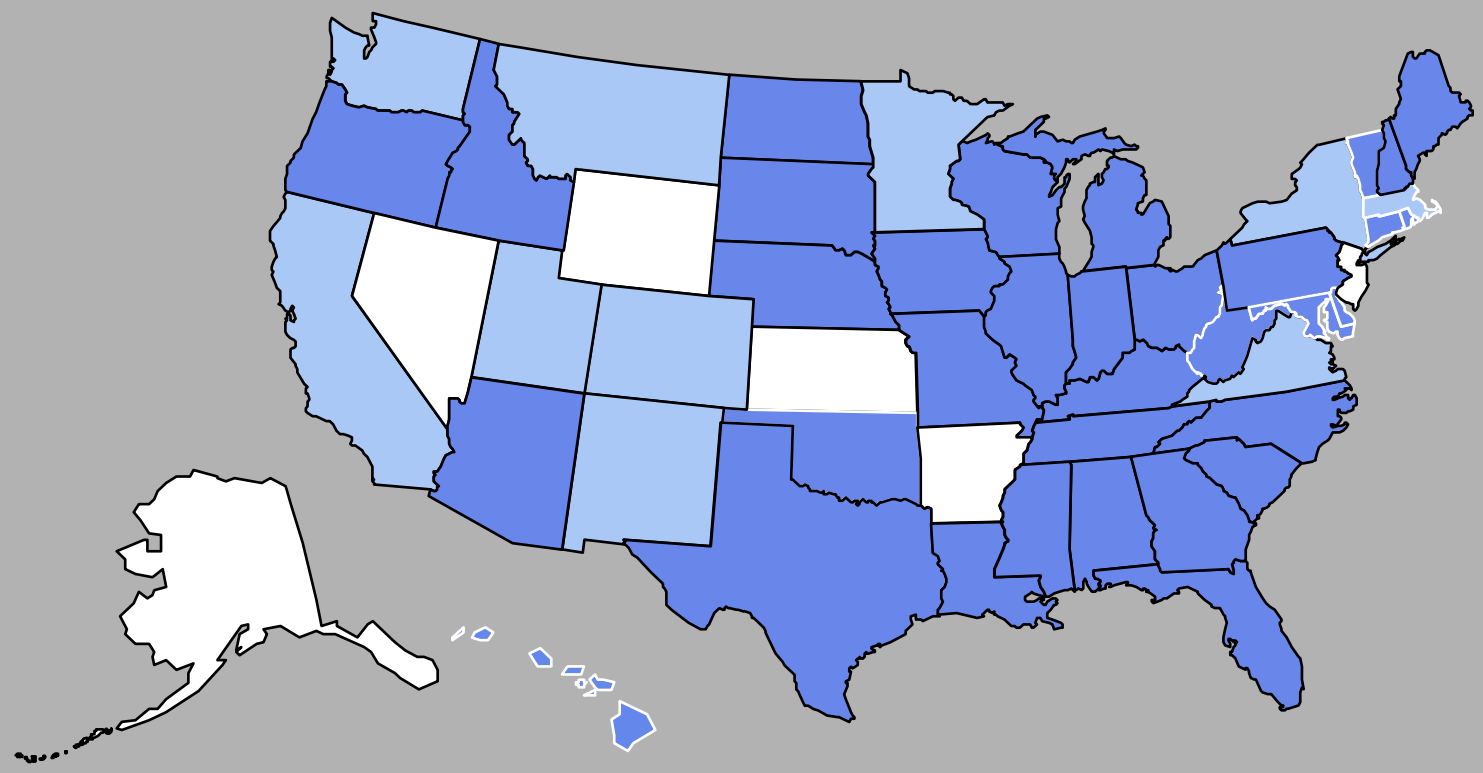


No Data | <10% | 10%–14%

Obesity Trends* Among U.S. Adults

BRFSS, 1990

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” person)



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Obesity Trends* Among U.S. Adults

BRFSS, 1992

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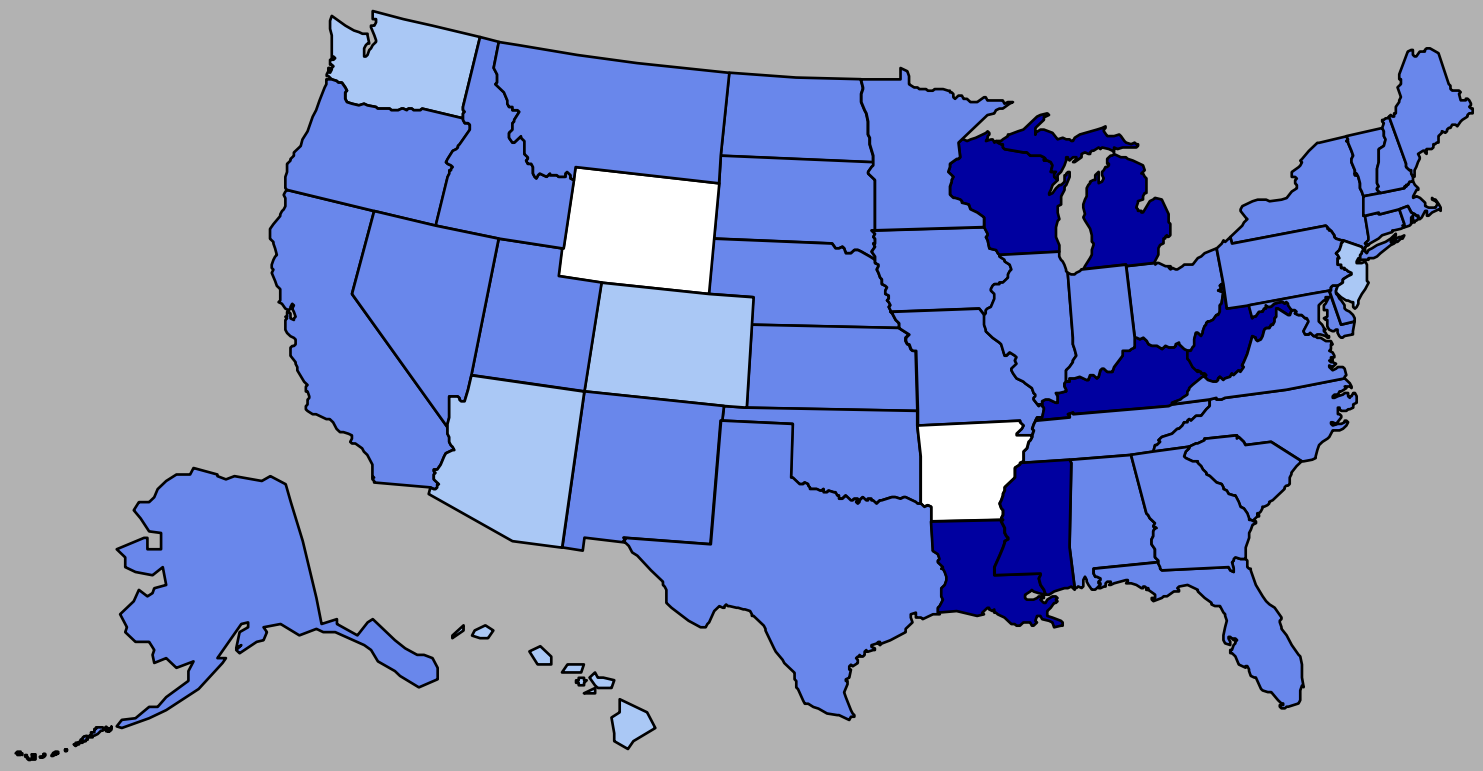

No Data | <10% | 10%–14% | 15%–19%

Obesity Trends* Among U.S. Adults

BRFSS, 1994

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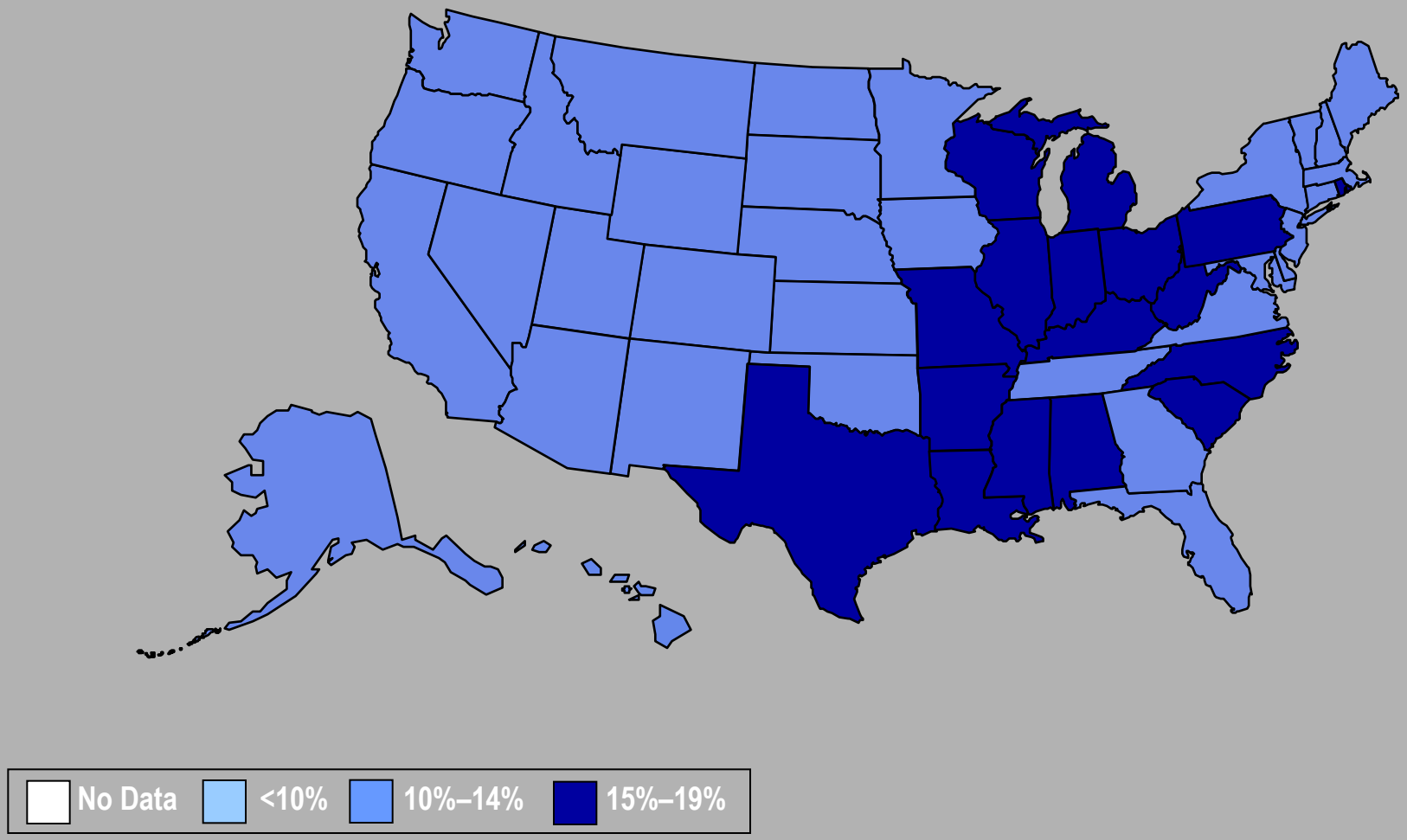
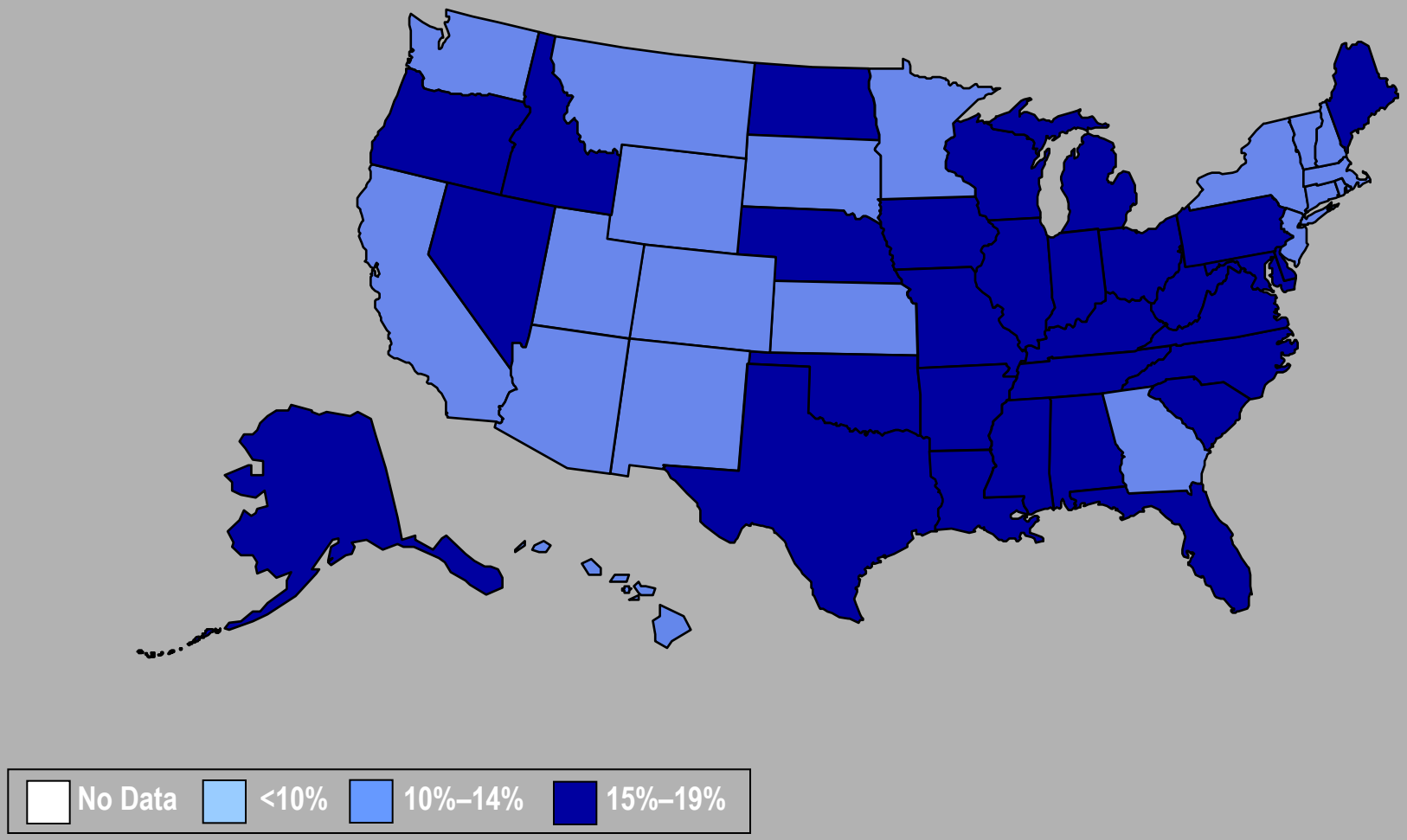


Obesity Trends* Among U.S. Adults

BRFSS, 1996

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” person)



Obesity Trends* Among U.S. Adults

BRFSS, 1998

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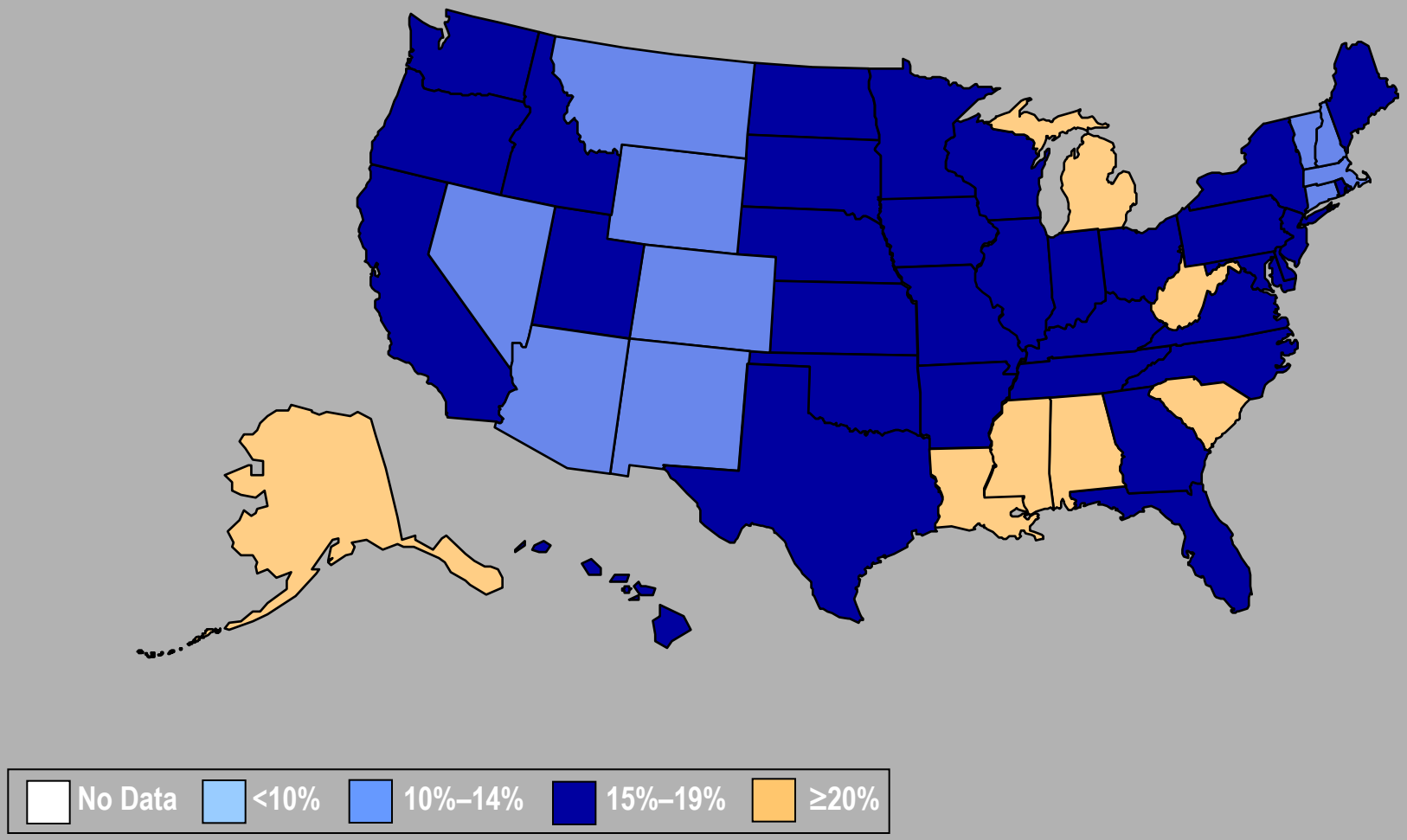

Obesity Trends* Among U.S. Adults

BRFSS, 2000

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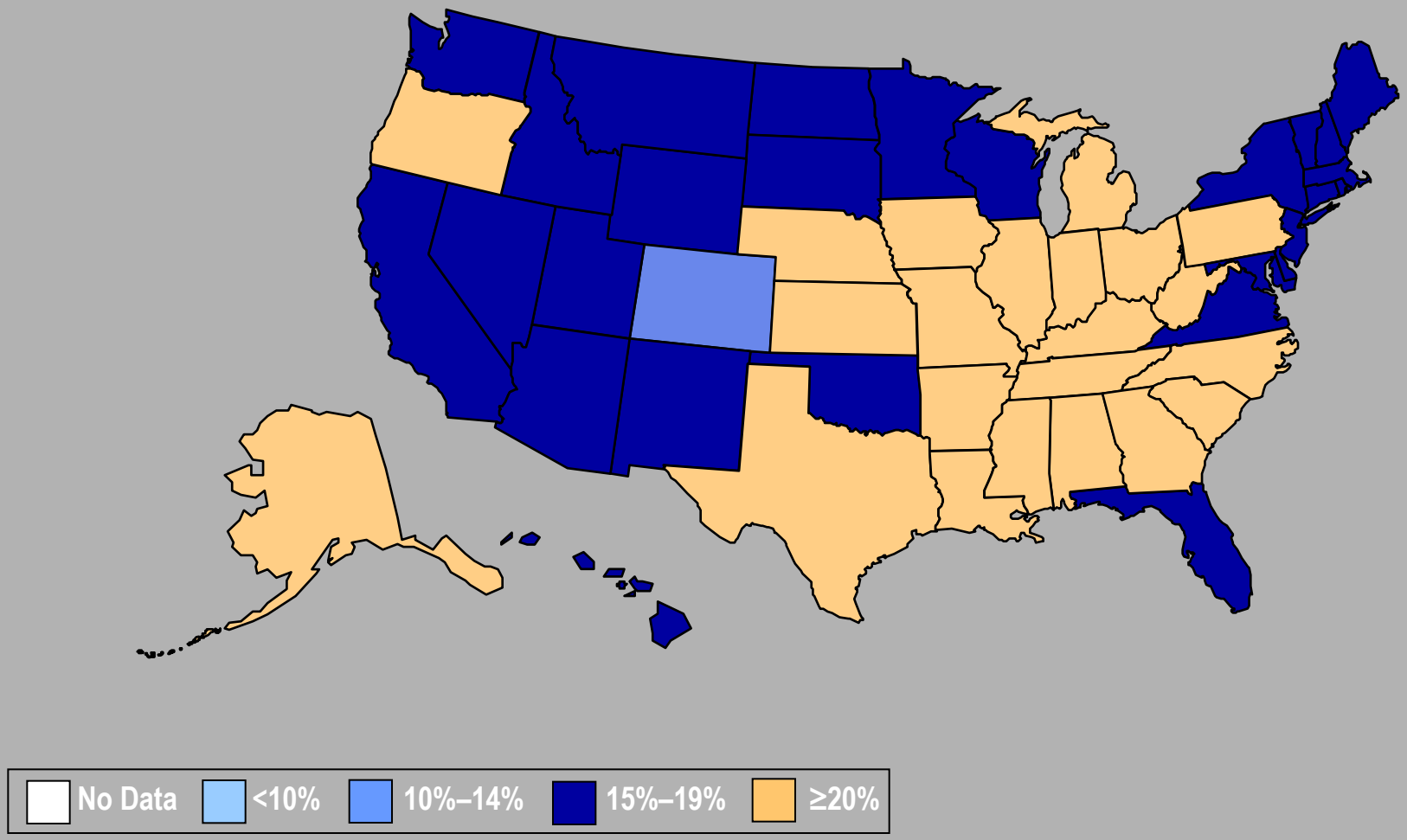
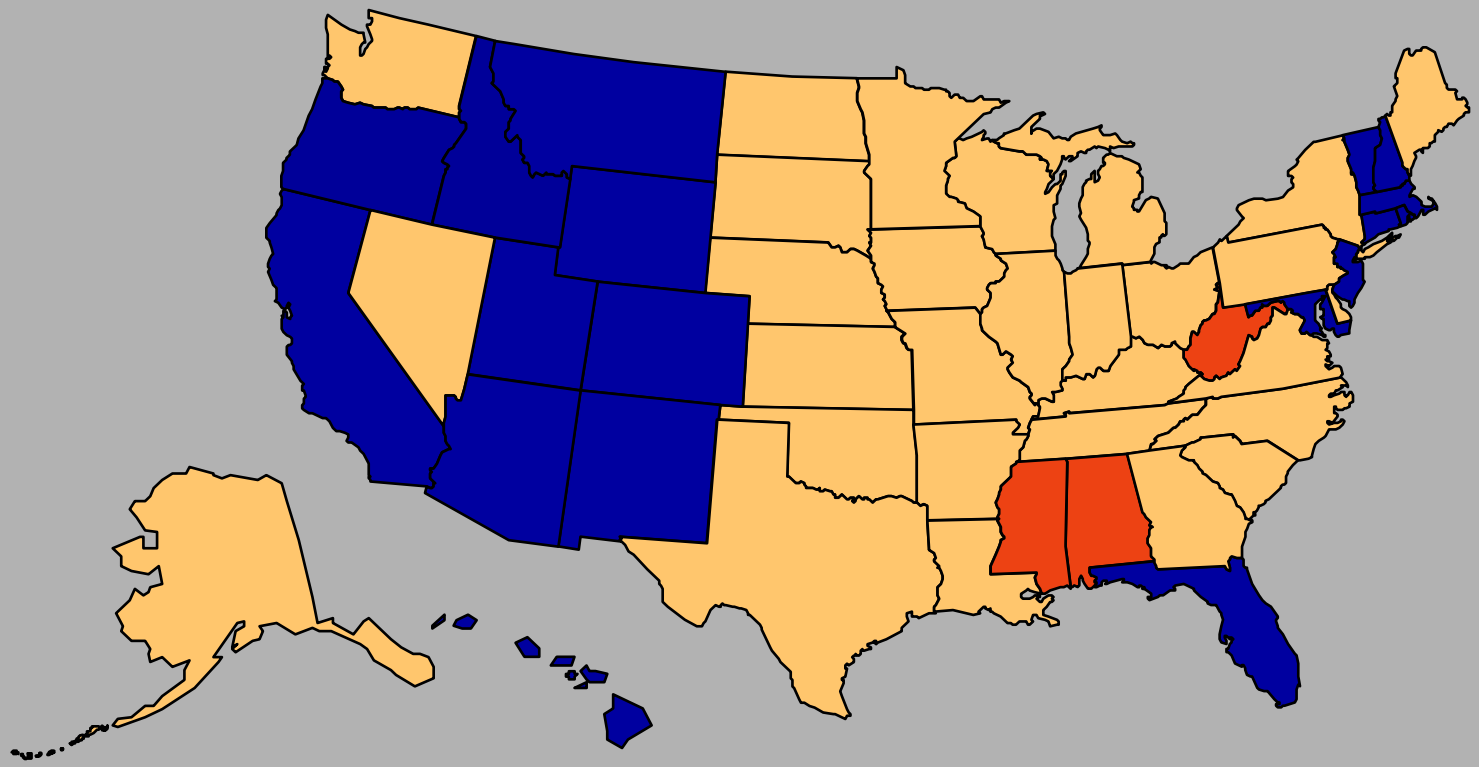


Obesity Trends* Among U.S. Adults

BRFSS, 2002

(*BMI ≥30, or ~ 30 lbs overweight for 5’ 4” person)



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Obesity Trends* Among U.S. Adults

BRFSS, 2004

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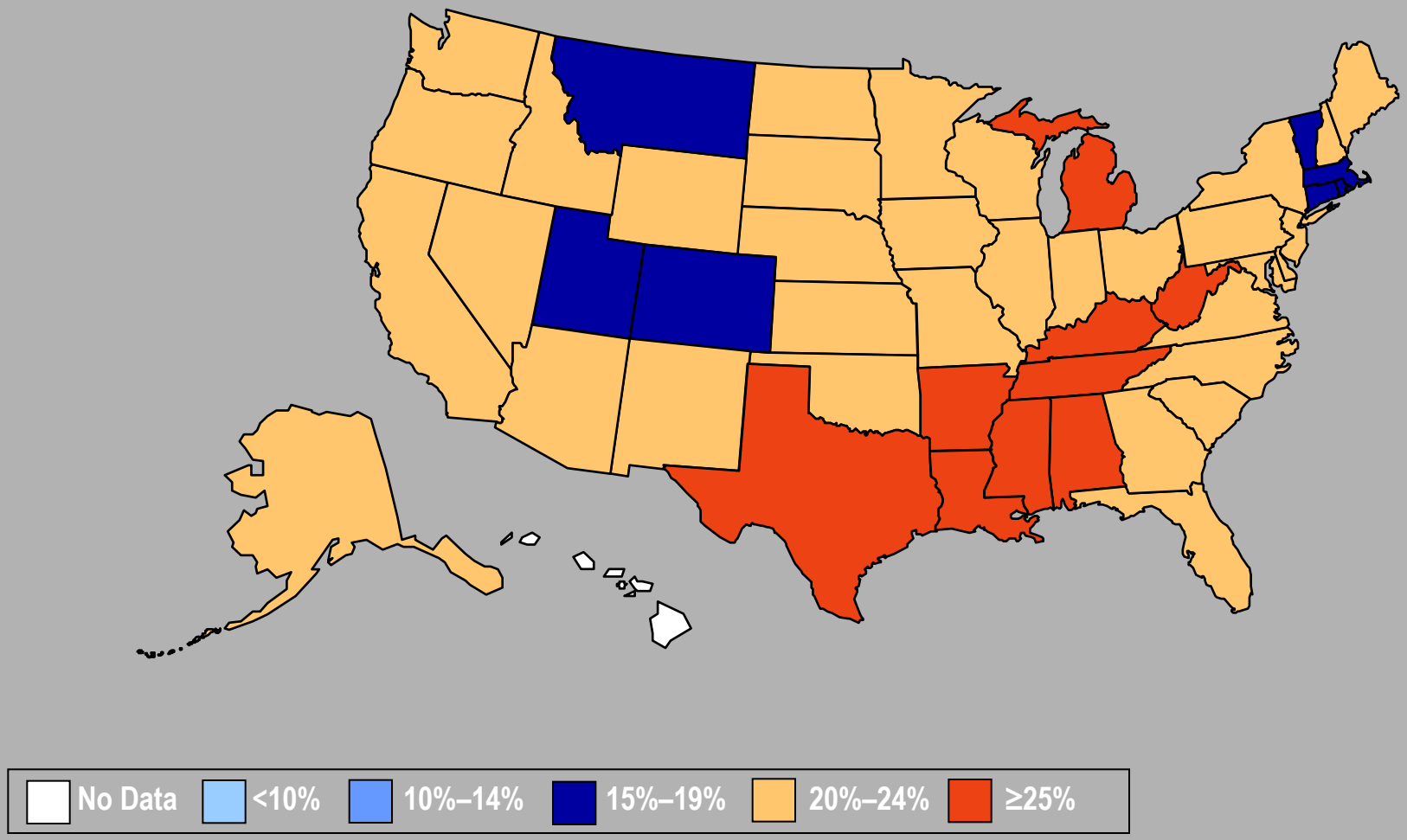

Obesity Trends* Among U.S. Adults

BRFSS, 2006

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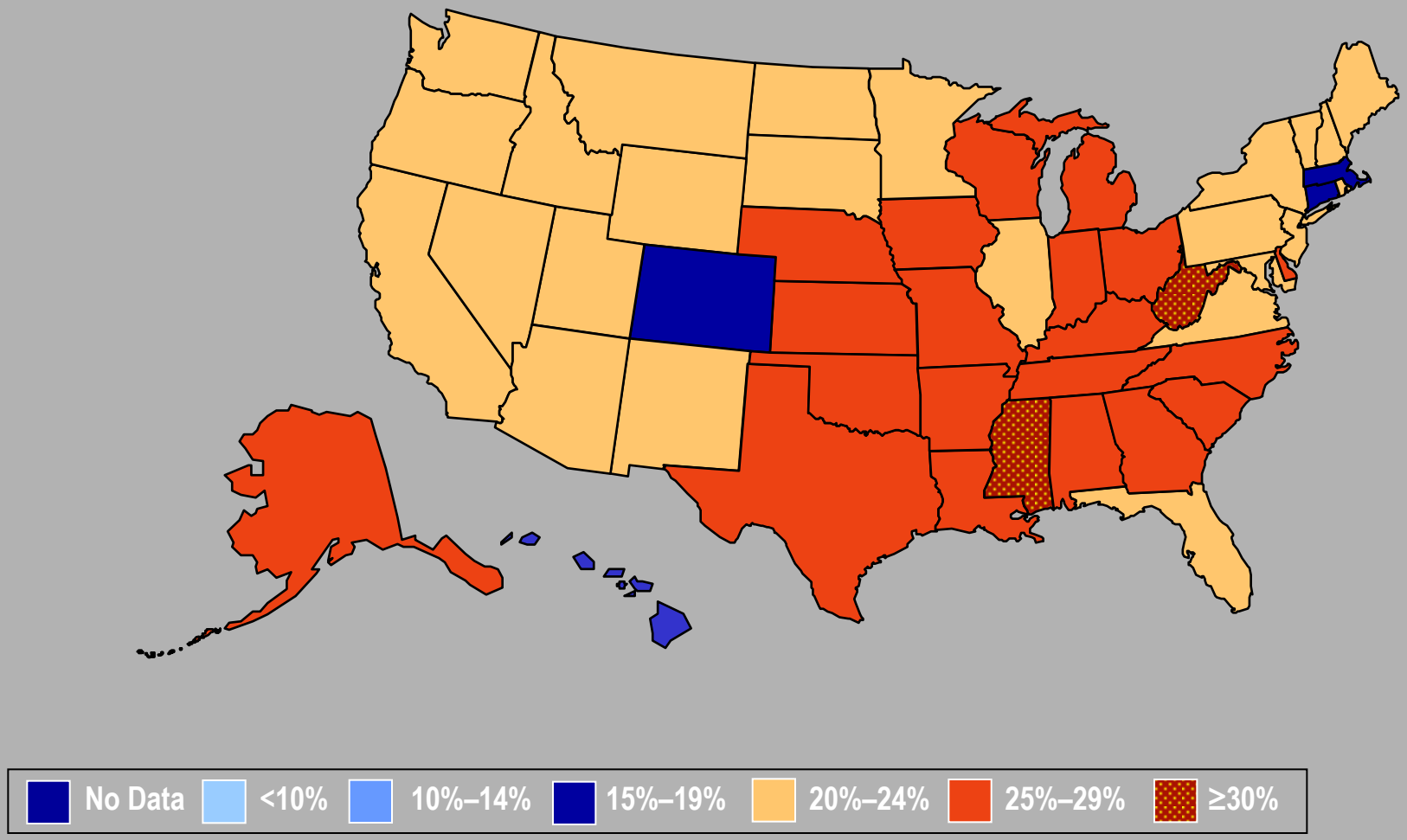

Obesity Trends* Among U.S. Adults

BRFSS, 2008

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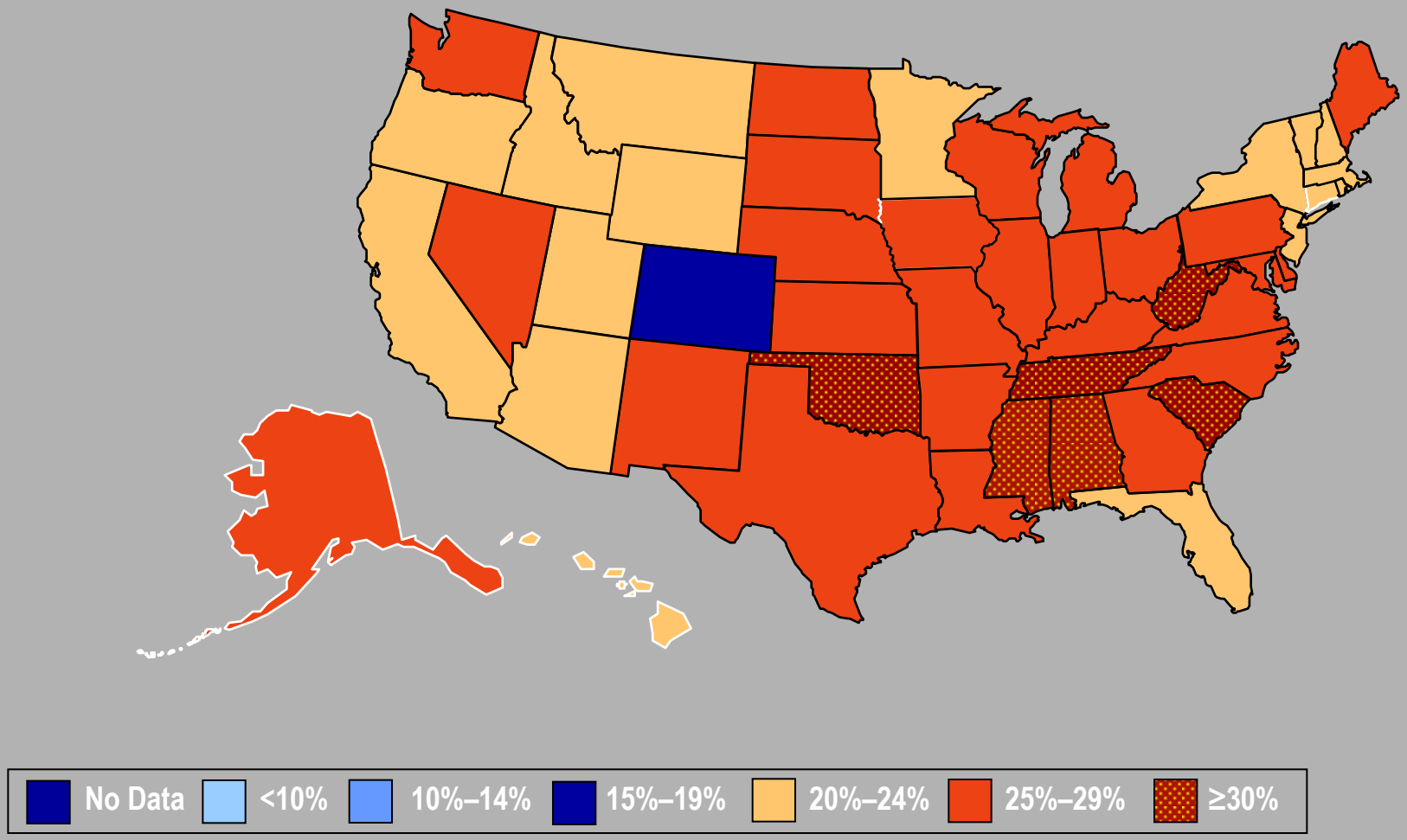

Obesity Trends* Among U.S. Adults

BRFSS, 2010

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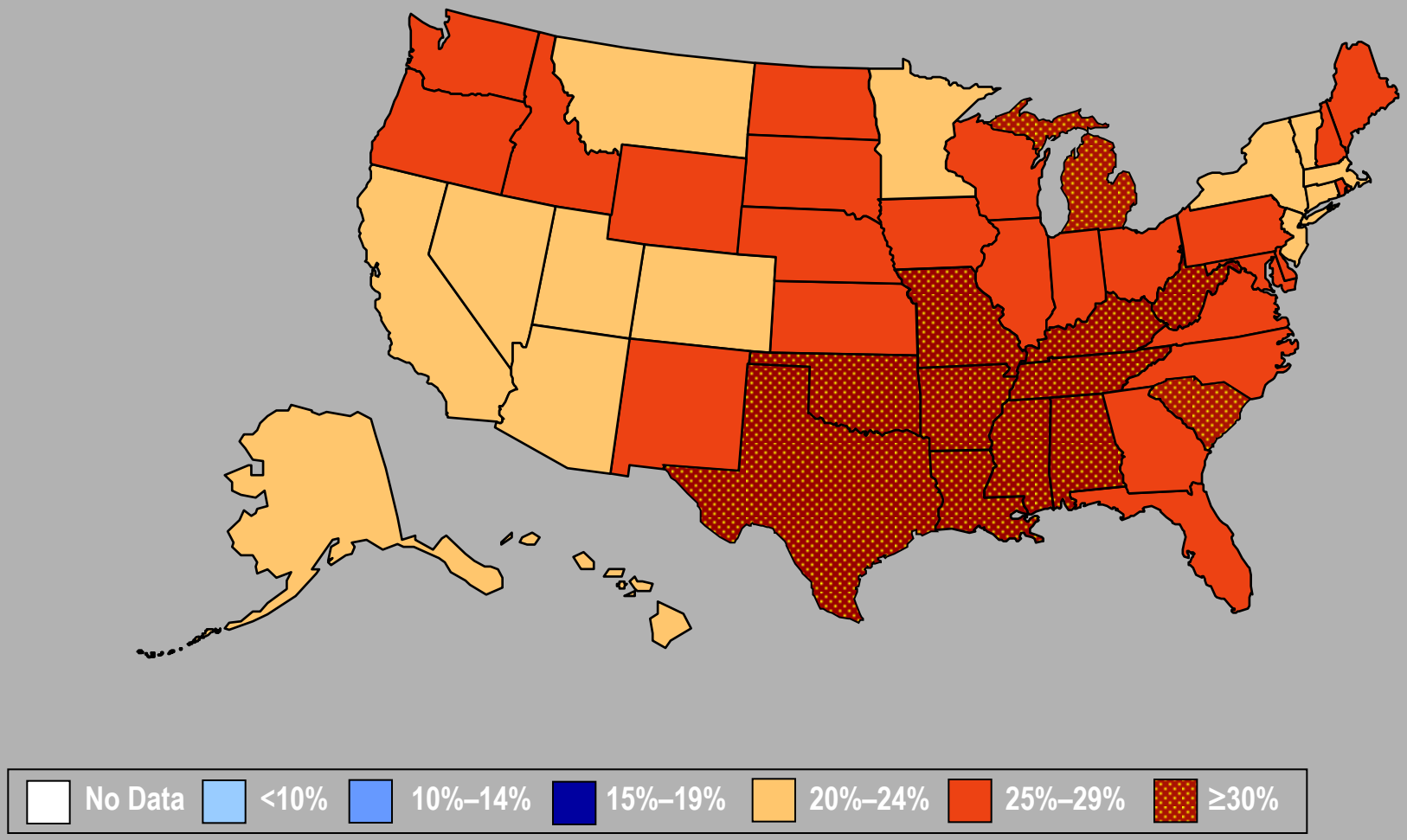


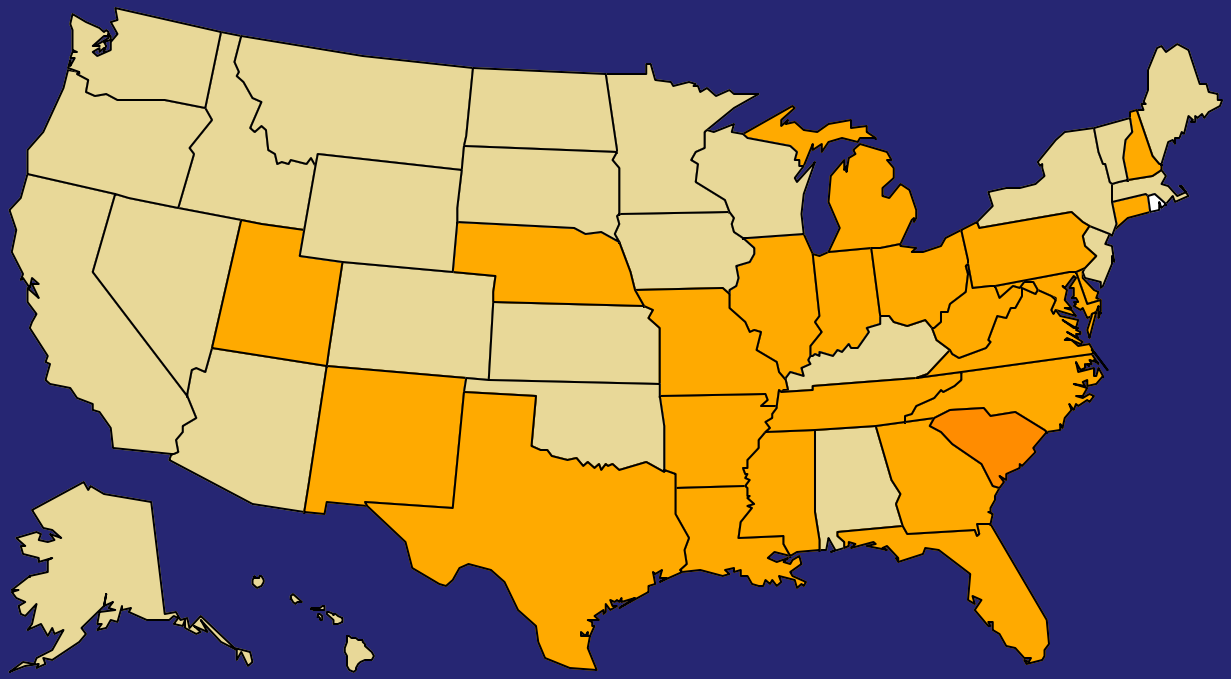
Diabesity

- For each kg increase in weight the risk of diabetes increases by 9%

Mokdad AH. *Diabetes Care* 2000;23:1278-83.

Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults

1994

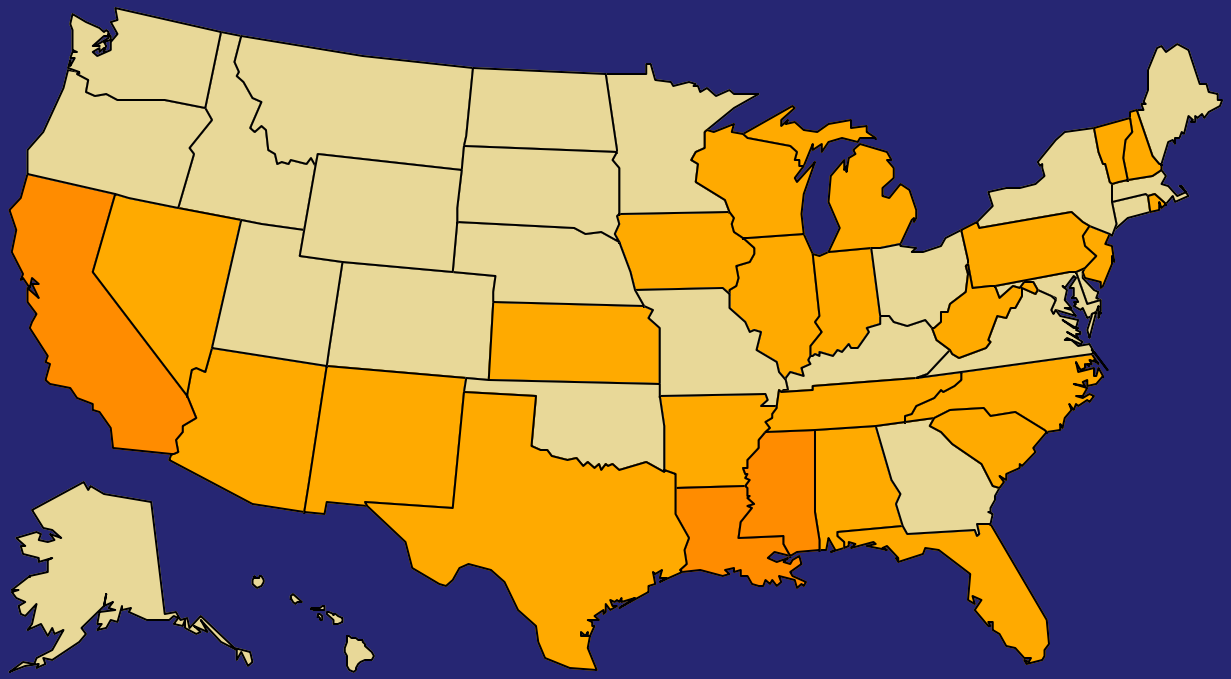


Missing data	<4.5%
4.5%–5.9%	6.0%–7.4%
7.5%–8.9%	≥9.0%

CDC's Division of Diabetes Translation. National Diabetes Surveillance System available at http://www.cdc.gov/diabetes/statistics

Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults

1995



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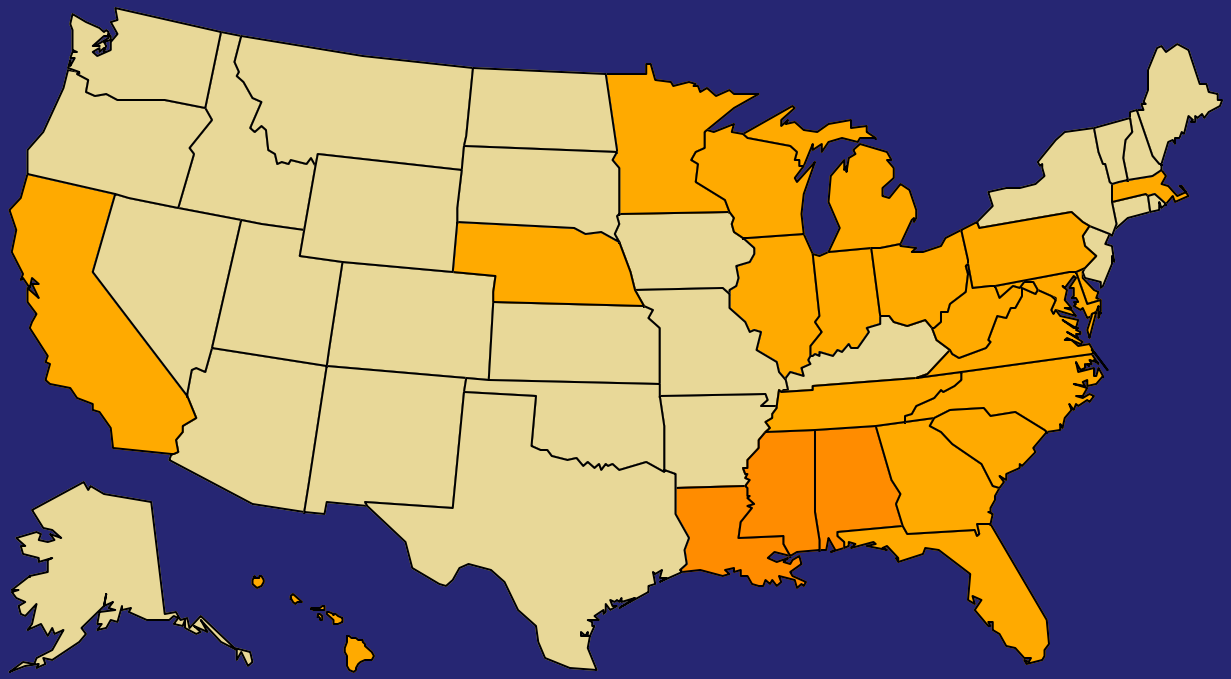

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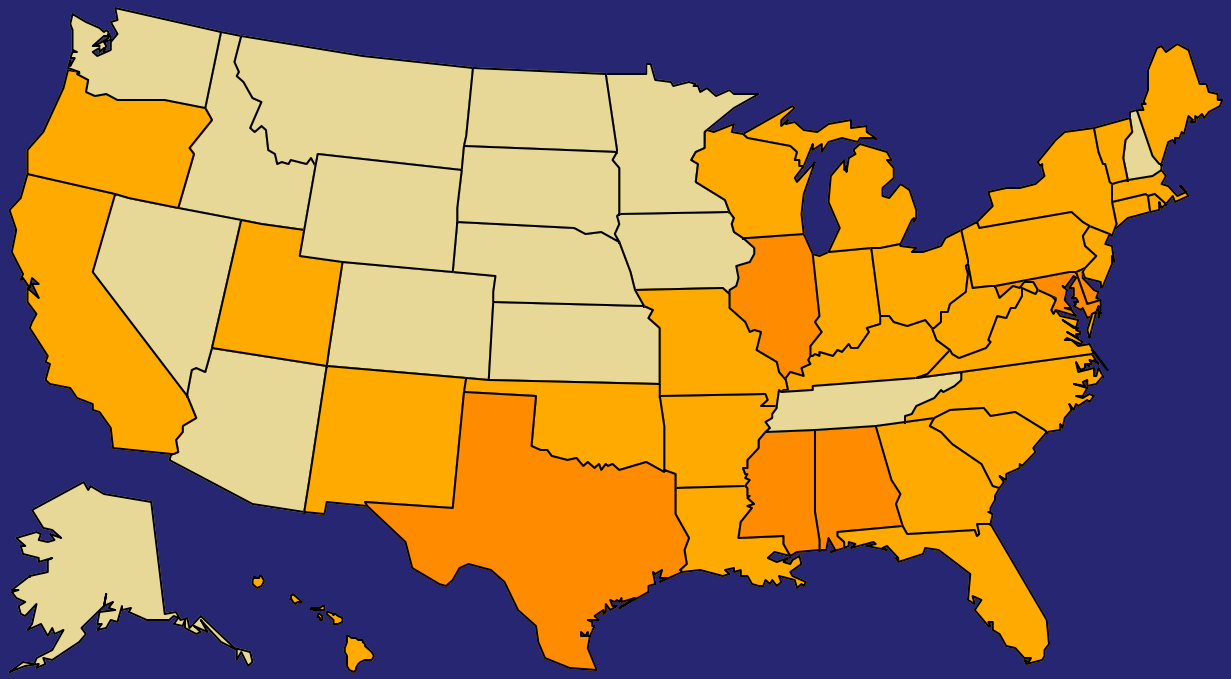
Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults

1997



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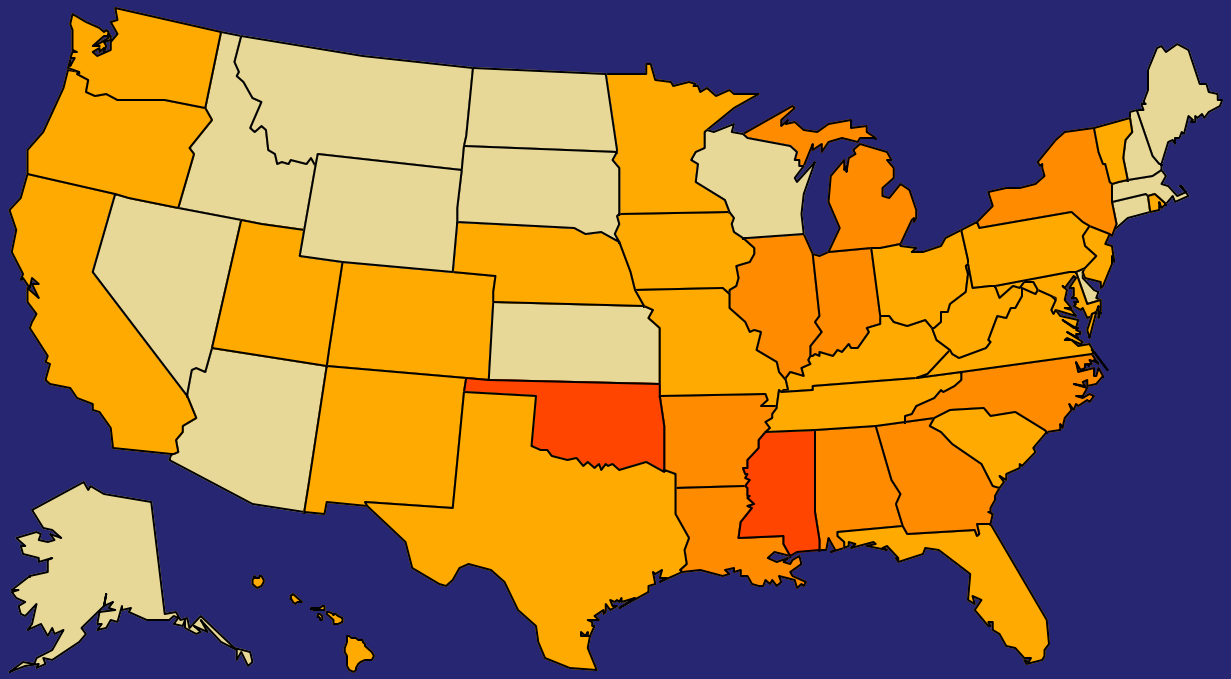

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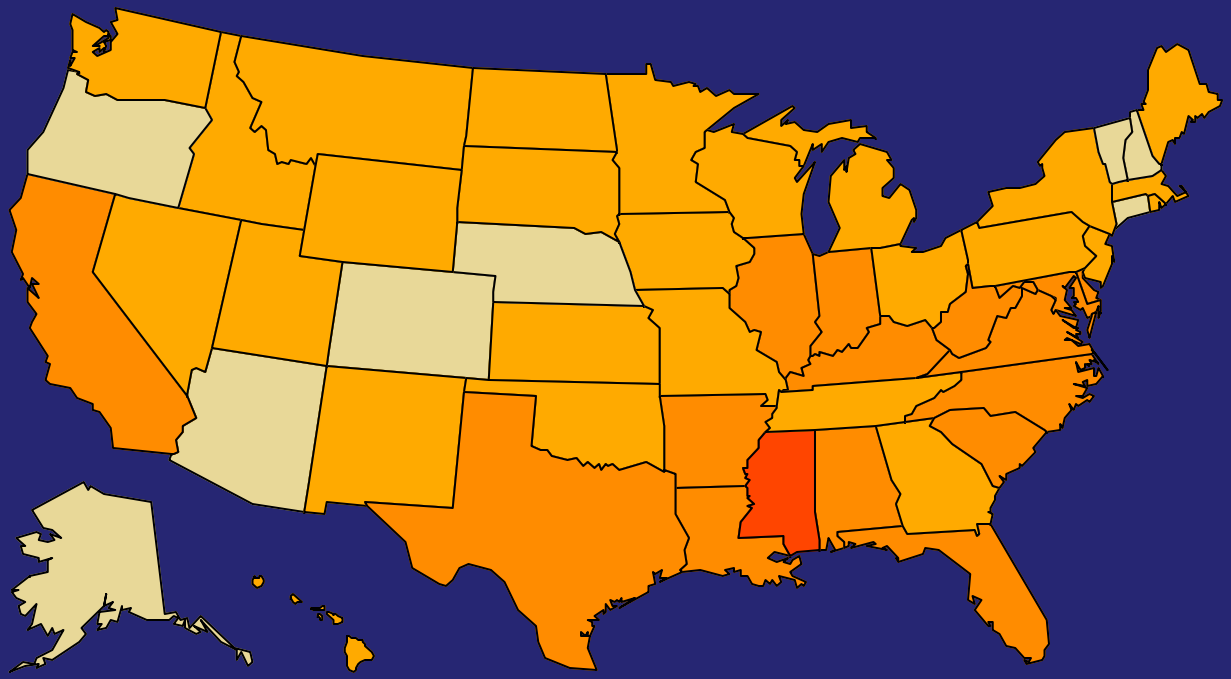

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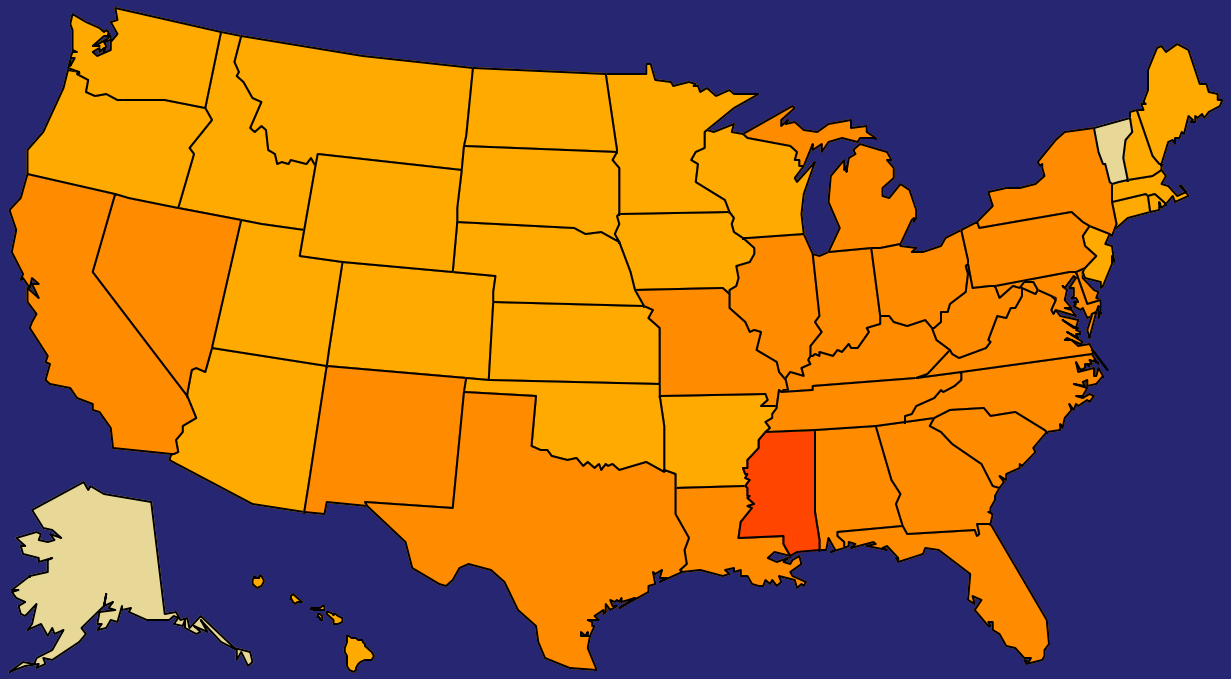

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Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults

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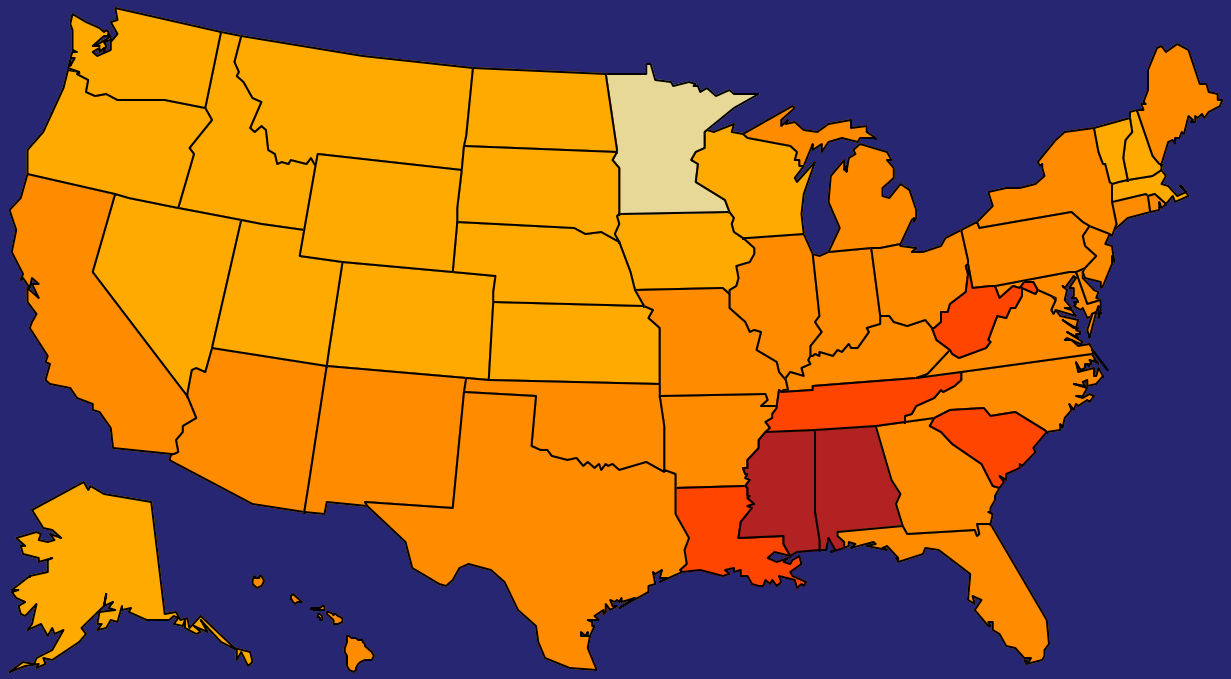

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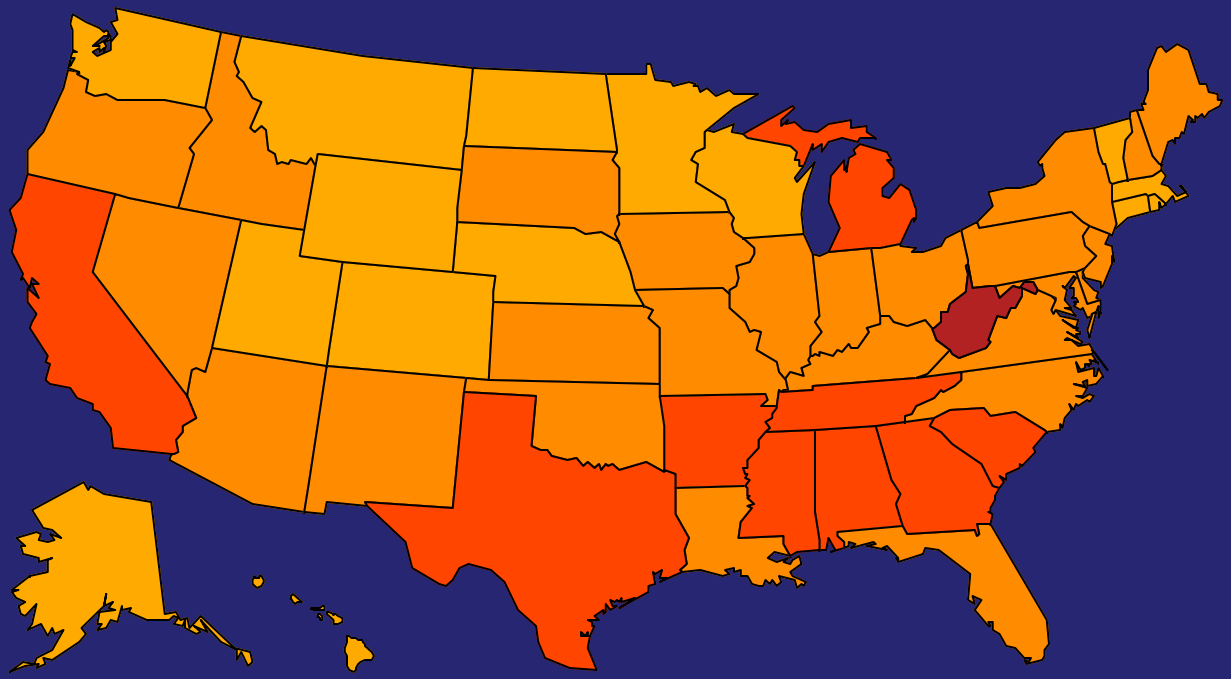

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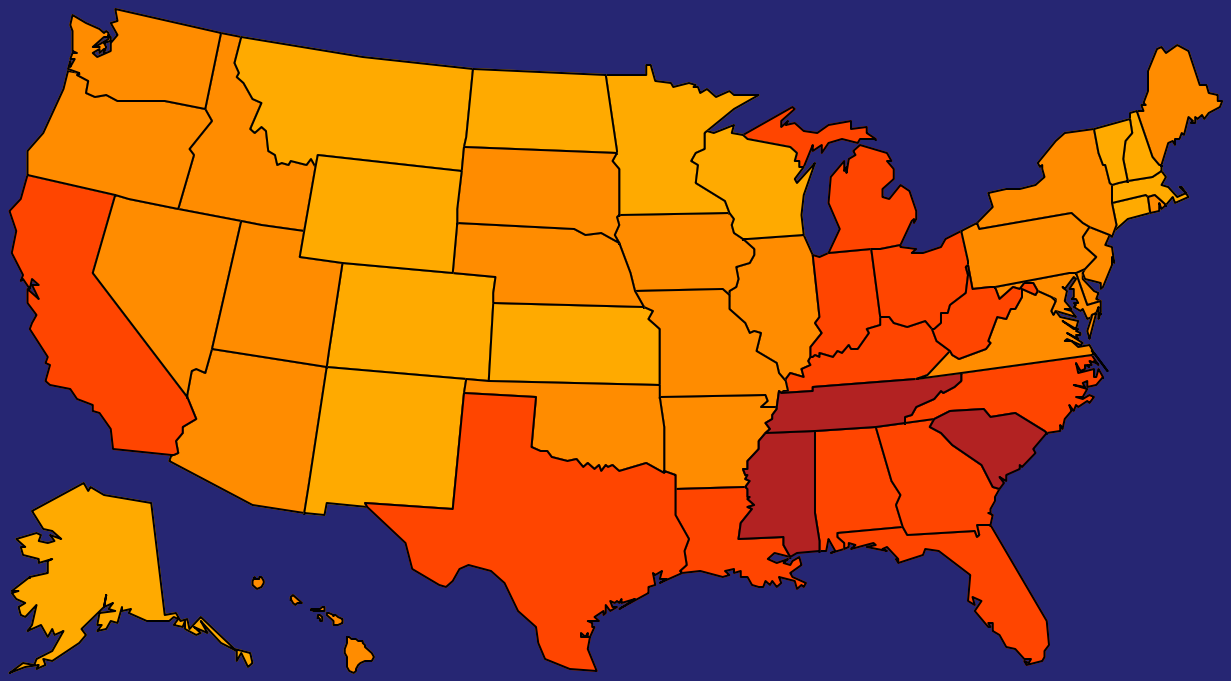
Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults

2003



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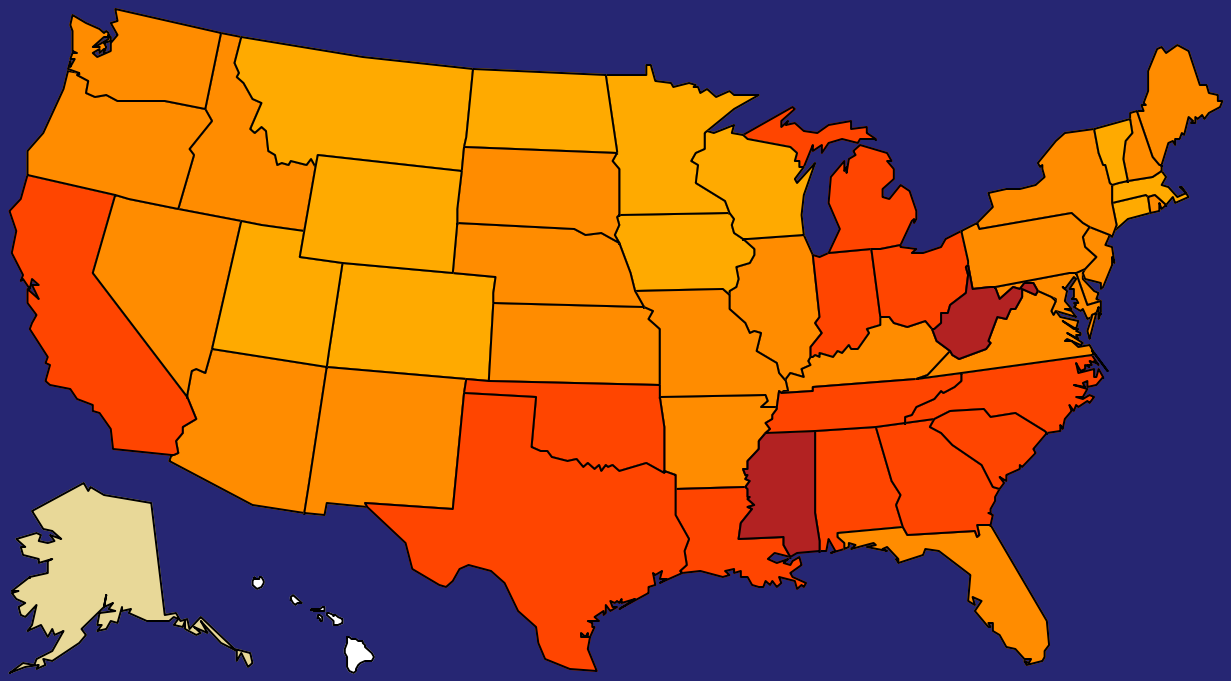

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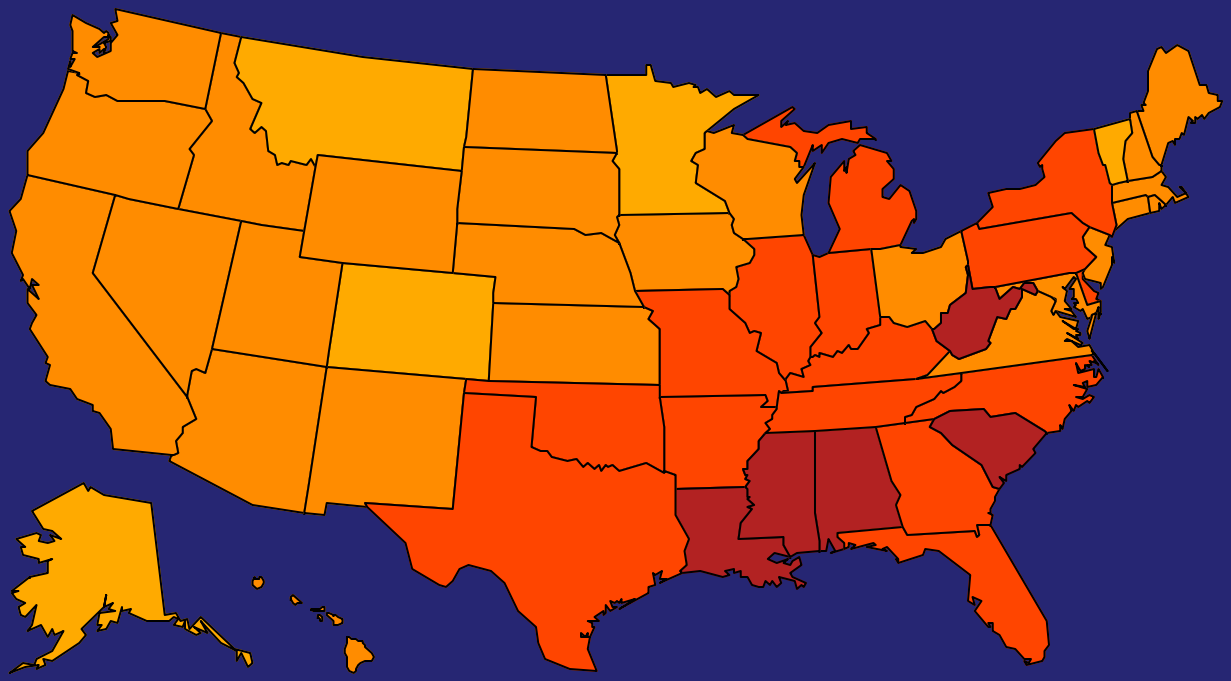

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Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults

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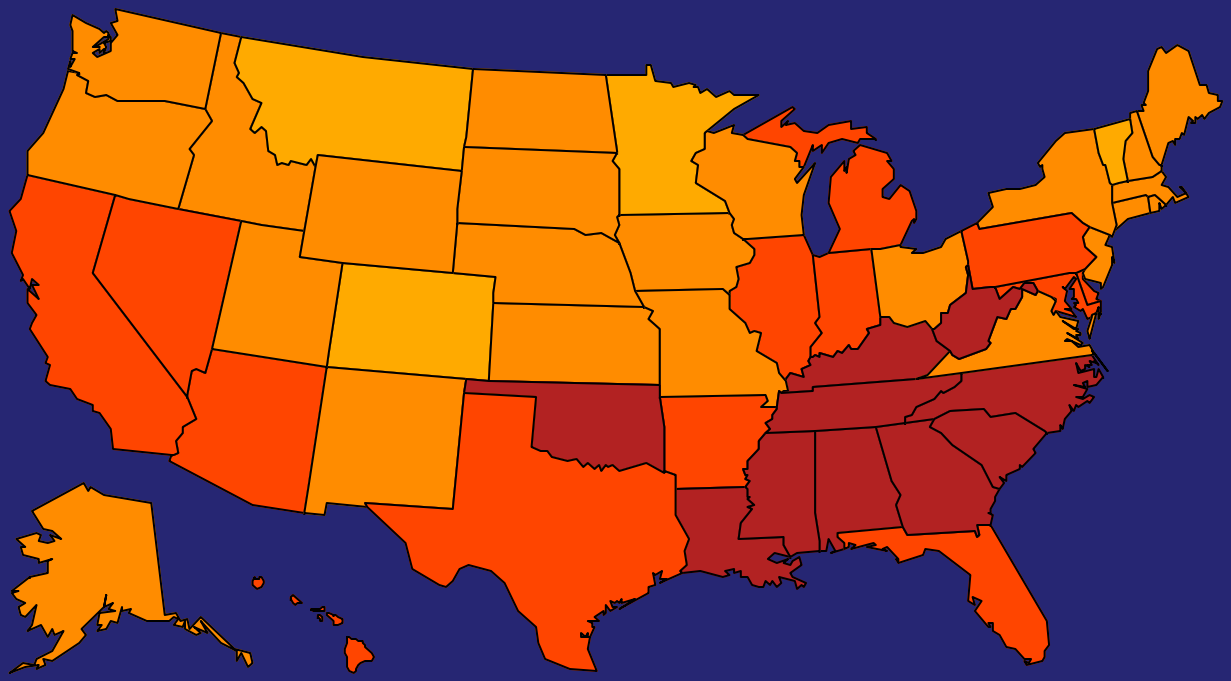

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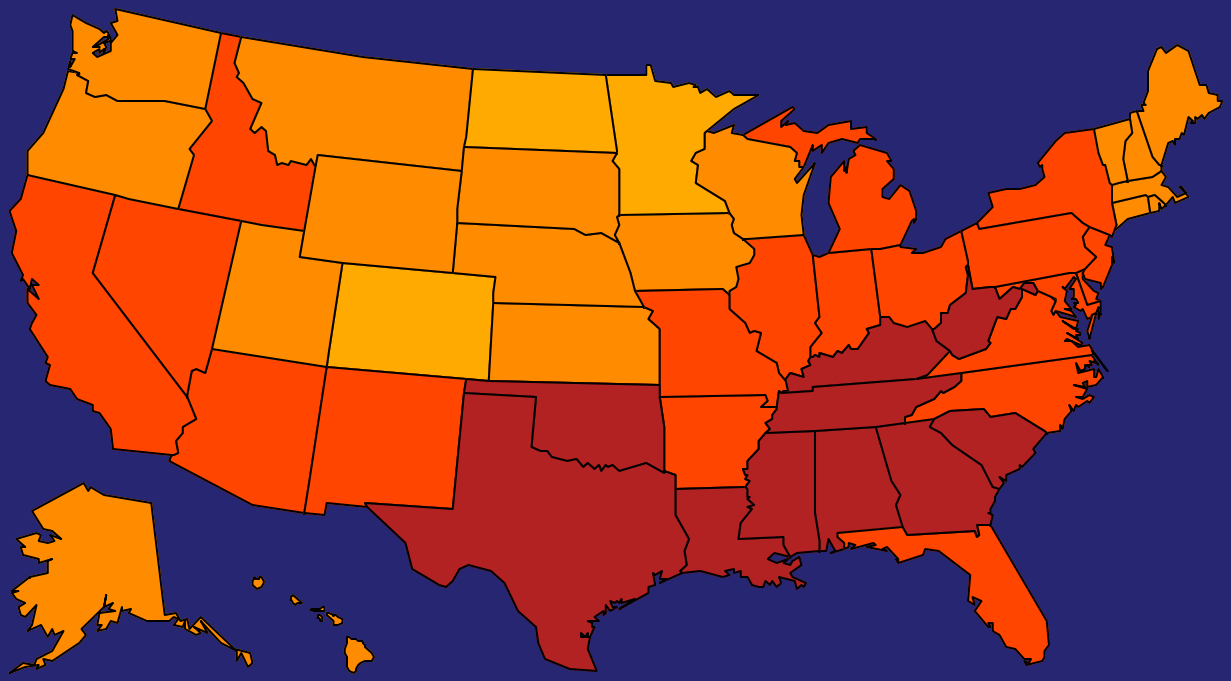
Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults

2007



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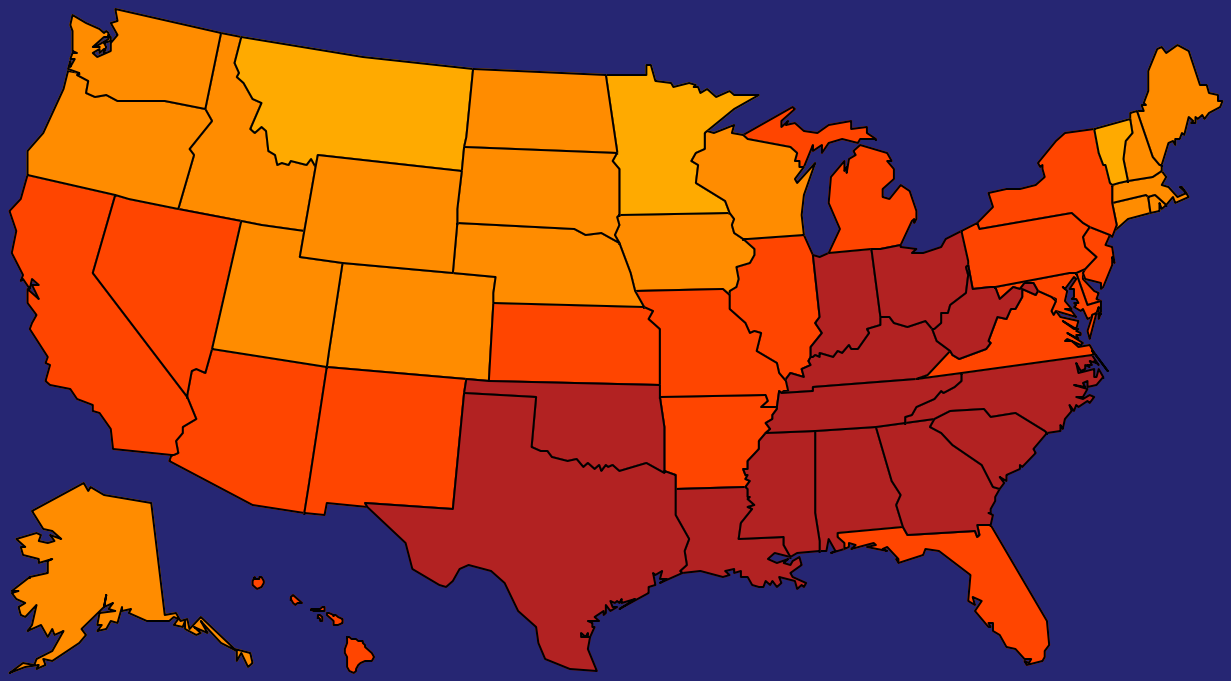
Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults

2008



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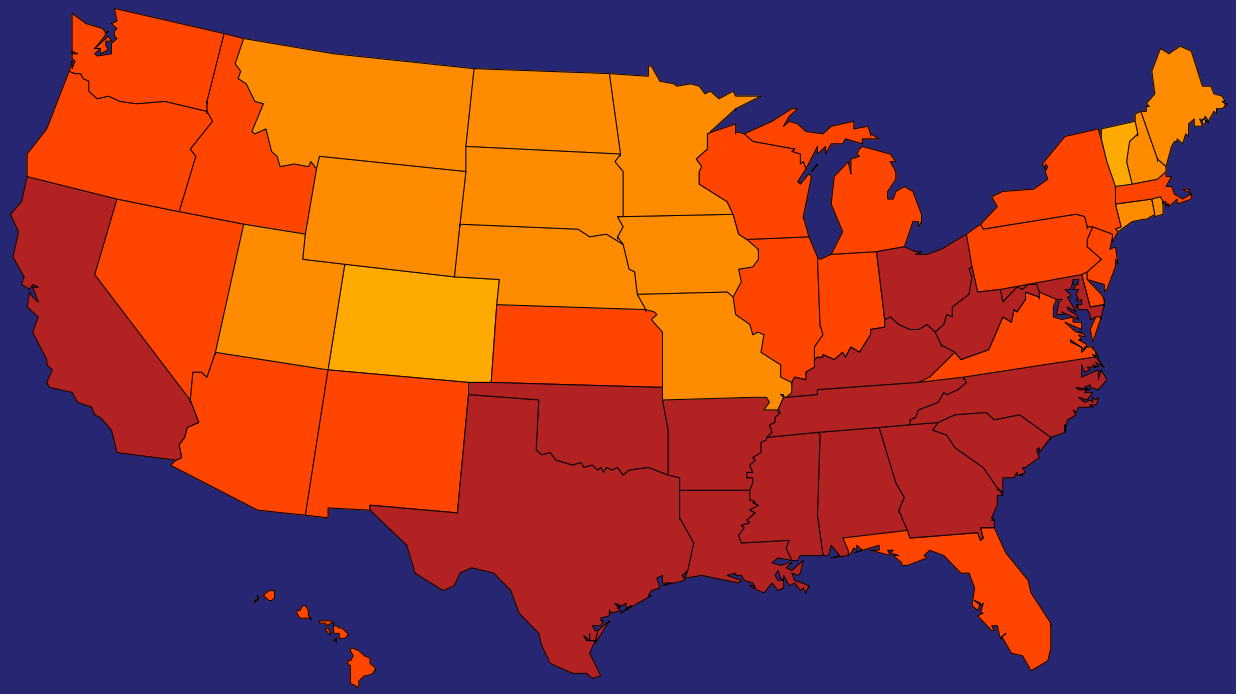
2009



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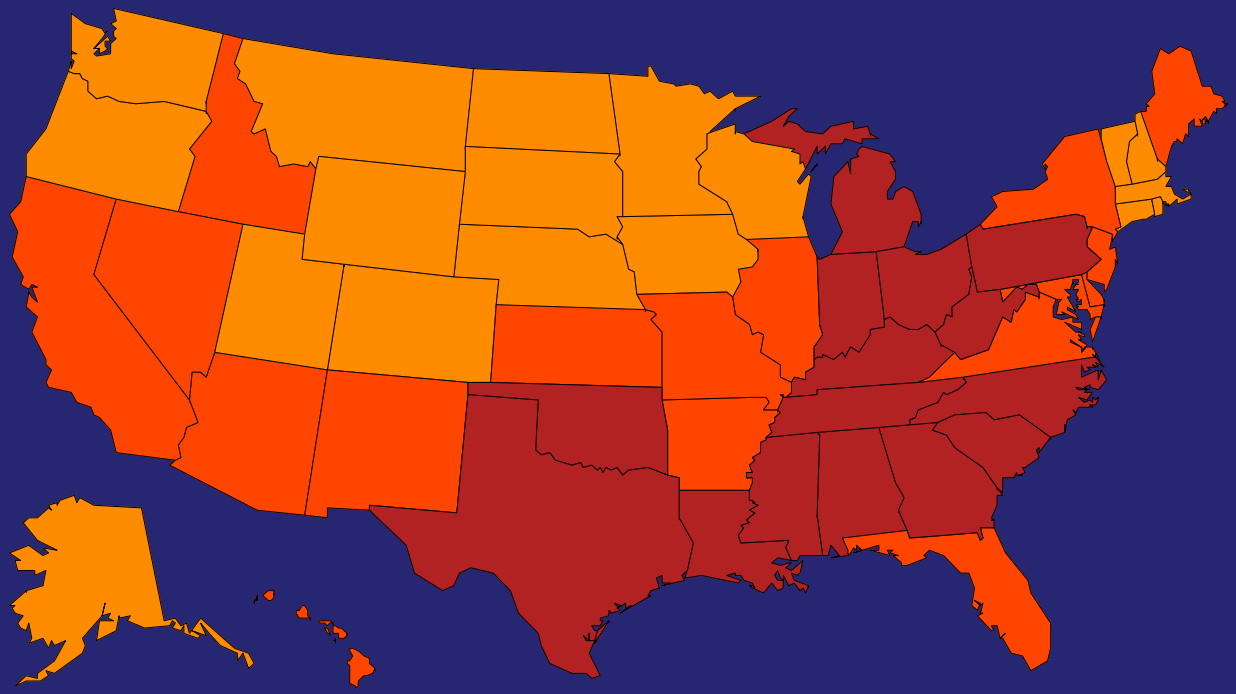
Age-Adjusted Prevalence of Diagnosed Diabetes Among U.S. Adults

2010



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2 to 20 years: Girls
Stature-for-age and Weight-for-age percentiles

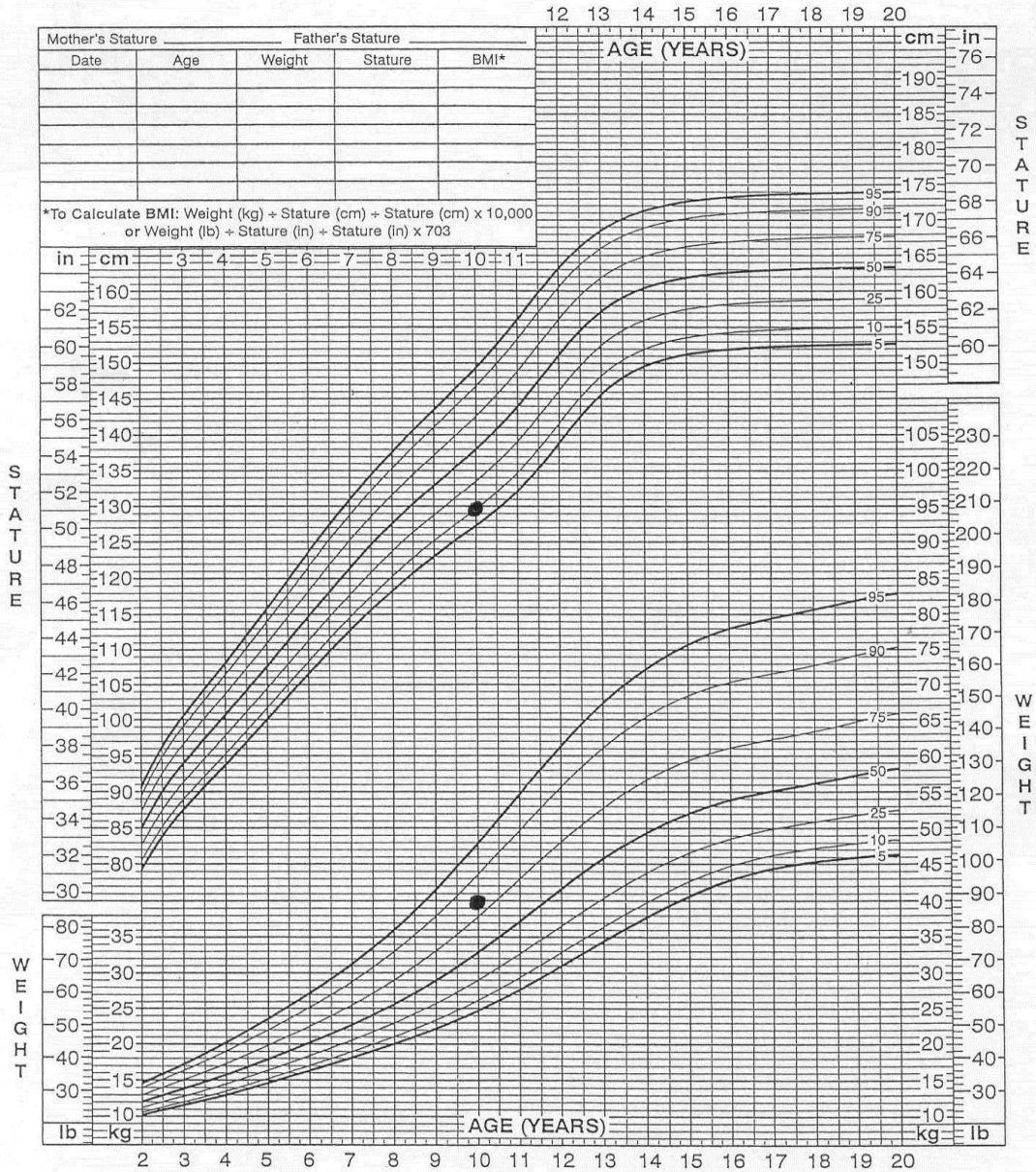
NAME _____

RECORD # _____

Mother's Stature _____ Father's Stature _____

Date	Age	Weight	Stature	BMI*

*To Calculate BMI: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



Revised and corrected November 28, 2000.

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

CDC

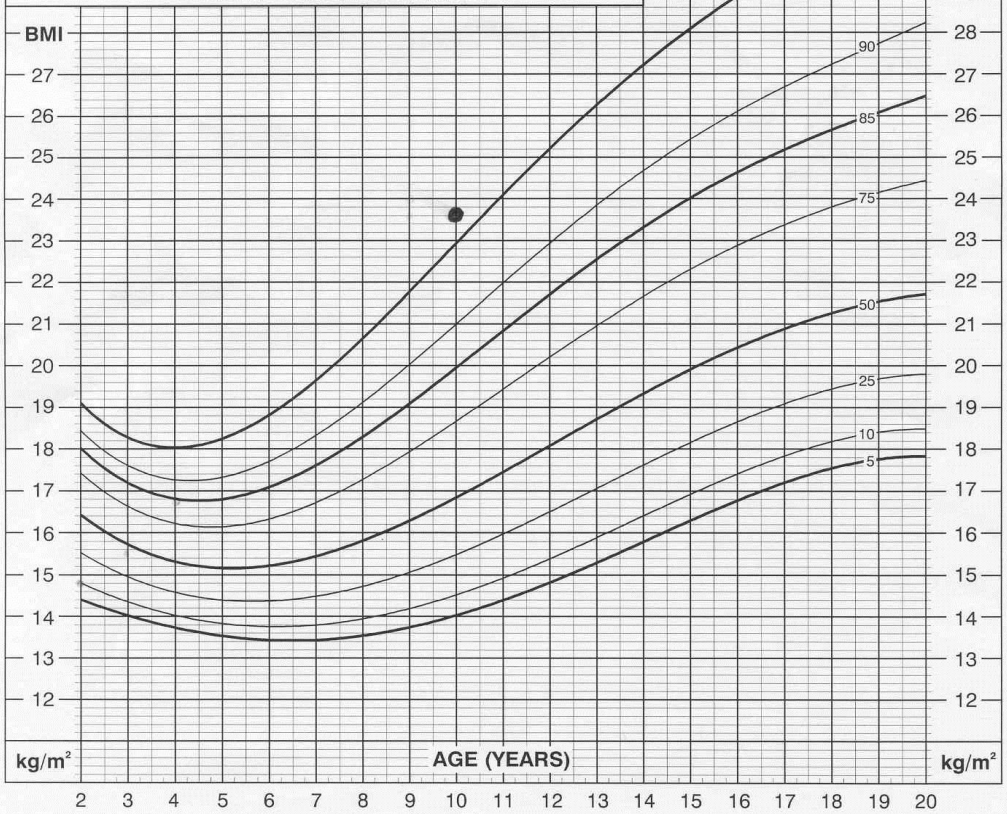
2 to 20 years: Girls
Body mass index-for-age percentiles

NAME _____

RECORD # _____

Date	Age	Weight	Stature	BMI*	Comments

***To Calculate BMI**: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703



SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).
http://www.cdc.gov/growthcharts

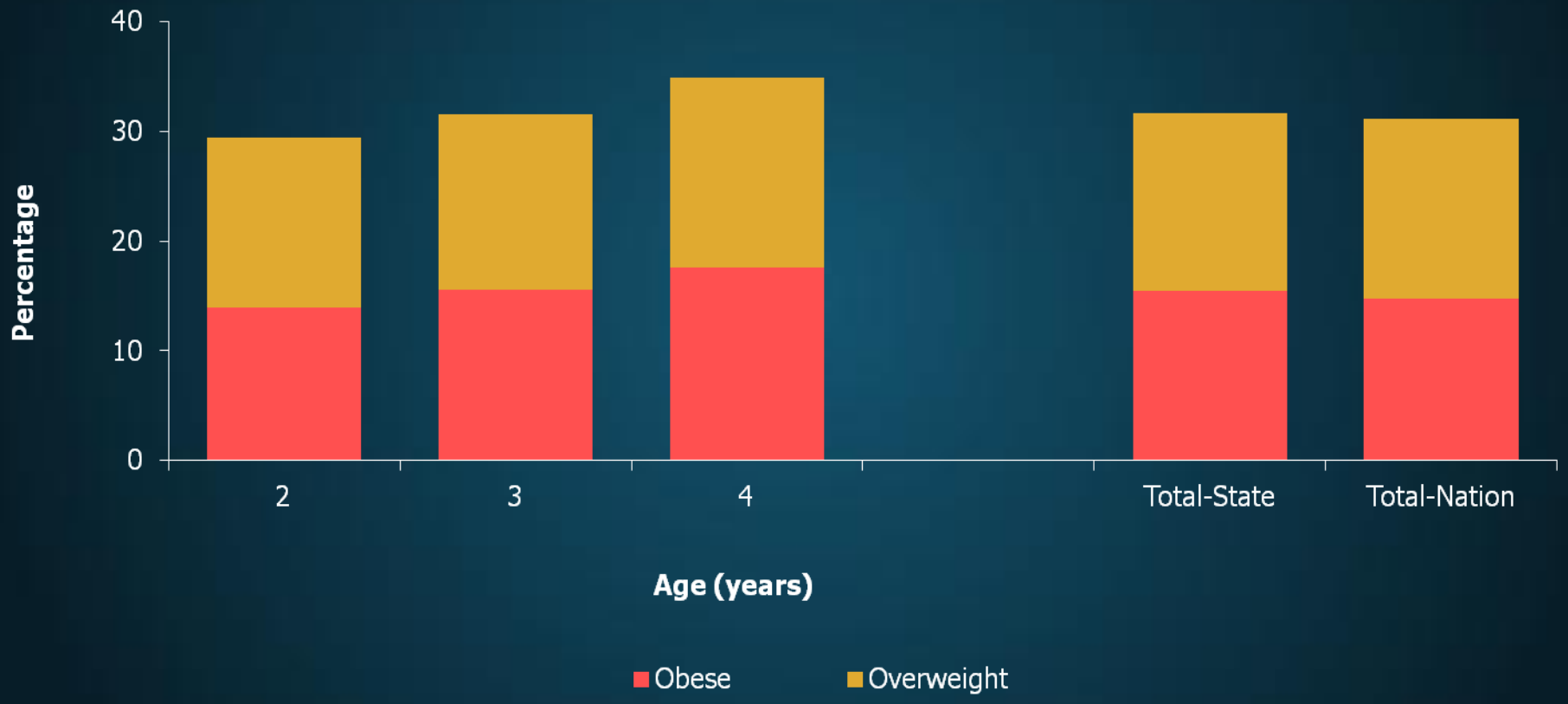
Prevalence of Overweight in Children*
BMI-for-Age -Percentiles

	≥ 95th percentile		≥ 85th percentile
	1971-1974	2009-2010	2009-2010
2-5 years	5.0	12.1	26.7
6-11 years	4.0	18.0	32.6
12-19 years	6.1	18.4	33.6

*4111 children and adolescents (2-19 yrs) from NHANES.

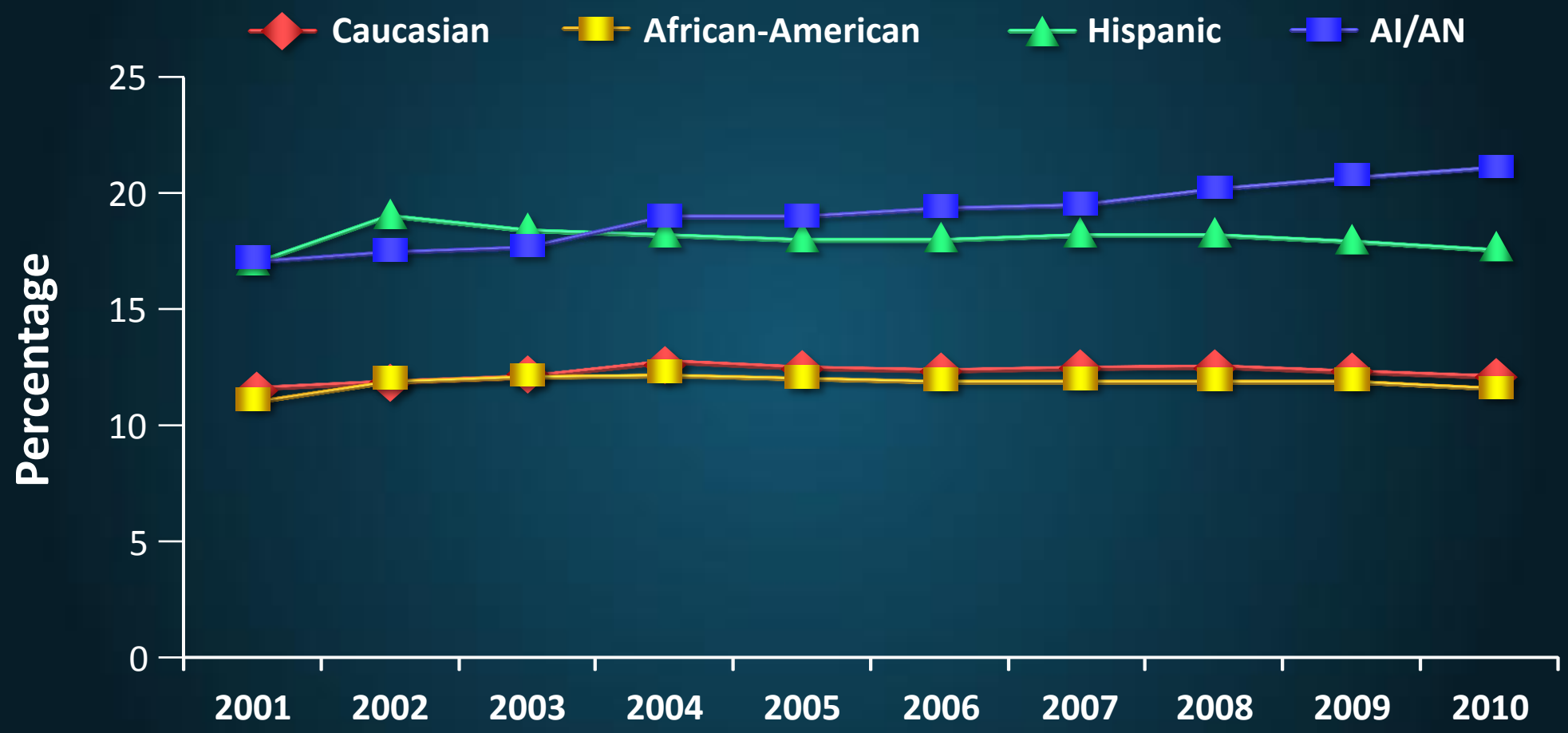
Ogden CL, et al. *JAMA.* 2012;307(5): 483-490.

Prevalence of obesity and overweight* among children aged 2 <5 years, PedNSS** 2010



*Obese: ≥ 95th percentile BMI-for-age; overweight: ≥ 85th -<95th percentile BMI-for-age, CDC Growth Charts, 2000. 15% of children are expected to fall above the 85th percentile (5% above the 95th percentile and 10% between the 85th and 95th percentiles).
**North Carolina-Pediatric Nutrition Surveillance System (NC-PedNSS) is limited to data on children seen in North Carolina Public Health Sponsored WIC and Child Health Clinics and some School Based Health Centers.

Obesity Trends in Children <5 Y/O: Pediatric Nutrition Surveillance System



AI/AN=American Indian/Alaskan Native.

Dalenius K, et al. *Pediatric Nutrition Surveillance 2010 Report*. US DHHS CDC; 2012. http://www.cdc.gov/pednss/pednss_tables/pdf/national_table18.pdf.

Is Obesity A Disease?

- 65% of obese 5-10 year old children have at least one cardiovascular disease risk factor
- 25% of obese 5-10 year olds have two or more risk factors

Dietz WH. J Pediatr 1999;134:535-536.

Complications of Obesity

- Cardiovascular - hypertension, atherosclerosis
- Metabolic - type 2 diabetes, dyslipidemia
- Pulmonary - sleep apnea
- Skeletal - leg deformities, fractures
- Liver - fatty liver (steatohepatitis)
- Kidney - glomerulosclerosis
- Reproductive – hirsutism, polycystic ovary disease
- Psychological - low self esteem, depression

Identifying Risk for Obesity in Early Childhood

- 1042 children from 10 locations in U.S. followed for 13 years in NICHD Study of Early Child Care and Youth Development
- Children who were overweight (> 85th percentile) at ages 24, 36, or 54 months were 5 times more likely to be overweight at age 12 years

Nader PR et al. Pediatrics 2006;118:e594-601.

Crossing Growth Percentiles in Infancy and Risk of Obesity in Childhood

- 44,622 children followed from 1 month to 11 years at 14 health centers in Massachusetts
- Obesity prevalence at ages 5 and 10 years was highest in children crossing upwards 2 or more major weight-for-length percentiles in first 24 months of life.

Taveras EM et al. Arch Pediatr Adolesc Med 2011;165:993-998.

Risk Factors for Obesity in Early Childhood

- Prospective study of 150 children from birth to 9.5 years
- 25% were above the 85th BMI percentile at 9.5 years
- Risk factors included:
  1) parental BMI
  2) low parental concern about the child's weight
  3) children with persistent temper tantrums
  4) children's hours of sleep at 3-4 years.

Agras WS et al. J Pediatr. 2004;145:20-25.

Parental Obesity and Early Adiposity Rebound as Risk Factors for Adult Obesity

- Parental obesity more than doubles the risk of adult obesity among both obese and nonobese children under 10 years of age[1]
- Early adiposity rebound increases the risk of adult obesity independent of parent obesity[2]

1. Whitaker RC et al. N Engl J Med. 1997;337:869-873.
2. Whitaker RC et al. Pediatrics. 1998;101:e5.

Short Sleep Duration in Infancy and Risk of Childhood Overweight

- 915 mother-infant pairs followed in multispecialty group practice in Massachusetts for 3 years postpartum
- Sleep duration of less than 12 hours during infancy was associated with increased child adiposity at 3 years
- Adverse effect of decreased sleep was further increased in children watching at least 2 hours of TV per day.

Taveras EM et al. Arch Pediatr Adolesc Med. 2008;162:305-311.

Maternal Perceptions of Toddler Weight

- 281 mother-toddler pairs; mean age 20 months; 71% African American
- 29% of children overweight; 8.5% underweight; 72% of mothers overweight or obese
- Mothers of overweight toddlers were 87% less likely to be accurate in their weight perceptions than mothers of healthy weight toddlers

Hager ER et al. Arch Pediatr Adolesc Med. 2012;166:417-422.

Perrin EM. Arch Pediatr Adolesc Med. 2012;166:422-423.

Obesogenic Environment

The increasing weight of people worldwide is the result of a normal response by normal people to an abnormal environment.

Swinburn B. *Lancet*. 2011;378:741

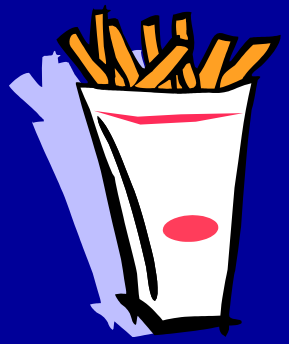
Factors Increasing Obesity

Factors Affecting Energy Intake

- Increased number of meals away from home
- Larger portion sizes
- Increased consumption of calorie dense fast foods/snacks
- Sugar sweetened drinks

Factors Affecting Energy Expenditure

- Decreased physical activity at school and at home.
- Increased inactivity – TV and video games



Dietary Practices

- Only 20% of children and adolescents consume 5 or more servings of fruit and vegetables per day
- Fast food consumption makes up 35% - 40% of average family's food budget
- Sugar – sweetened beverages are the largest source of added sugars in the diet of U.S. youths

Birch LL, Fisher JO. Pediatrics 1998;101:539-49.

MMWR. 2011;60:778-780.

Feeding Infants and Toddlers Study (FITS) 2008

- Cross-sectional study of 1596 infants and toddlers from birth to age 4 years
- Ethnicity: 55% white; 14% black; 23% Hispanic
- Breastfeeding rates:

Ever breastfed	80%	(76% in 2002)
4 - 6 months	42%	(26% in 2002)
9 - 12 months	37%	(21% in 2002)
6 months	49%	
12 months	24%	

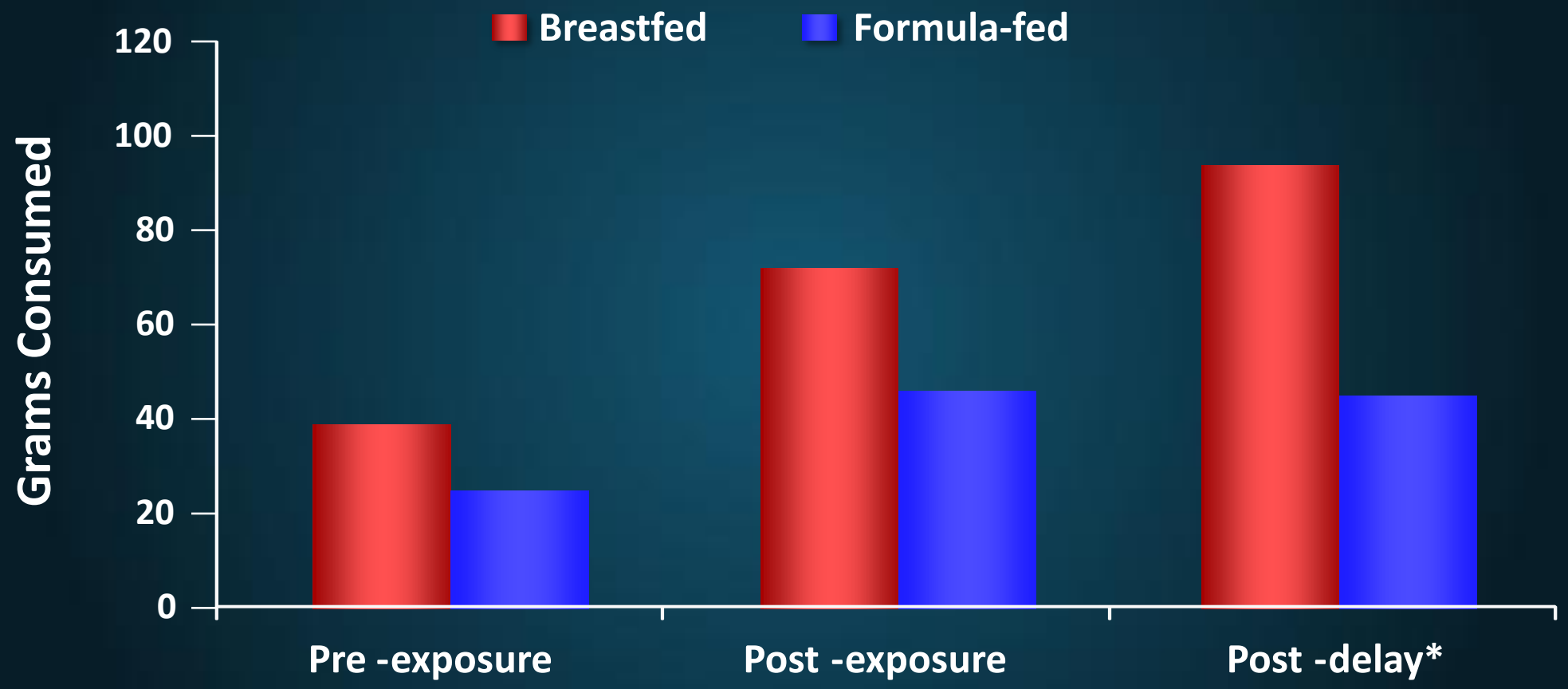
Siega-Riz AM et al. J Am Diet Assoc 2010;110:S38-S51.

Breastfeeding and Bottle-Feeding: Risk for Weight Gain During First Year of Life

- 1899 infants with at least 3 measurements in first year (87% white)
- Formula fed infants gained 71-89 grams per month more than the exclusively breastfed infants
- Infants fed at breast and by bottles of expressed human milk gained weight similar to exclusively breastfed infants
- Infants fed both at the breast and by bottles of formula gained 45 grams more per month.

Li R et al. Arch Pediatr Adolesc Med. 2012;166:431-436.

Intake of Vegetables by Breast- and Formula-Fed Infants



*Estimated.

Sullivan SA, Birch LL. *Pediatrics*. 1994;93(2):271-277.

Concerns From the Feeding Infants and Toddlers Study

- 17% received cow's milk before age 1 year
- Approximately 30% of children consume no fruit or vegetables on survey days
- 19% of 12-15 month and 30% of 21-24 month old children consume presweetened cereals daily
- 14% of 12-15 month and 38% of 21-24 month old infants consume sweetened drinks daily
- Desserts or candy are consumed by 54% of 12-15 month and 68% of 21-24 month old children daily

Siega-Riz AM et al. J Am Diet Assoc 2010;110:S38-S51.

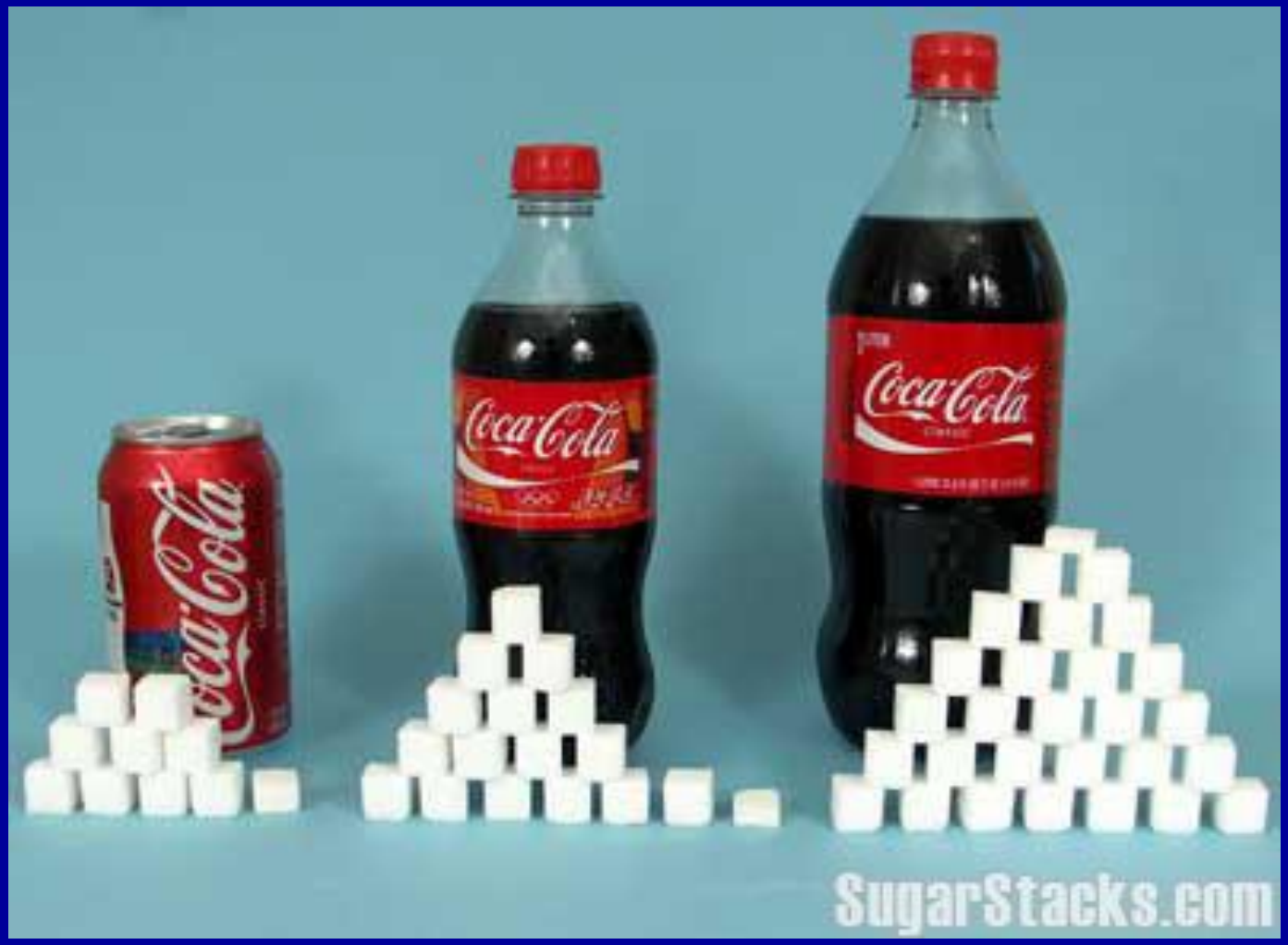
SOFT DRINKS & OBESITY

THE CHOICE OF NEW GENERATION

Age (yrs)	Percent drinking soft drinks daily
8	56
9 to 13	70-73
14 (girls)	78
14 (boys)*	85

*One-third of teenage boys consume at least three 12-ounce servings of soft drinks daily.

Source: USDA


Coca-Cola
Coca-Cola
Coca-Cola
SugarStacks.com

Minute Maid
Lemonade
SugarStacks.com

Relation Between Soft Drinks and Childhood Obesity

- Study Design: 548 ethnically diverse 6th-7th grade children (11-12 yrs) in public schools in Boston (1995-97)
- Children studied prospectively for 19 months
- Odds ratio of becoming overweight increased 1.6 times (60%) for each additional can of sugar-sweetened drink consumed every day

Ludwig DS, Peterson KE, Gortmaker SL. *Lancet* 2001;357:505-08.

Limit Consumption of Sugar-Sweetened Beverages

- Limit availability of sugar-sweetened drinks.
- Offer water as the best thirst quencher.
- Provide low fat milk at meals.
- Support policies at school and public places to ensure that water, 100% juice and low fat milk are available in vending machines.

Nutritional and Economic Efforts at Replacing Juice with Fruit in Children's Diets

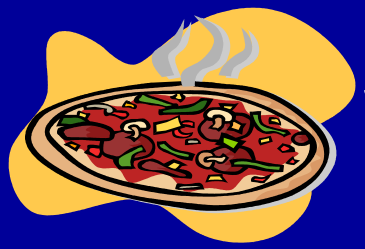
- Fruit juices have energy densities similar to sugar-sweetened beverages
- 2010 Dietary Guidelines recommend that no more than half of total fruit servings be in form of fruit juice.
- WIC program has reduced availability of fruit juice and introduced fruit and vegetable benefit
- Substitution of fresh fruit for fruit juice has potential to reduce energy intake and improve fiber. However, this change may result in higher costs for schools, childcare providers, and families.

Monsivais, P, Rehm CD. Arch Pediatr Adolesc Med. 2012;166:459-464.

Doritos
BIGGIE
Snapple
Oatmeal Creme
PEPSI
Vanilla
DQ
KFC
Coca-Cola

FAST FOODS

Food	Calories	Fat
Pepperoni pizza - 1 slice (Pizza Hut)	422	16
Big Mac (McDonalds)	530	28
BK Double Whopper with Cheese	1150	76
Big Fish (Burger King)	700	41
Chicken Nuggets	300	18
BK 32 oz. old Fashioned Shake	1200	64
Soft Drink (20 oz.)	250	0
Fruit Works (20 oz.)	275	0



30 minutes of moderate exercise = 210 calories

(cycling, swimming, walking, tennis, fast dancing)

Fast Food Consumption and Obesity

- 6212 children and adolescents 4-19 years old
- 30% consumed fast food on typical day
- Children eating fast food consumed additional 187 kcal/day
- Fast food consumption had adverse effect on diet quality

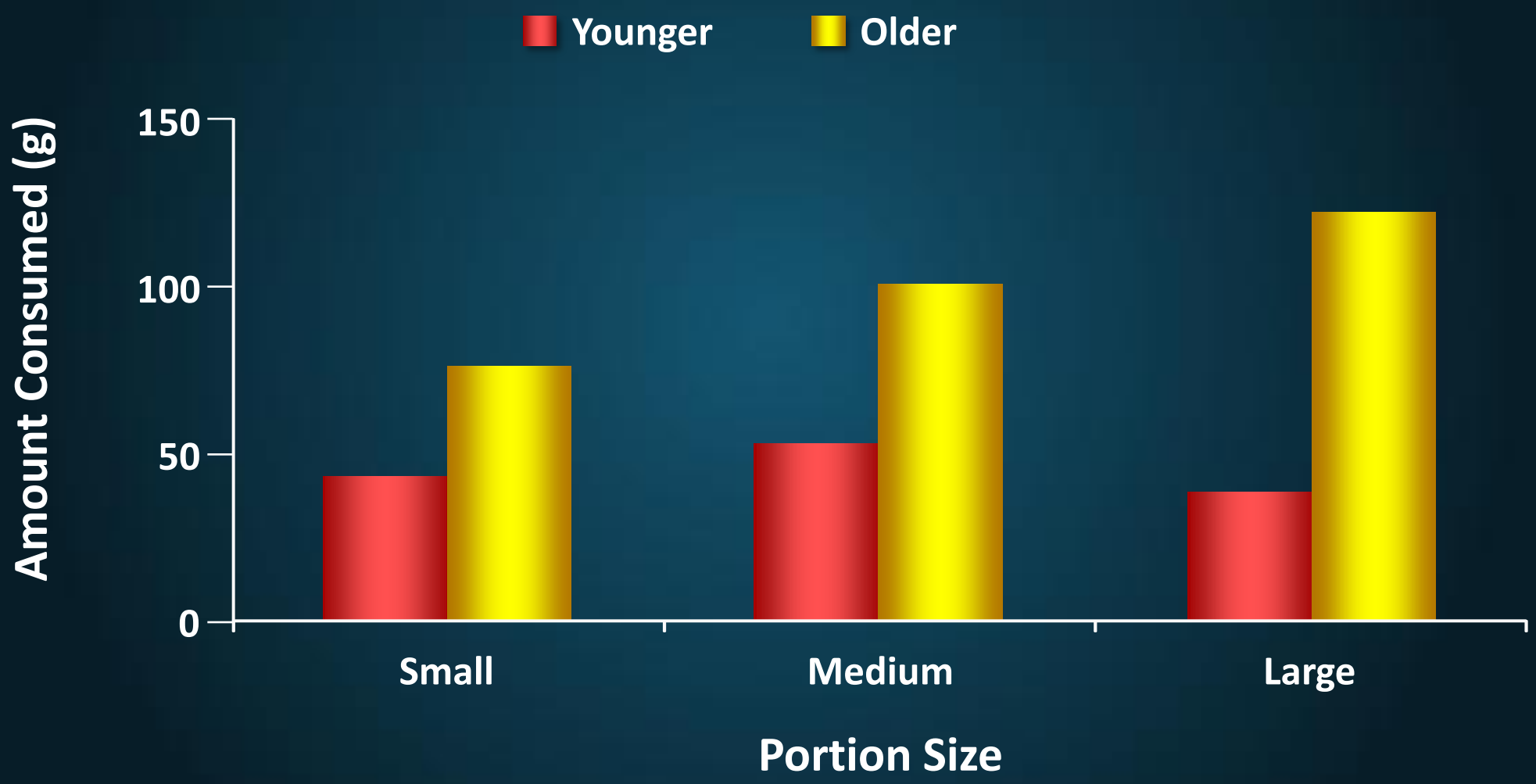
Bowman SA et al. Pediatrics 2004; 113: 112-118.

U.S. Portions
JOURNAL ILLUSTRATION BY NICHOLAS WEIR

McDonald's French Fries

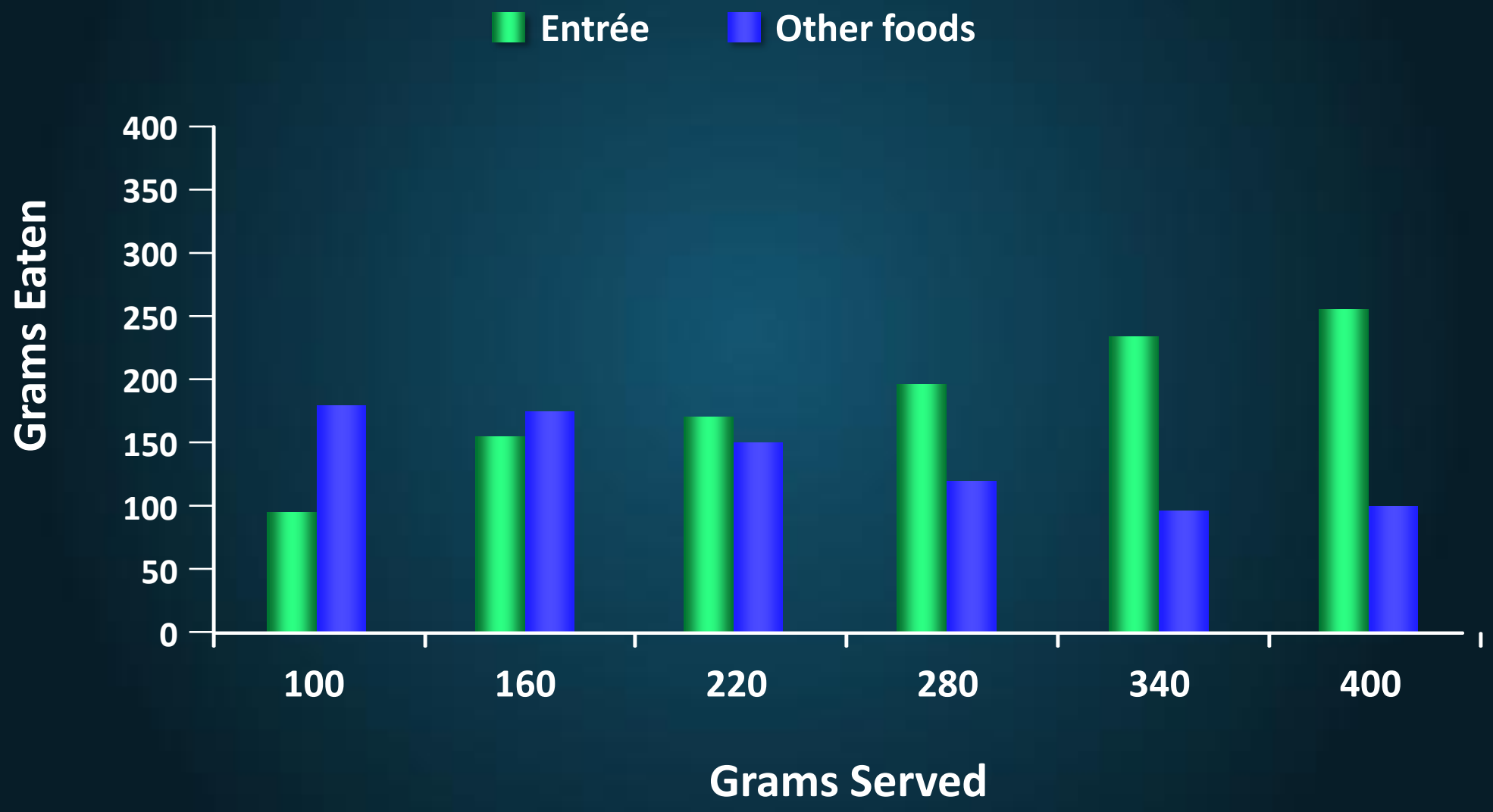
		Calories
1950-60's	one size	200
1970's	large	320
1980's	large	400
1990's	large	450
	super size	540
2000	super size	610

Effects of Portion Size on Food Consumption Among Young (3.6 Years) and Older (5.0 Years) Children



Rolls BJ, et al. *J Am Diet Assoc.* 2000;100(2):232-234.

Effects of Entrée Size on Intake of Other Foods in 3- to 5-Year-Old Children



Savage JS, et al. *Am J Clin Nutr.* 2012;95:335-341.

Provide Appropriate Portion Sizes for Foods and Beverages

- Serve portion sizes appropriate for age.
- Avoid super-size meals and drinks and all-you-can eat buffets.
- Share restaurant meals or ask for take-home container.
- Help children learn to eat when hungry and stop when full.

Physical Activity

Consensus Physical Activity Guidelines for Young Children

- **Institute of Medicine**: childcare providers should provide toddlers and pre-schoolers with “opportunities for light, moderate, and vigorous physical activity for at least 15 minutes per hour while children are in care.”

  (3 hours of physical activity over 12 waking hours)
- Australia Department of Health and 4 UK chief medical officers have made similar recommendations (180 minutes or 3 hours) spread throughout the day.

Pate RR, O’Neill JR. doi:10.1001/archpediatrics. 2012.1458

Physical Activity in Preschools

- 281 children 3-5 years attending 9 preschools in Fort Walton Beach, Florida
- Physical activity measured by accelerometry
- Children participated average of 7 minutes MVPA per hour (4.4-10.2 minutes)
- Conclusion: children's physical activity levels were highly variable among preschools.

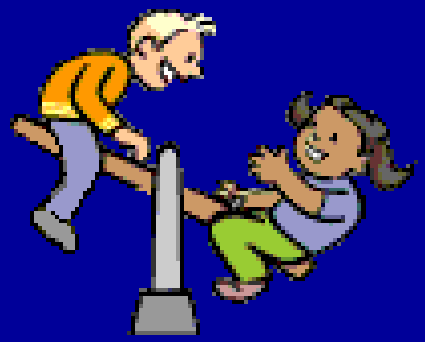
Pate, RR et al. Pediatrics 2004;114:1258-1263.

Physical Activity in Young Children and 4-Year Change in Body Mass Index

- 4550 children with mean age 6.6 years at study entry
- Children were 50% male, 54% Hispanic and 32% white
- Setting was 45 schools in 13 communities in southern CA
- Participation in organized sports activities as early as kindergarten and first grade resulted in smaller increases in BMI during the adiposity rebound period of childhood.

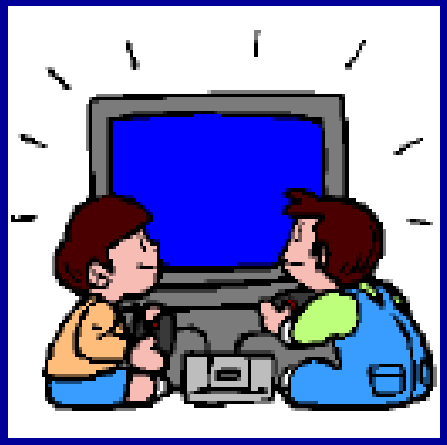
Dunton G et al. Arch Pediatr Adolesc Med. 2012;166:713-718.

Ensure that All Children/Youth Have 60 Minutes of Physical Activity Every Day



- Establish physical activity as routine part of everyday life for all family members
- Support physical activity in child care, pre-schools and schools
- Parents should participate in physical activity with children when possible
- Support participation in non-competitive and competitive activities. Make it fun!
- Support physical activity programs for children/youth with special needs

Children and Television



- The average child or adolescent watches 3 hours of television per day
- 32% of 2-7 year olds and 65% of 8-18 year olds have a TV set in their bedrooms.

Committee on Public Education. Pediatrics 2001;107:423-426.

Preschool-Aged Children's TV Viewing in Child Care Settings

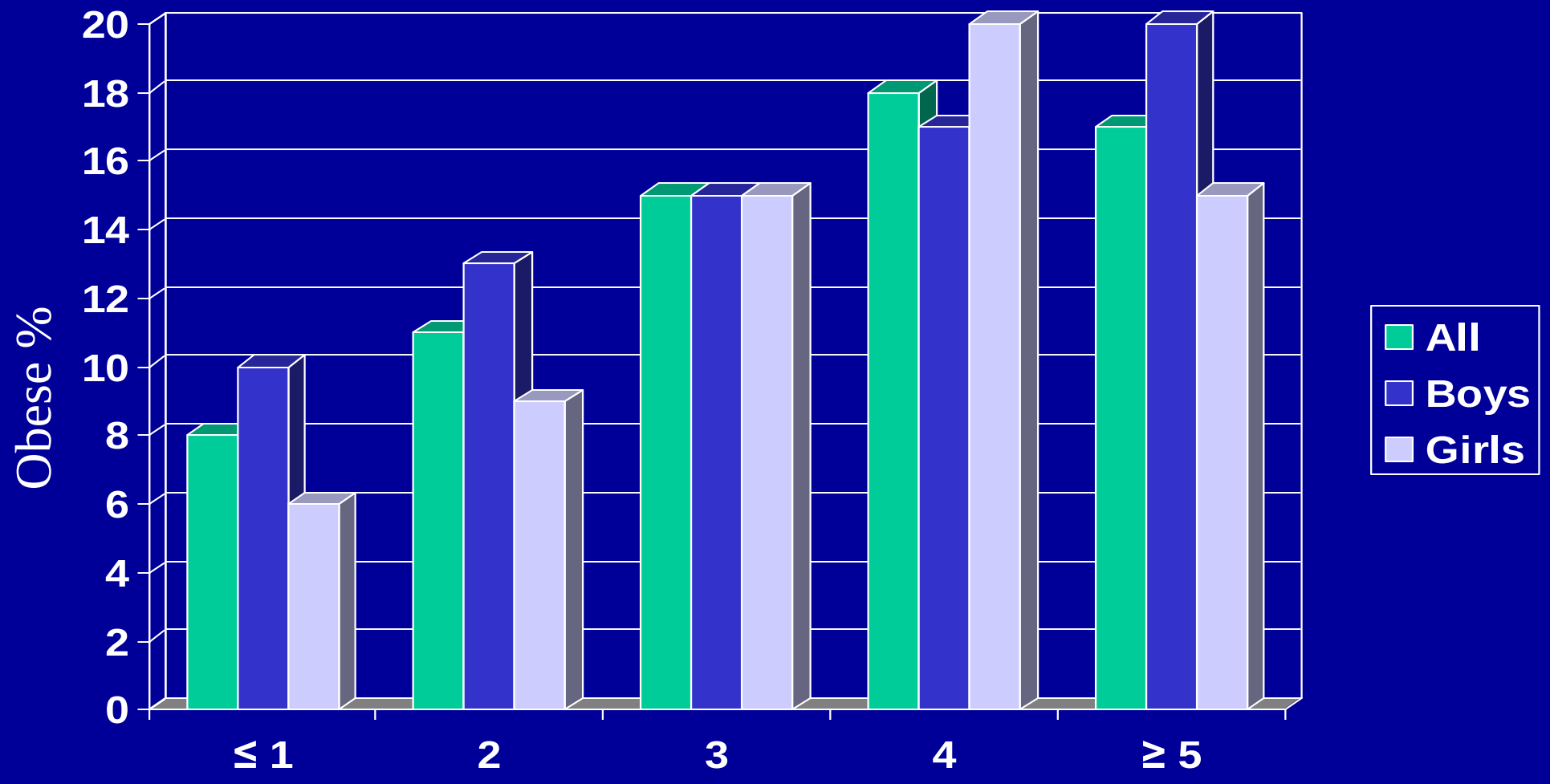
- Children in 70% of home-based child care settings and 36% of center-based settings watch TV daily
- When TV is viewed at all, average time is 2-3 hours in home-based programs and 1.5 hours in center-based programs.

Christakis DA. Pediatrics 2009;124:1627-1632.

Association Between TV Viewing and Irregular Sleep Schedules in Children Less Than 3 Years of Age

- National survey of early childhood health
- 2068 children 4-35 months of age
- 34% had irregular naptime schedules and 27% irregular bedtime schedules
- Number of hours of TV watched per day was associated with both irregular naptime and bedtime schedules

Thompson DA. Pediatrics 2005;116:851-856.



Time Spent Watching Television
(hrs/day)

Crespo CJ et al. Arch Pediatr Adolesc Med 2001; 155:360-365.

Advertising Directed at Children

- Children exposed to 3 food commercials per hour of TV time
- Food and beverage industry spends $10-12 billion a year advertising to children and youth
- 80% of food advertisements are for sugary cereals, unhealthy snacks, candy, soft drinks, and fast food
- 2% of advertising expenditures for fruits and vegetables
- Promoting food sales through toy distribution is an effective strategy targeting children less than age 3 years

Borzekowski D, Robinson T. J Am Diet Assoc 2001;101.

Connor SM. Pediatrics 2006; 118:1478-1485.

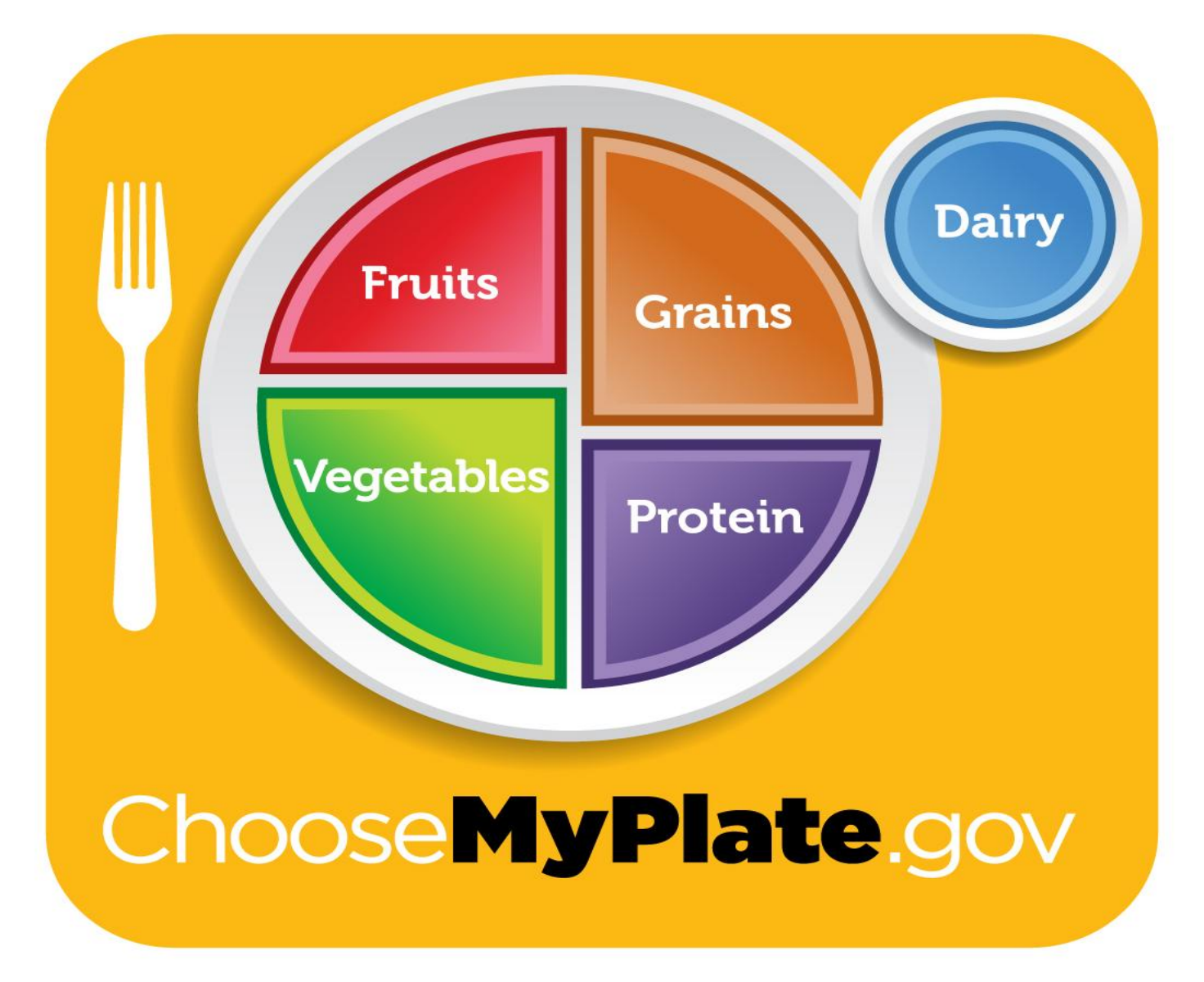
Limit Television Time to 1-2 Hours a Day

- Avoid TV for children less than 2 years of age.
- Limit TV in child care settings.
- Avoid having TV set in children’s bedrooms.
- Help children prioritize programs they watch.
- Teach children to critique TV advertising.
- Encourage active play as alternative to TV/video games.

Parent-Child Interaction

- Parent provides healthy choices
- Child decides what and how much to eat

Satter E. J Pediatr. 1990;117:S181-189.


Fruits
Grains
Dairy
Vegetables
Protein
ChooseMyPlate.gov

AAP Healthy Active Living for Families (HALF) Project

www.healthychildren.org/growinghealthy

www.aap.org/HALFIG

www.healthychildren.org/Espanol

Goals:

- For parents: support healthy active living
- For pediatricians: begin early obesity prevention counseling during infancy and early childhood well visits.

Resources for HALF Project

- Positive and strength-based
- Plain language
- Developmentally appropriate for infants, toddlers, and preschool children
- Individualized and focused materials to meet family's needs
- Action oriented

Parent and Family Quick Tips (HALF Project)

- Breastfeeding
- Bottle feeding
- Starting solid food
- Picky eaters
- Snack time
- Routines and schedules
- Physical activity
- Screen time
- Sleep

Evidence-Informed Desired Family Behaviors (HALF Project)

- Breastfeeding for at least 6 months
- Appropriate bottle feeding
- Appropriate introduction of solid food
- Understanding hunger and satiety cues (responsive feeding)
- Establish sleeping, eating, and activity routines
- Limit/eliminate juice and sugar-sweetened beverages
- Limit screen time and avoid TV in bedroom
- Encourage active play for all ages
- Role modeling

Recommendations for Families

- Take a whole family approach
- Encourage responsive feeding
- Increase acceptance of healthy foods
- Find alternatives to food for comfort and rewards
- Encourage positive family mealtimes
- Encourage active play

Recommendations for Families

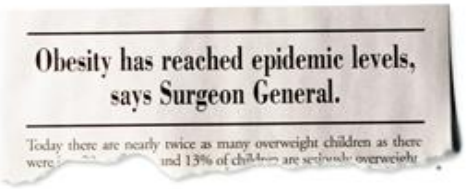
- Limit screen time
- Reduce sugar-sweetened beverages and increase water
- Reduce availability of energy-dense foods
- Ensure appropriate portion sizes
- Ensure adequate sleep
- Model a healthy lifestyle

Adapted from W. H. Dietz, MD, PhD

Time Magazine – August 19, 2002

Bad eating habits are learned early.

And keep getting worse.



Now is the time to teach your baby good eating habits for the rest of his life.

Research shows that lifelong eating habits and tastes are learned early. Sure, it's tempting to let your baby eat convenient adult foods. But now is your best opportunity to teach good eating habits by choosing a wide variety of foods that best meet your baby's nutritional needs. For more information on how to teach healthy eating habits now so he'll make the right choices later in life, contact us anytime, day or night.

Gerber Parents Resource Center

1-800-4-GERBER @ www.gerber.com
Anytime, day or night.

Gerber

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*The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity 2001

Make the healthy choice

the easy choice