

The Prevention of Childhood and Adolescent Obesity

Steven Gortmaker, Ph.D.

Harvard School of Public Health

Overview

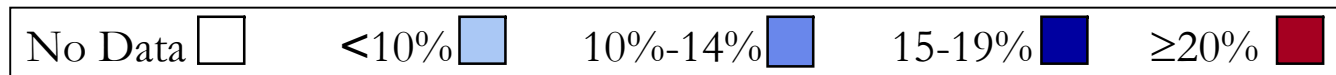
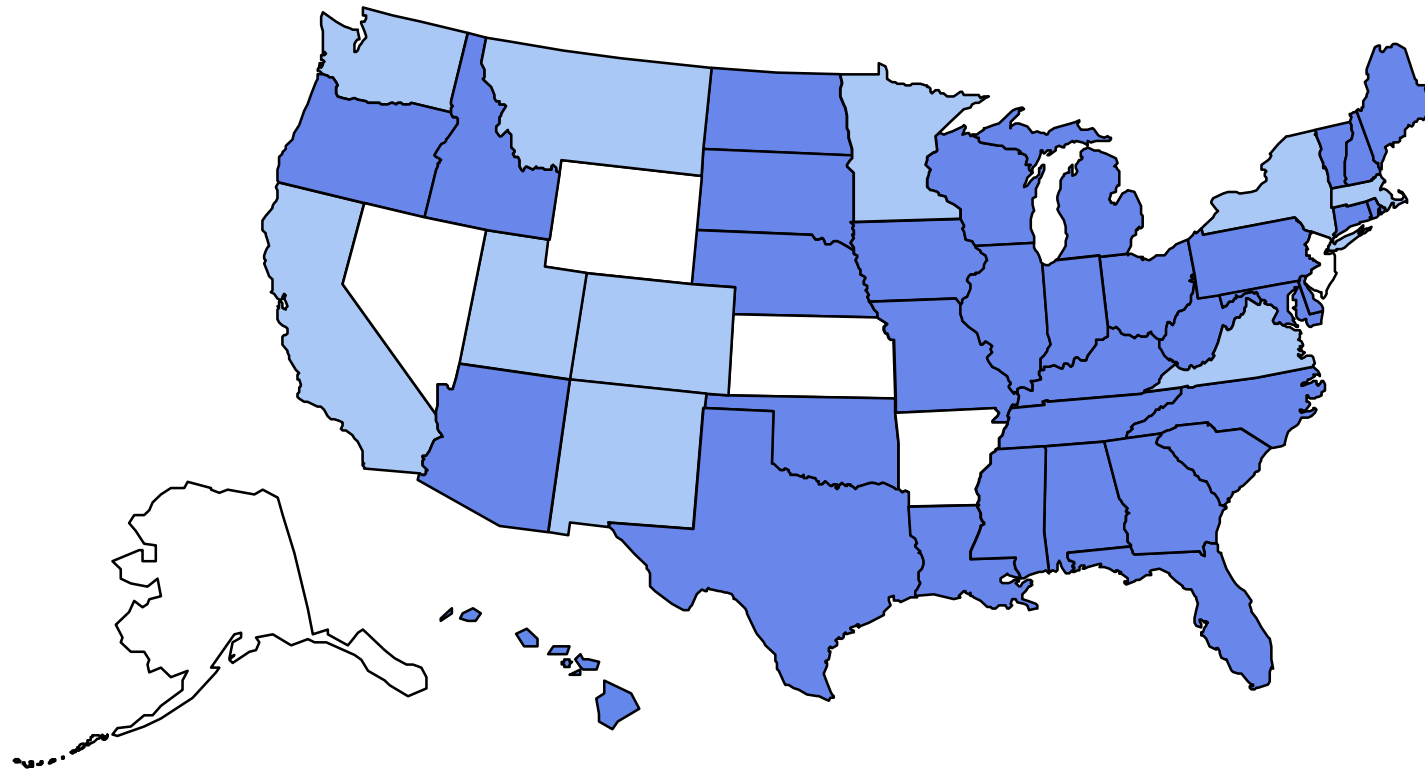
- A brief update on the obesity epidemic - and it's consequences
- What can be done with children and youth that is science-based and will make a difference (and adults too)
- The importance of a broad theoretical framework
- The most effective science-based approaches are generally ignored - a discussion of why

The Problem:

- **Obesity is increasing rapidly among children, youth and adults in the US**
 - **Increases are found in all regions of the country, urban/rural, both sexes, all ethnic groups, rich and poor**
-

Obesity Trends* Among U.S. Adults

BRFSS, 1990

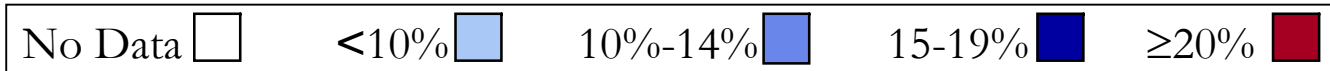
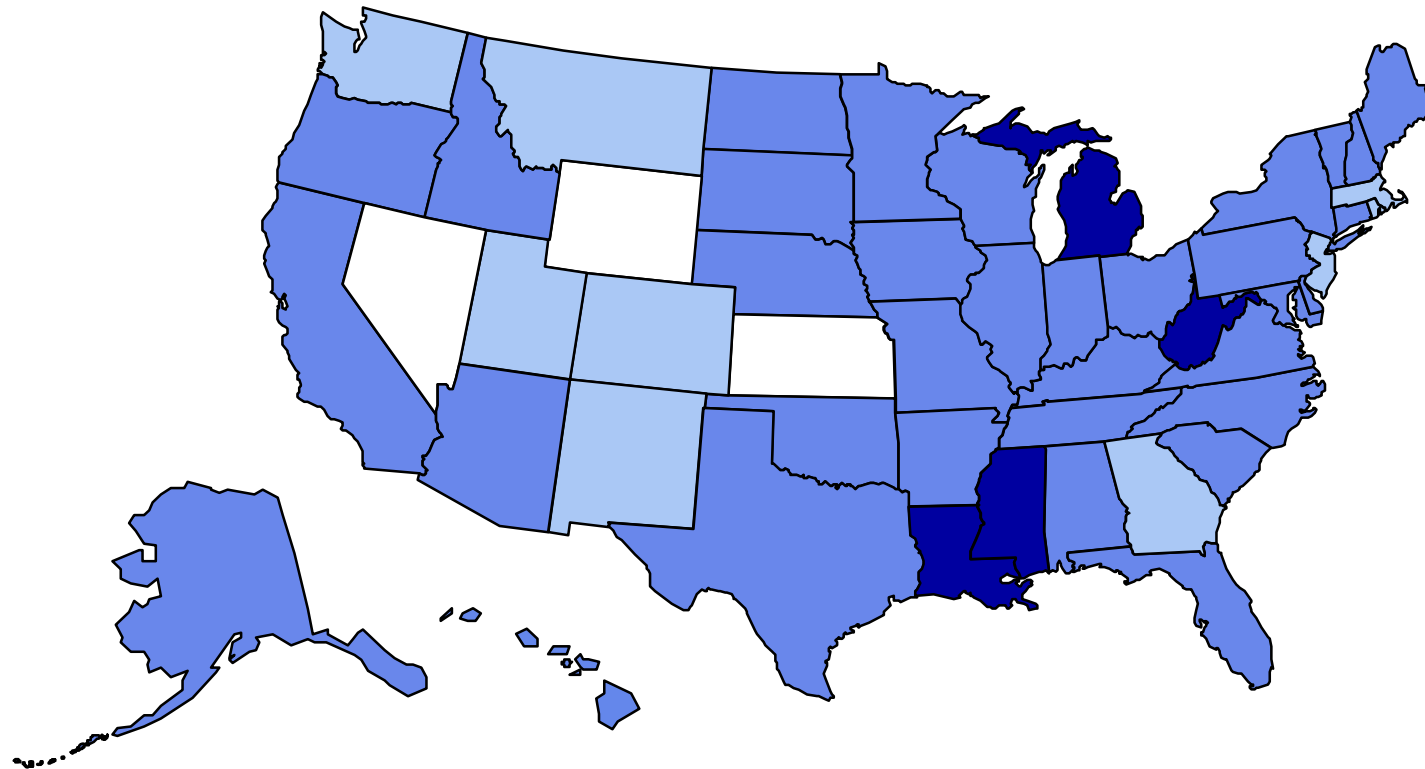
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5'4" woman)

Source: Mokdad AH.

Obesity Trends* Among U.S. Adults

BRFSS, 1991

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

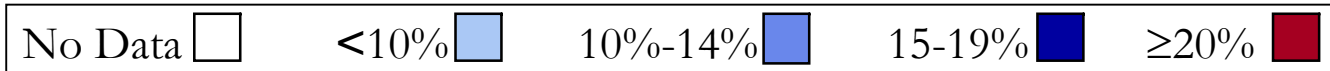
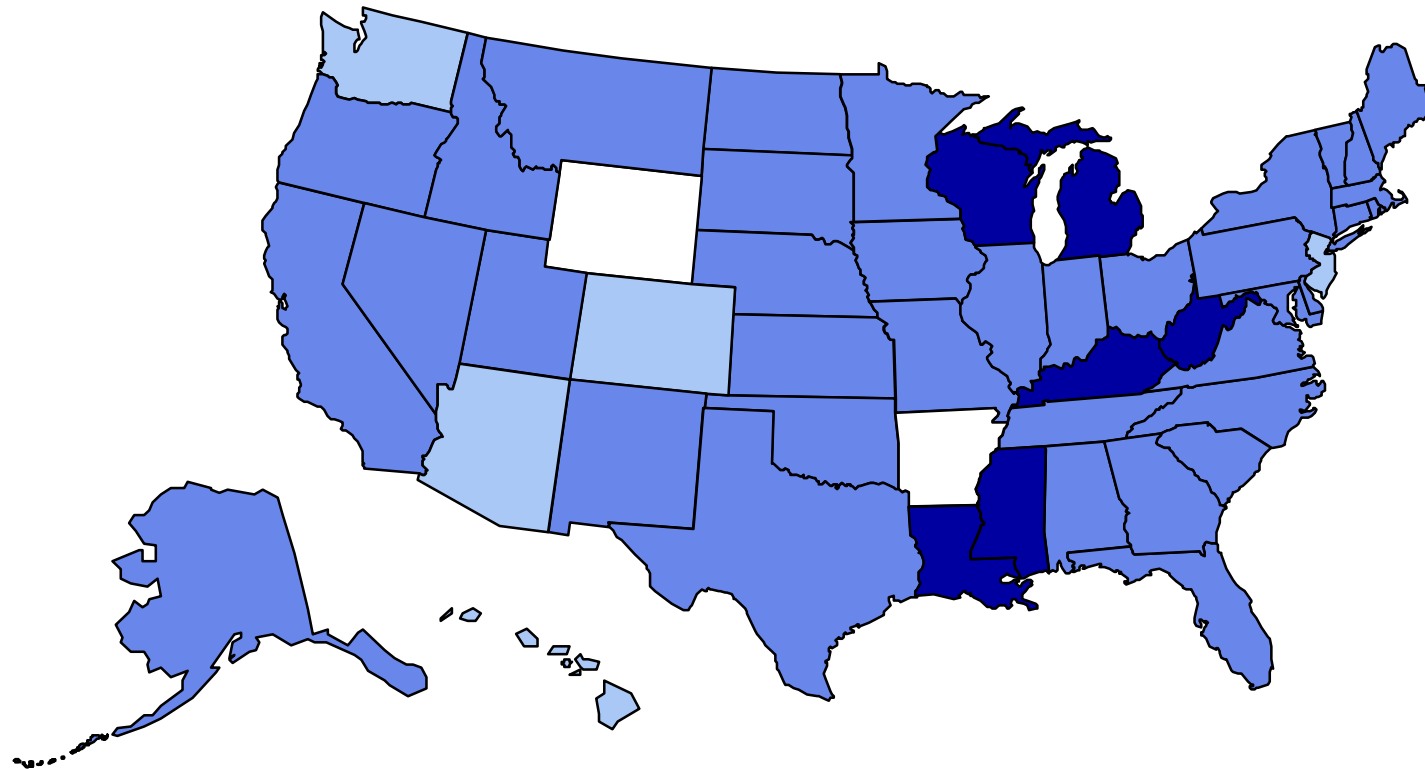


Source: Mokdad AH.

Obesity Trends* Among U.S. Adults

BRFSS, 1992

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

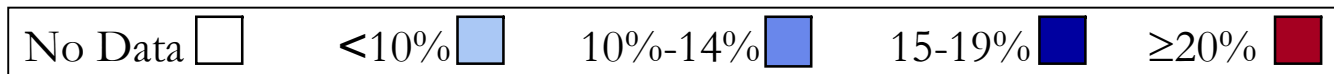
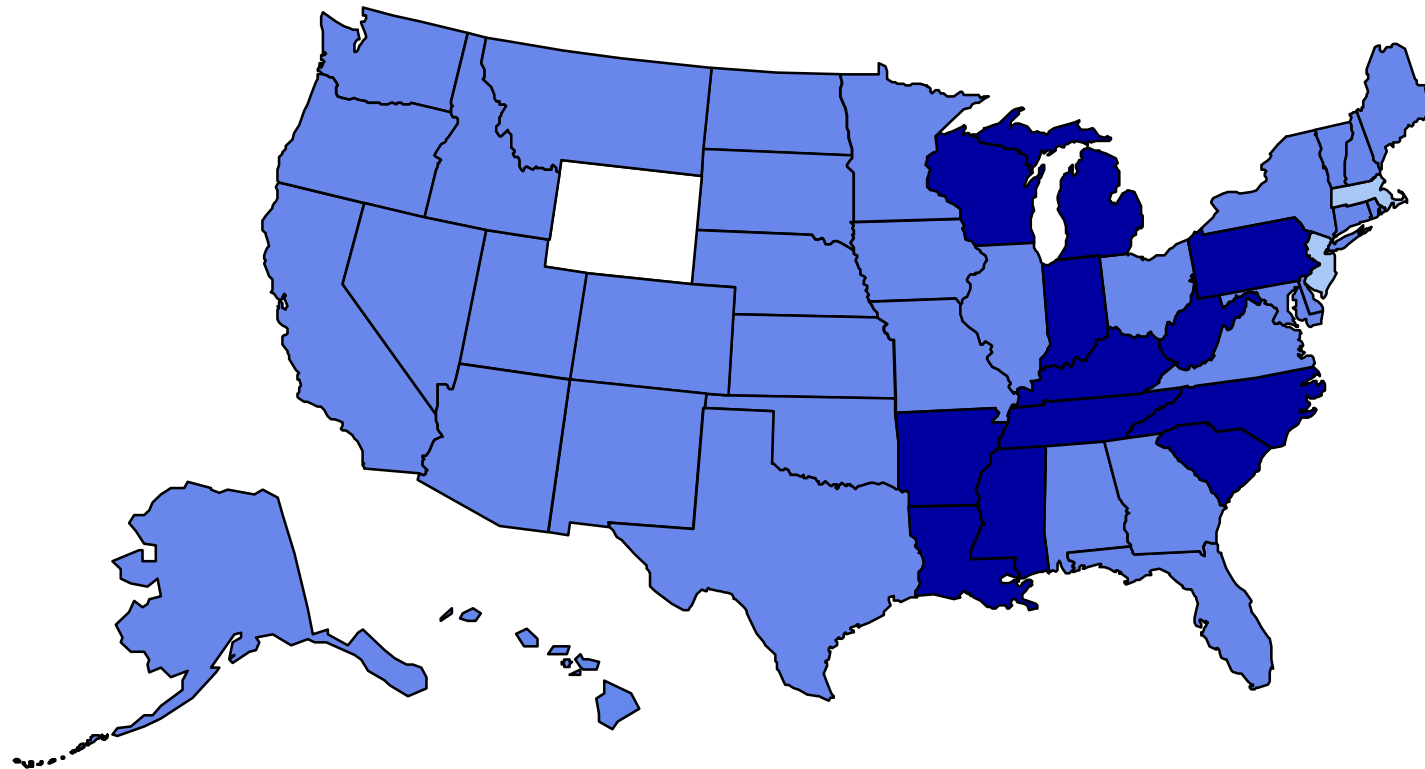


Source: Mokdad AH.

Obesity Trends* Among U.S. Adults

BRFSS, 1993

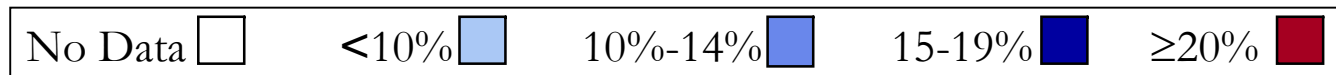
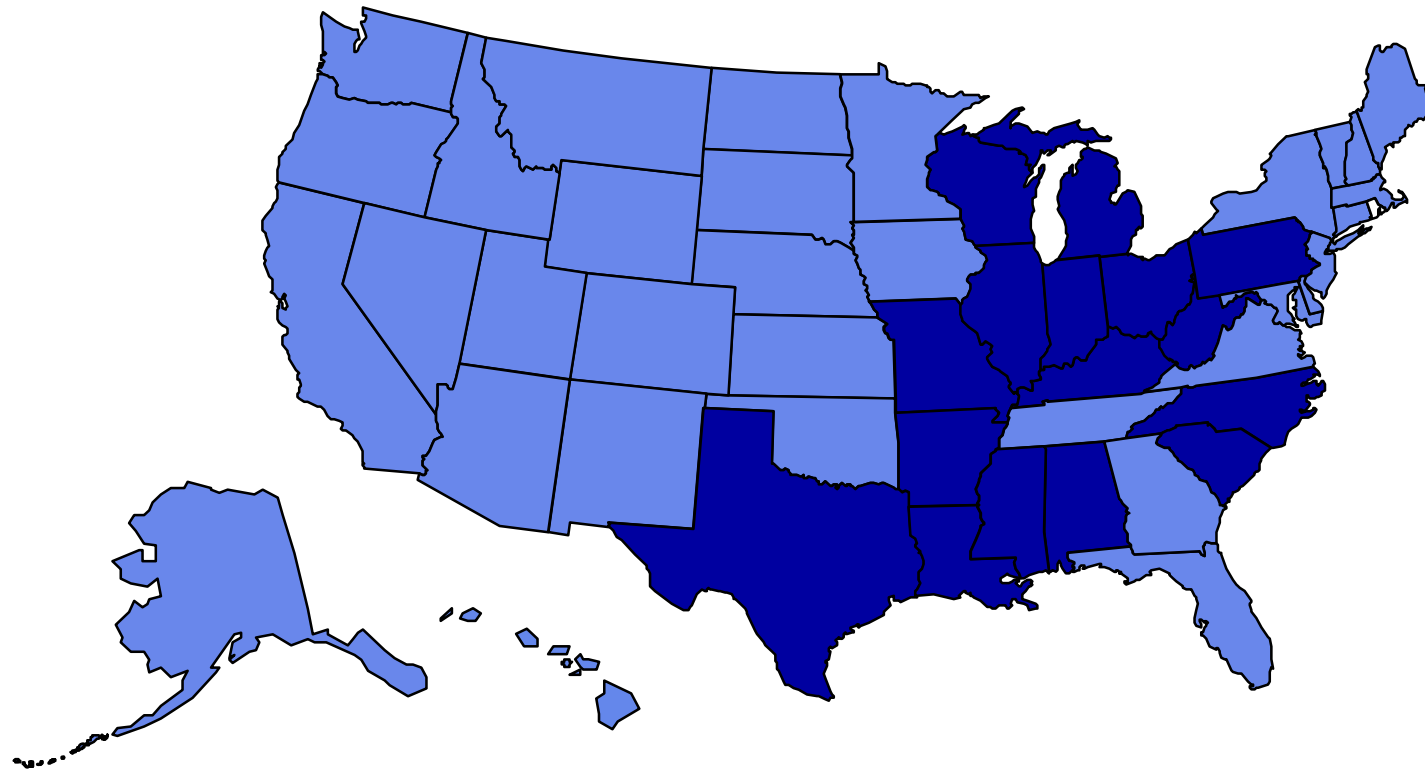
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5'4" woman)



Source: Mokdad AH.

Obesity Trends* Among U.S. Adults

BRFSS, 1994

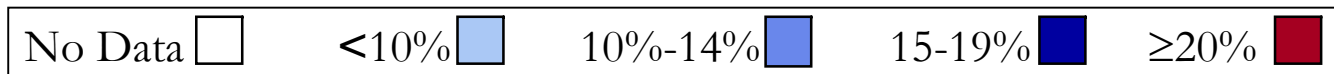
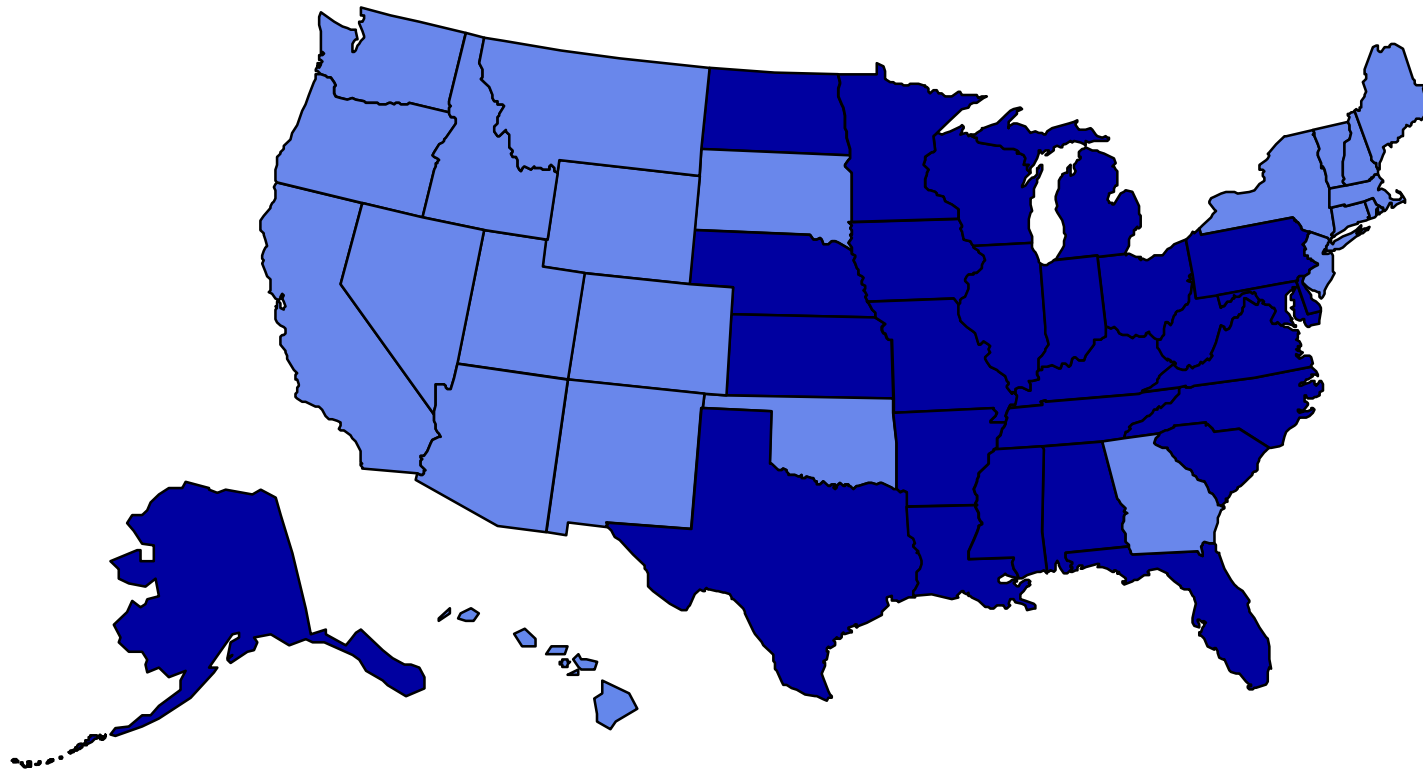
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5'4" woman)

Source: Mokdad AH.

Obesity Trends* Among U.S. Adults

BRFSS, 1995

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

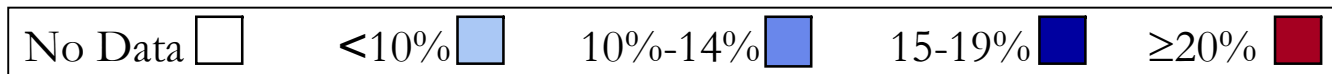
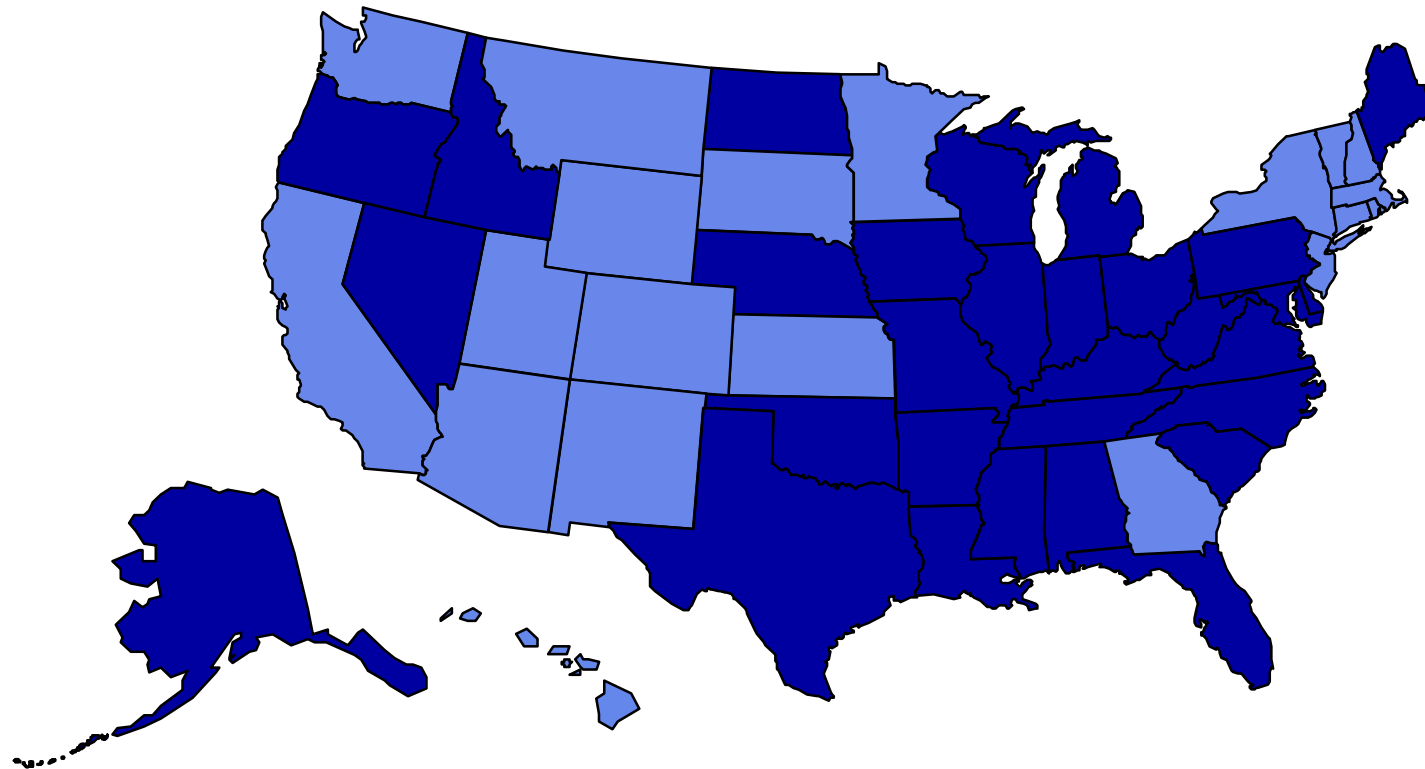


Source: Mokdad AH.

Obesity Trends* Among U.S. Adults

BRFSS, 1996

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

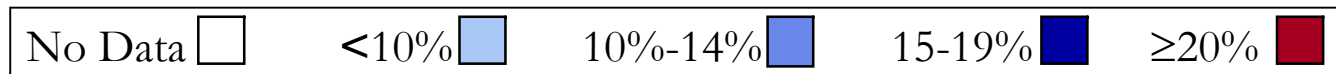
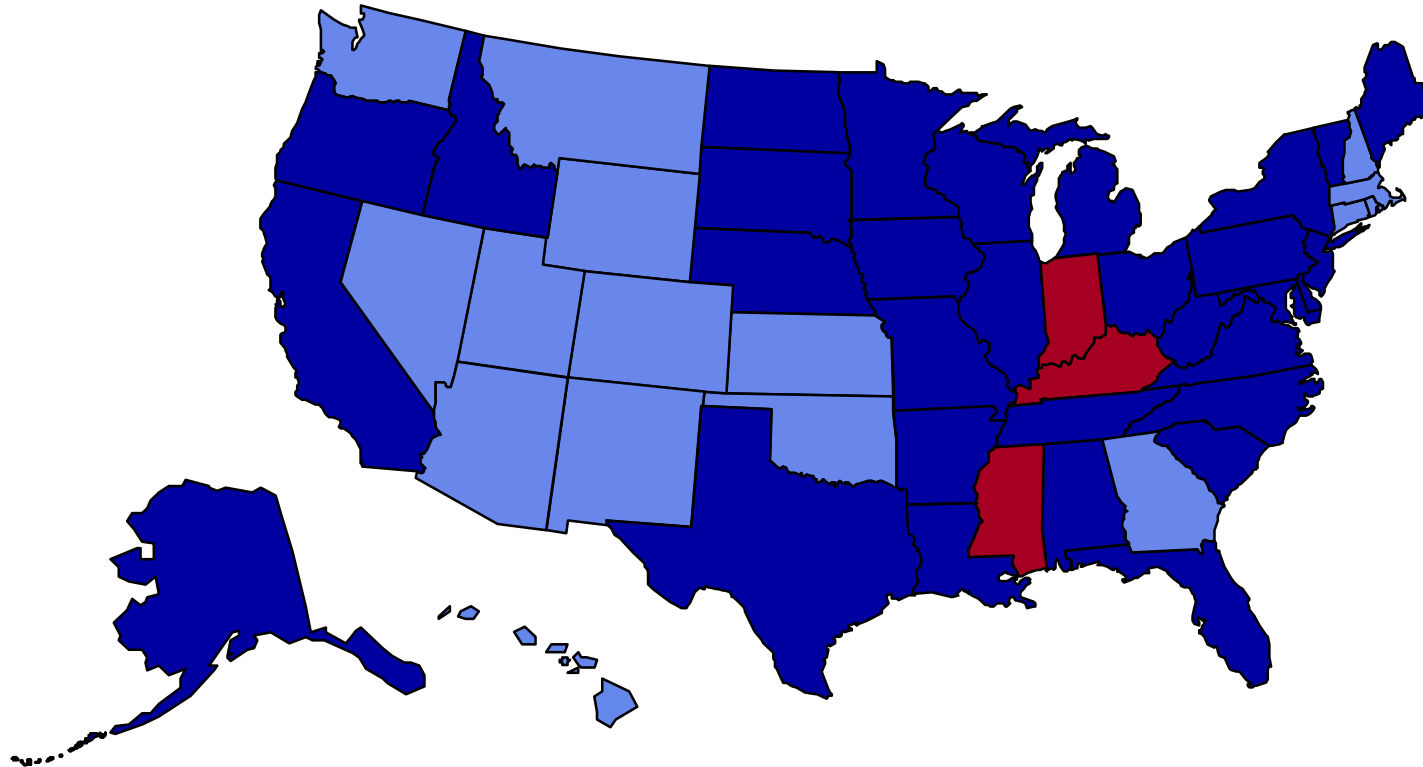


Source: Mokdad AH.

Obesity Trends* Among U.S. Adults

BRFSS, 1997

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

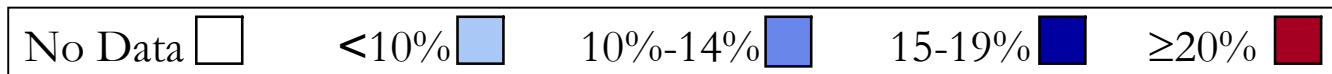
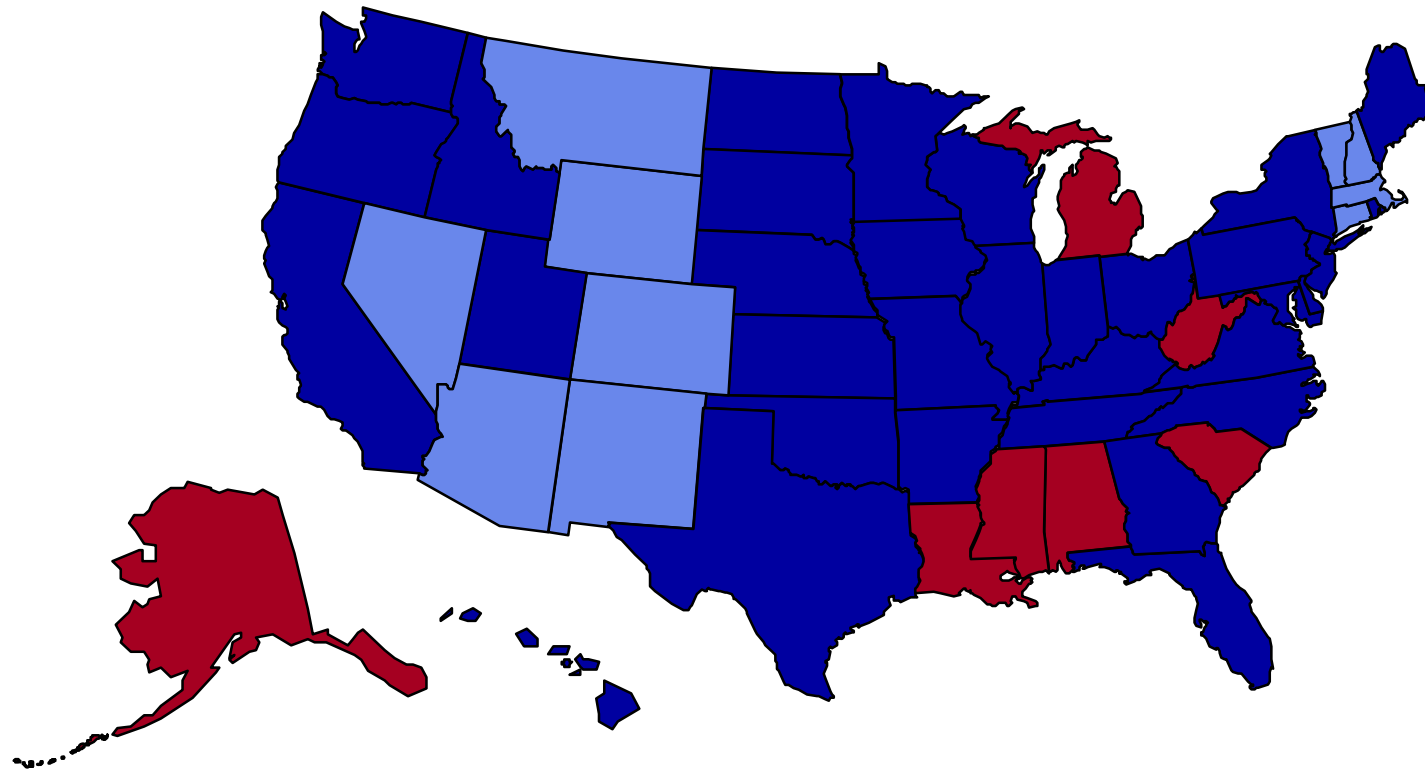


Source: Mokdad AH.

Obesity Trends* Among U.S. Adults

BRFSS, 1998

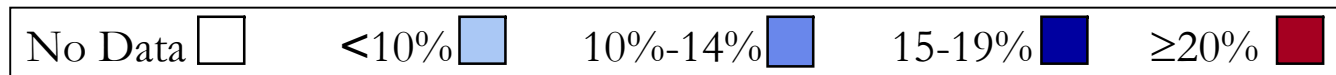
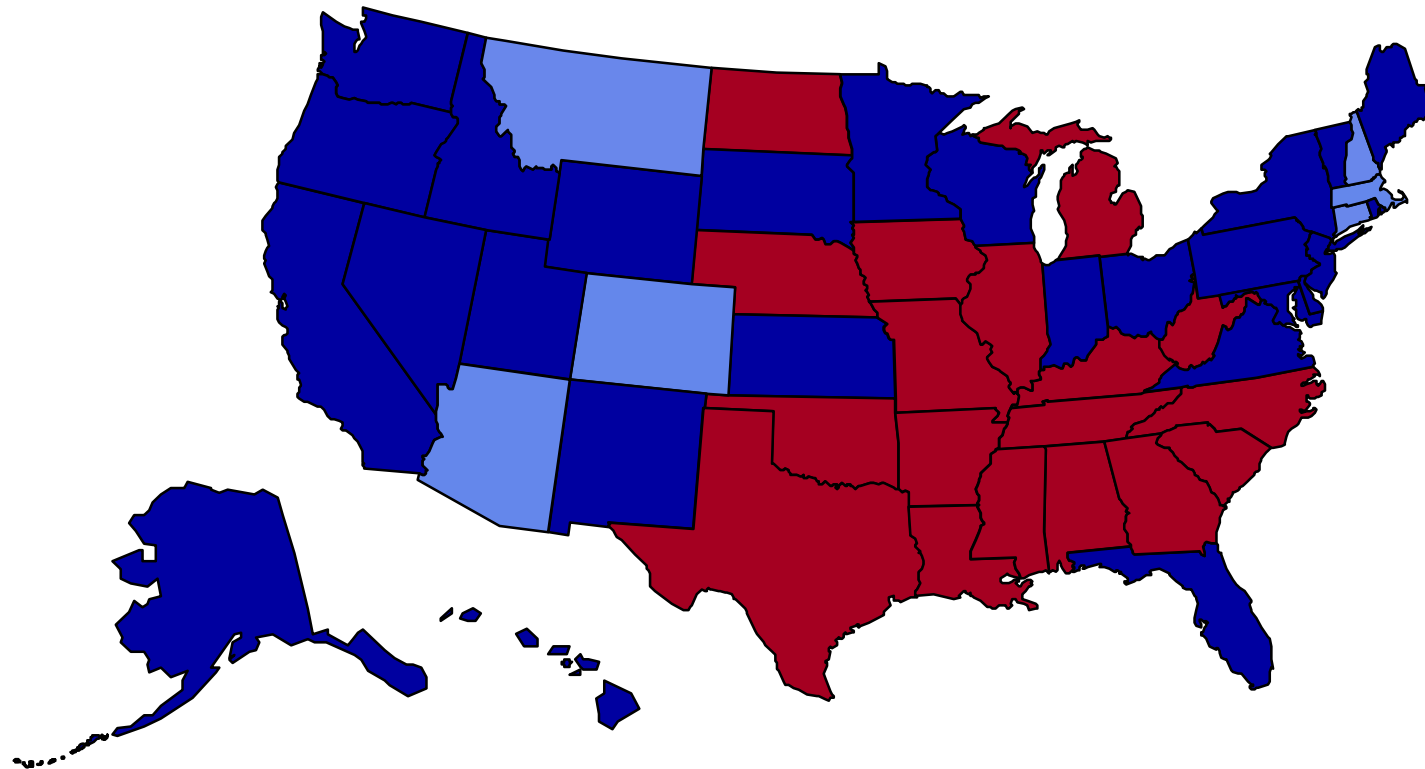
(*BMI ≥ 30 , or ~ 30 lbs overweight for 5'4" woman)



Source: Mokdad AH.

Obesity Trends* Among U.S. Adults

BRFSS, 1999

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

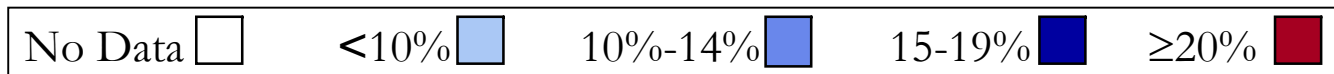
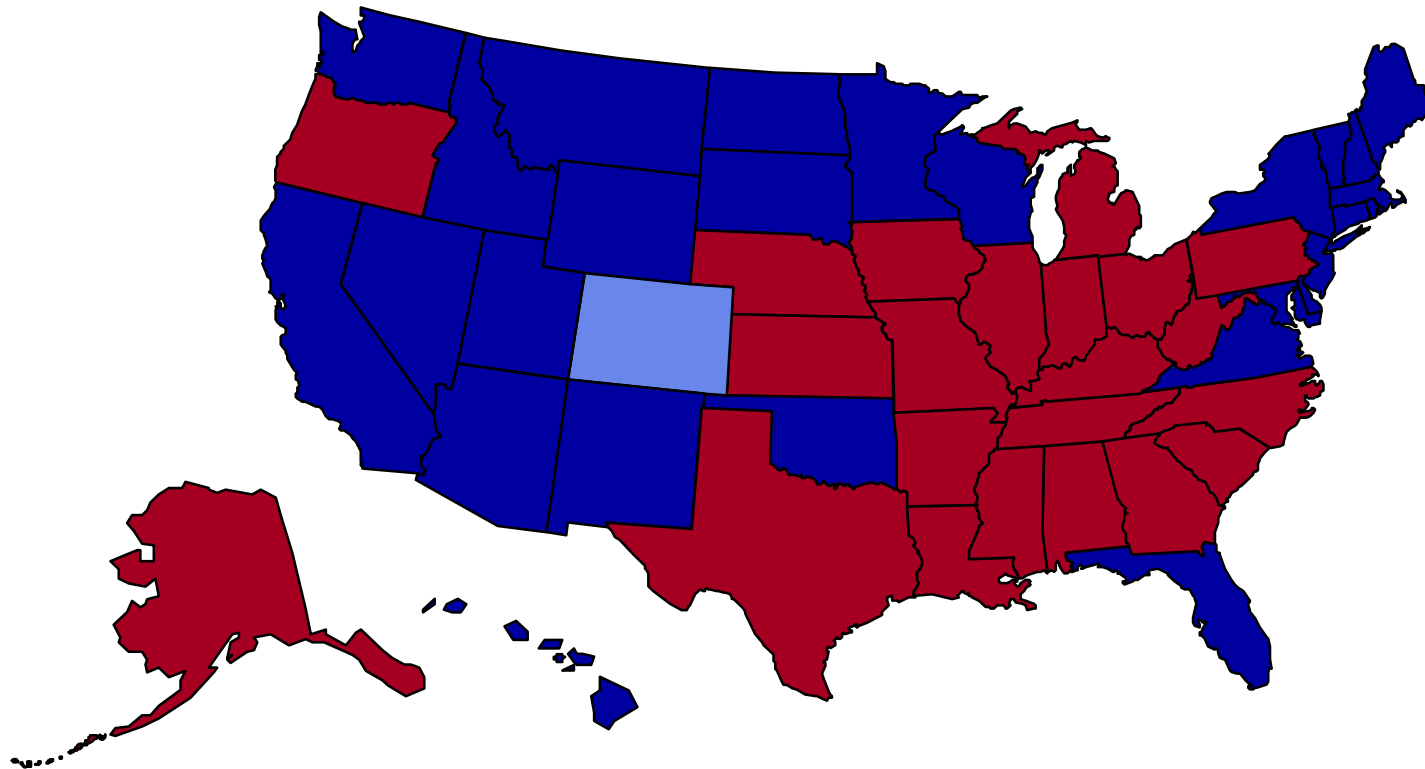
Source: Mokdad A H, et al. *J Am Med Assoc* 2000;284:13



Obesity Trends* Among U.S. Adults

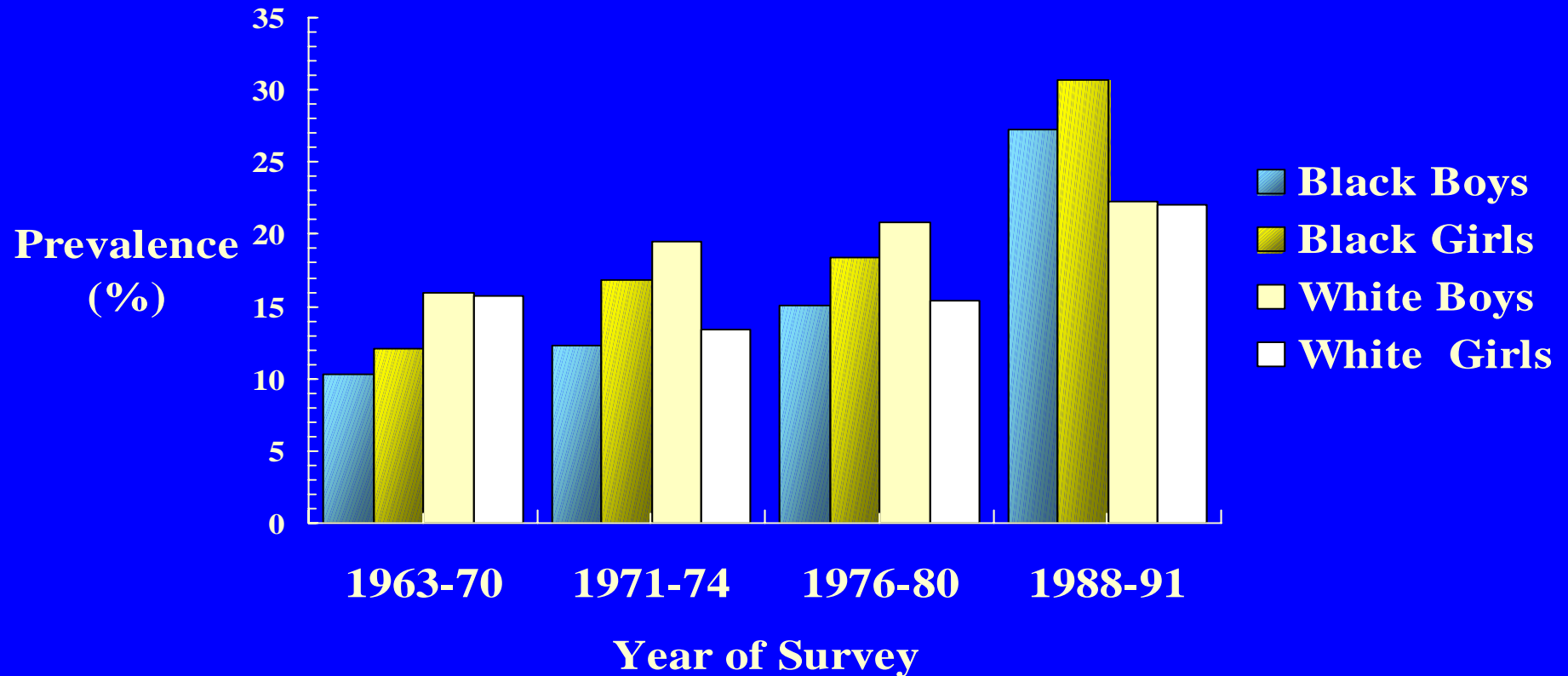
BRFSS, 2000

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



Source: Mokdad A H, et al. *J Am Med Assoc* 2001;286:10

Prevalence of Overweight Among U.S. Boys and Girls by Race/Ethnicity, Ages 6-11, 1963-1991



Troiano RP, Flegal KM, Kuczmarski RJ, Campbell SM, Johnson CL. Overweight prevalence and trends for children and adolescents. The National Health and Nutrition Examination Surveys, 1963 to 1991. Arch Pediatr Adolesc Med 1995;149:1085-1091.

The Consequences?

- **Clear evidence for increasing risk of cardiovascular disease, diabetes, adult obesity and risk**
 - **But we don't really know the magnitude: never before have our children and youth been so overweight (and we don't know consequences for adults either)**
-

Freedman DS, Dietz WH, Srinivasan SR, Berenson GS . The relation of overweight to cardiovascular risk factors among children and adolescents: the Bogalusa Heart Study. Pediatrics 1999 Jun;103(6 Pt 1):1175-82

Must A, Spadano J, Coakley EH, Field AE, Colditz G, Dietz WH. The disease burden associated with overweight and obesity. JAMA. 1999 Oct 27;282(16):1523-9.

Obesity Fundamentals

- **Obesity is caused by excess Energy Intake minus Energy Expenditure**
 - **Daily imbalance is on average small: lots of small seemingly inconsequential acts add up to a difficult problem over time - the “fat ratchet”**
 - **A Strategy: Reducing risk based on science**
-

Social and Behavioral Risks for Obesity: Examples

- **Behavioral risks for obesity are structured by social context**
- **Physical activity of youth is limited by a lack of school and after-school physical activities and facilities**
- **Limited opportunity leads to more TV viewing (low activity along with commercial reinforcement for food)**
- **Placement of sodas and fast-foods everywhere alters the eating habits of children and youth**

The Need for A Broad-Based Society and Health Perspective

- A focus on individual level risk factors does not address the importance of social context for sustainable change
- Mediating institutions are key: households, communities, schools, work-sites, churches, health-care organizations
- Social and economic structures influence institutional and policy change

The Production of Obesity in the United States

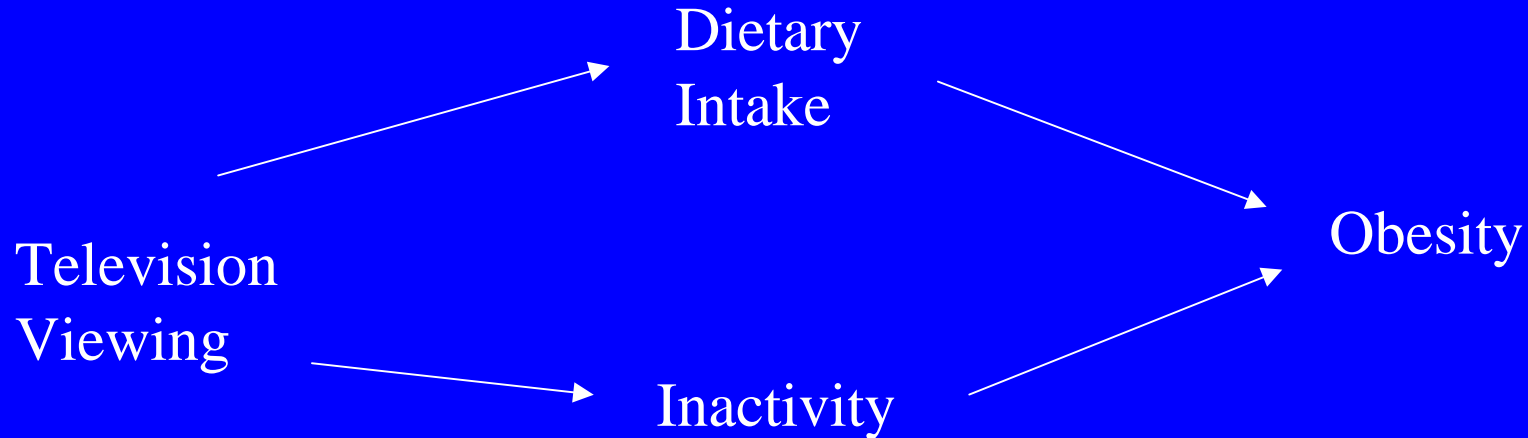


Some Science-Based Strategies That Can Reduce Obesity and Impact Caloric Imbalance

Television Viewing and Energy Balance: The Science

- **A relatively new construct and focus of research: Is it scientific?**
- **How can television viewing cause obesity?**
- **Evidence in support of hypothesis**

Hypothesized Impact of Television Viewing on Obesity

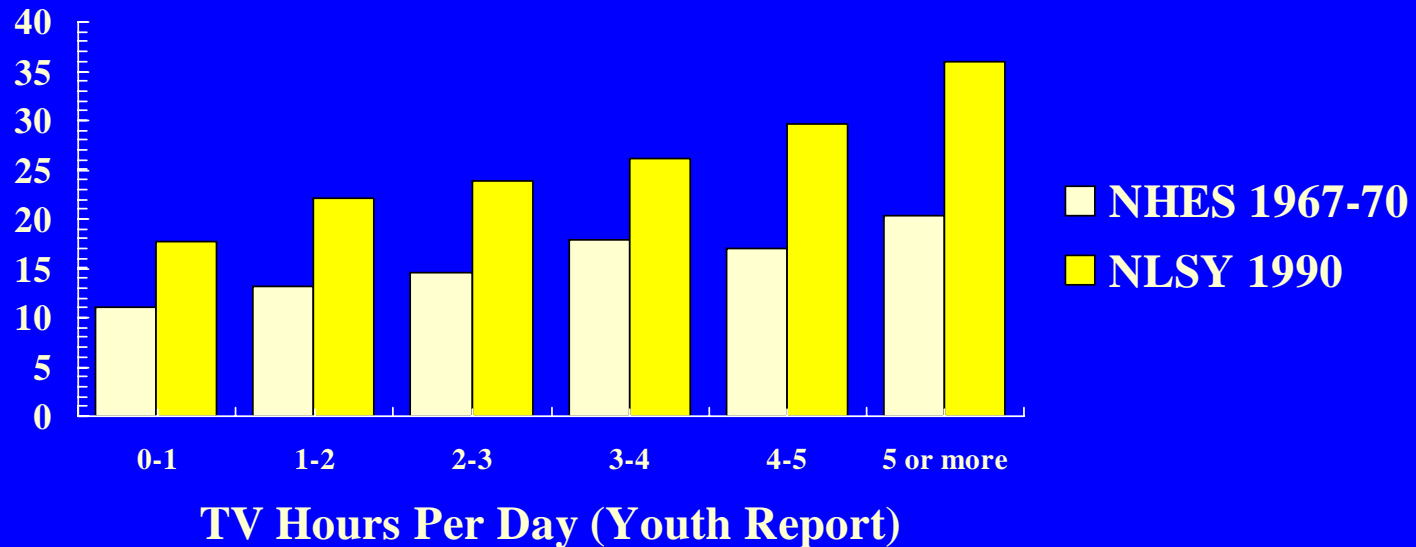


Evidence for the Impact of Television Viewing on Obesity

Population-Based Epidemiological Data

Prevalence of Obesity by Hours of TV per Day; NHES Youth Aged 12-17 in 1967-70 and NLSY Youth Aged 10-15 in 1990

Prevalence (%)



Dietz WH, Gortmaker SL. Do we fatten our children at the tv set? Obesity and television viewing in children and adolescents. *Pediatrics*, 1985; 75:807-812.

Gortmaker SL, Must A, Sobol AM, Peterson K, Colditz GA, Dietz WH. Television viewing as a cause of increasing obesity among children in the United States, 1986-1990. *Archives of Pediatrics and Adolescent Medicine*, 1996;150:356-362.

Evidence for the Impact of Television Viewing on Obesity

Randomized Controlled Trials

Randomized Controlled Trials: Television and Obesity

- **School-based intervention: primary grades;** impact on mean BMI (Robinson. JAMA.1999.)
- **Clinical Intervention:** Obese children and youth; impact of reducing inactivity on overweight (Epstein et al. Health Psychol. 1995.)
- **School-based intervention; middle school;** reduced television predicts reduced obesity among girls (Gortmaker et al. Arch Pediatr Adolesc Med. 1999)

Why Schools?

- **Most children and youth are in schools**
 - **Schools are major settings for learning, physical activity, dietary intake**
 - **A caveat: strategies must be compatible with the primary educational aims of schools**
-

Planet Health



- **Steven Gortmaker, PhD PI**
 - **Karen Peterson, RD, ScD Co-PI**
 - **Jean Wiecha, PhD Project Director**
 - **Nan Laird, PhD Co-Investigator**
-
- **Funding NICHD HD 30780**

Interdisciplinary Curriculum

- A strategy in which health promotion materials are incorporated into existing school structure and core curricula, such as math, social studies, science, language arts and physical education
 - Emphasizes participation by regular classroom teachers
-

Clark DC, Clark SN. Interdisciplinary curriculum: meeting the needs of young adolescents. *Schools in the Middle*. 1994;3:4-7.

Carter J, Wiecha J, Peterson KE, Gortmaker SL. Planet Health. Champaign, Illinois: Human Kinetics Press, 2001.

Planet Health



- 6th-8th grade students in 10 ethnically diverse public schools, Boston MA metropolitan area
- Schools randomly assigned; 5 Intervention, 5 control
- Primary endpoint: obesity.

Summary

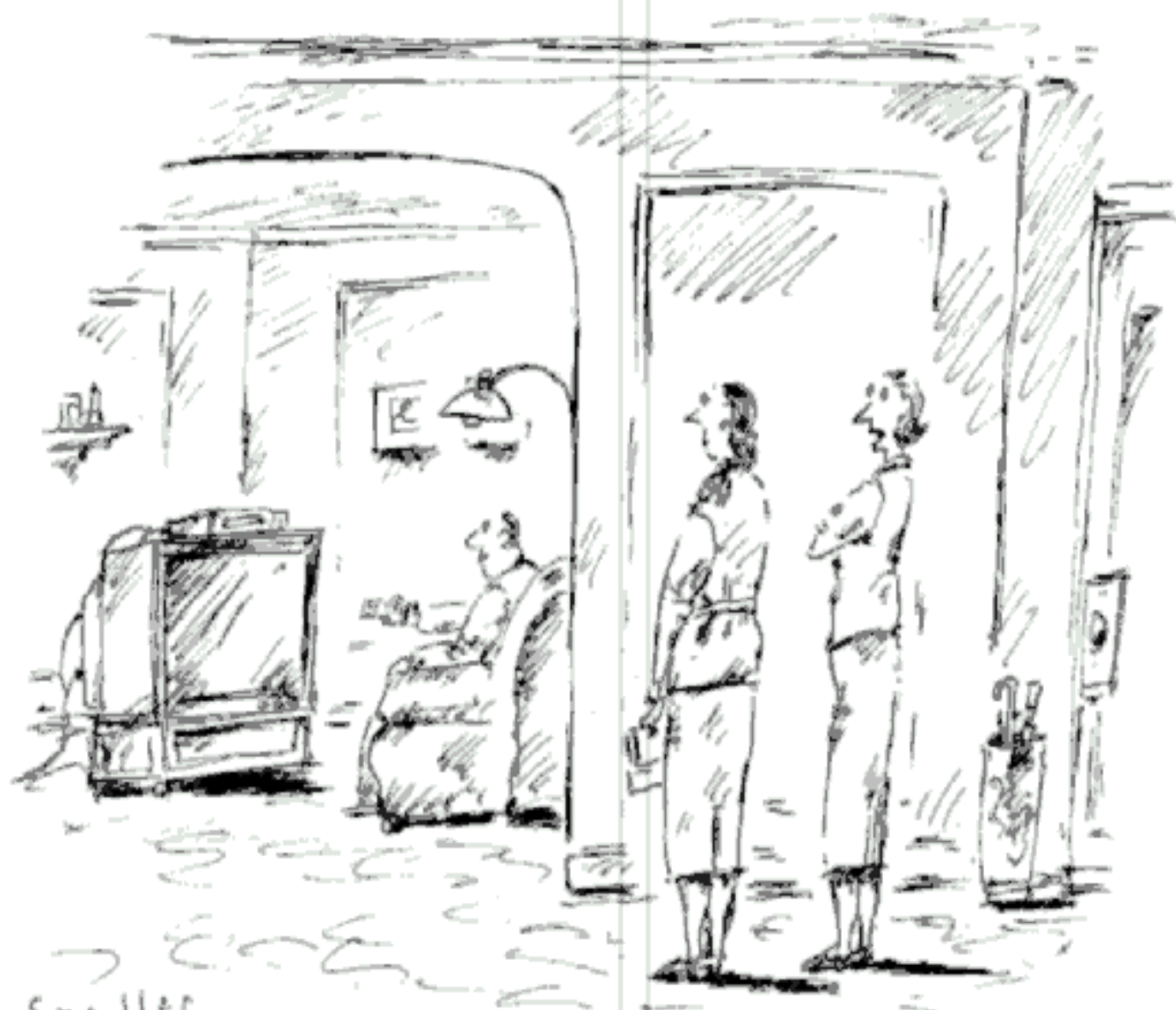


- Obesity among females in intervention schools was reduced compared to controls (OR 0.48; $P=0.03$)
- Reductions in TV; both boys & girls
- Among girls, each hour of TV => reduced obesity (OR 0.86/hour; $P=0.02$)
- Increases in fruit and vegetable intake and less increment in total energy intake among girls ($P=0.003$ and $P=0.05$)
- Gortmaker SL, Peterson K, Wiecha J, Sobol AM, Dixit S, Fox MK, Laird N. Reducing obesity via a school-based interdisciplinary intervention among youth: *Planet Health*. Archives of Pediatrics and Adolescent Medicine. 1999;153:409-18.

Conclusion: There is clear evidence for television viewing as a cause of obesity

Less clear evidence on relative importance of mediating mechanisms (diet, activity, fat-free mass)

TV viewing is a measurable construct, and appears to be a direct indicator of the imbalance of dietary intake and expenditure that causes obesity



B. S. Miller

"Every few years, Gordon and the TV get a couple of inches wider."

Points of Intervention: Television Viewing and Obesity

• **UPSTREAM**

- Causes of TV Viewing
 - Individual
 - Institutional
 - Societal
- Altering TV programming
 - Altering advertising
 - Programming that induces activity

• **DOWNSTREAM**

- Television Reduction Interventions
- Resisting Advertising Influence
 - Educational
 - Technical (e.g. VCR)
- Being Active While Watching
 - Educational
 - Technical

The Important Forces:

- **F**ood producers and the "Fast Food" industry - if they're successful, we all eat more
- **A**dvertisers for food and video/film industries - if they're successful, we all buy more
- **T**elevision and video/film production and distribution industry - if they're successful we all watch more

Some Other Science-Based Strategies

Eliminate Sugar-Sweetened Beverage and Candy Machines at School

- **Studies document impact on energy intake and obesity**
- **No nutritional value beyond calories**

Ludwig DS, Peterson KE, Gortmaker SL. Sugar-sweetened beverage consumption and childhood obesity. *The Lancet*. 2001;357:505-508

Harnack L, Stang J, Story M. Soft drink consumption among US children and adolescents: nutritional consequences. *J Am Diet Assoc*. 1999;99:436-41.

Some Science-Based Strategies That Can Improve Physical Activity Levels via Changed Environments

Implement More Physical Education in Schools & More Active PE

- **Randomized controlled trials indicate effectiveness in increasing activity levels in Physical Education (PE) classes**
- **Randomized controlled trial indicates no negative test score impact of active PE**

Luepker RV, Perry CL, McKinlay SM, et al. Outcomes of a field trial to improve children's dietary patterns and physical activity: the Child and Adolescent Trial for Cardiovascular Health (CATCH). JAMA. 1996;275:768-76.

Sallis JF, McKenzie TL, Kolody B, Lewis, M, Marshall S, Rosengard P. Effects of health-related physical education on academic achievement: project SPARK. Res Q Exerc Sport. 1999;2:127-34.

Implement Policies and Environmental Programs to Encourage Play & Walking

- **Make streets, playgrounds, intersections, local environments, safer**
- **Parent involvement is key: walking to school, organizing sports means time with children**
- **Expand Opportunities! Programs!**

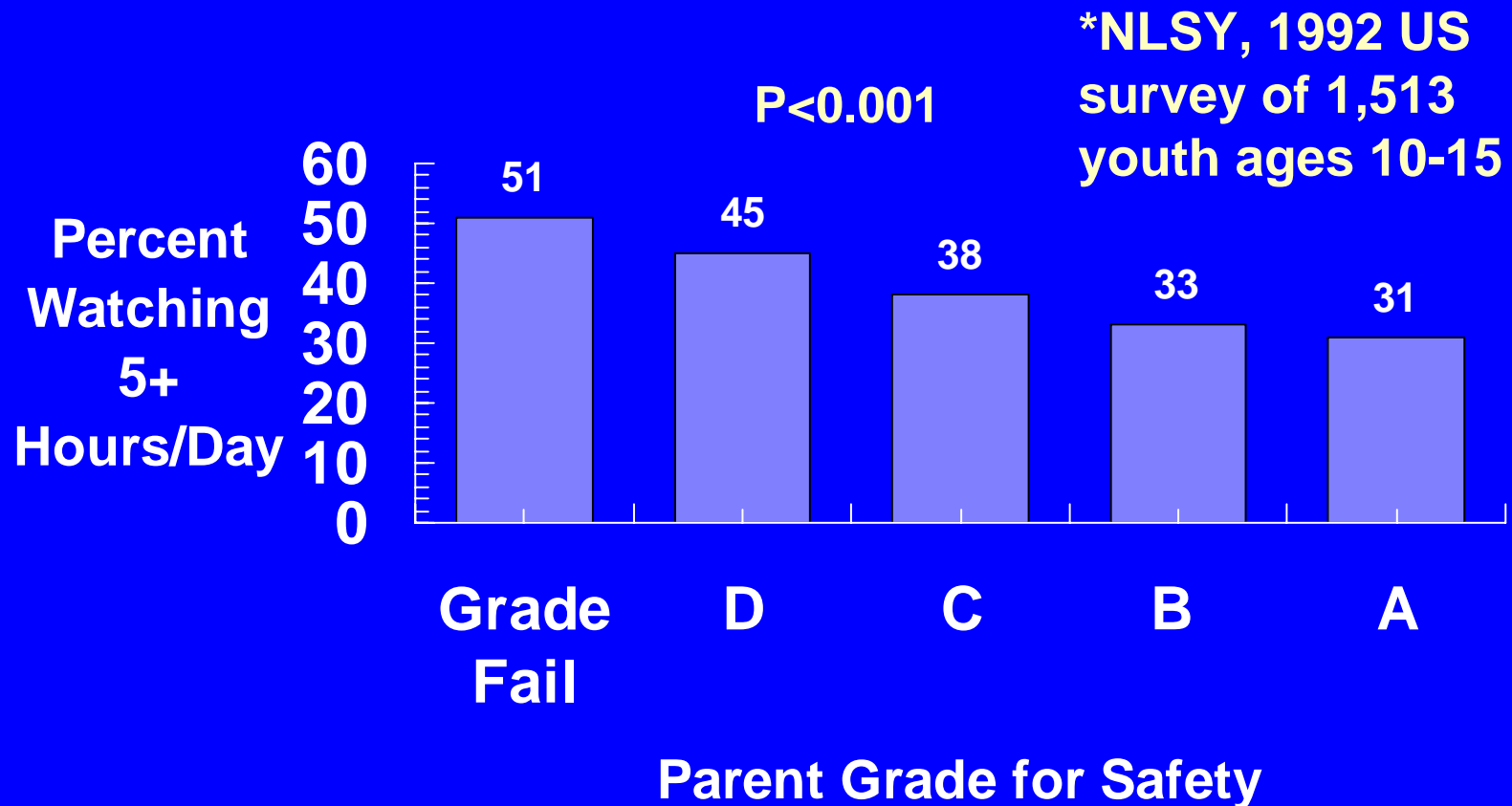
Roberts I. Adult accompaniment and the risk of pedestrian injury on the school-home journey. Inj Prev. 1995;4:242-4.

Sallis JF, Johnson MF, Calfas KJ, Caparosa S, Nichols JF. Assessing perceived physical environmental variables that may influence physical activity. Res Q Exerc Sport. 1997;58:345-51.

A Broad Range of Strategies:

- **Families**
- **School programs**
- **After-school care programs**
- **Youth sports and recreation programs**
- **Improve community structural environment**

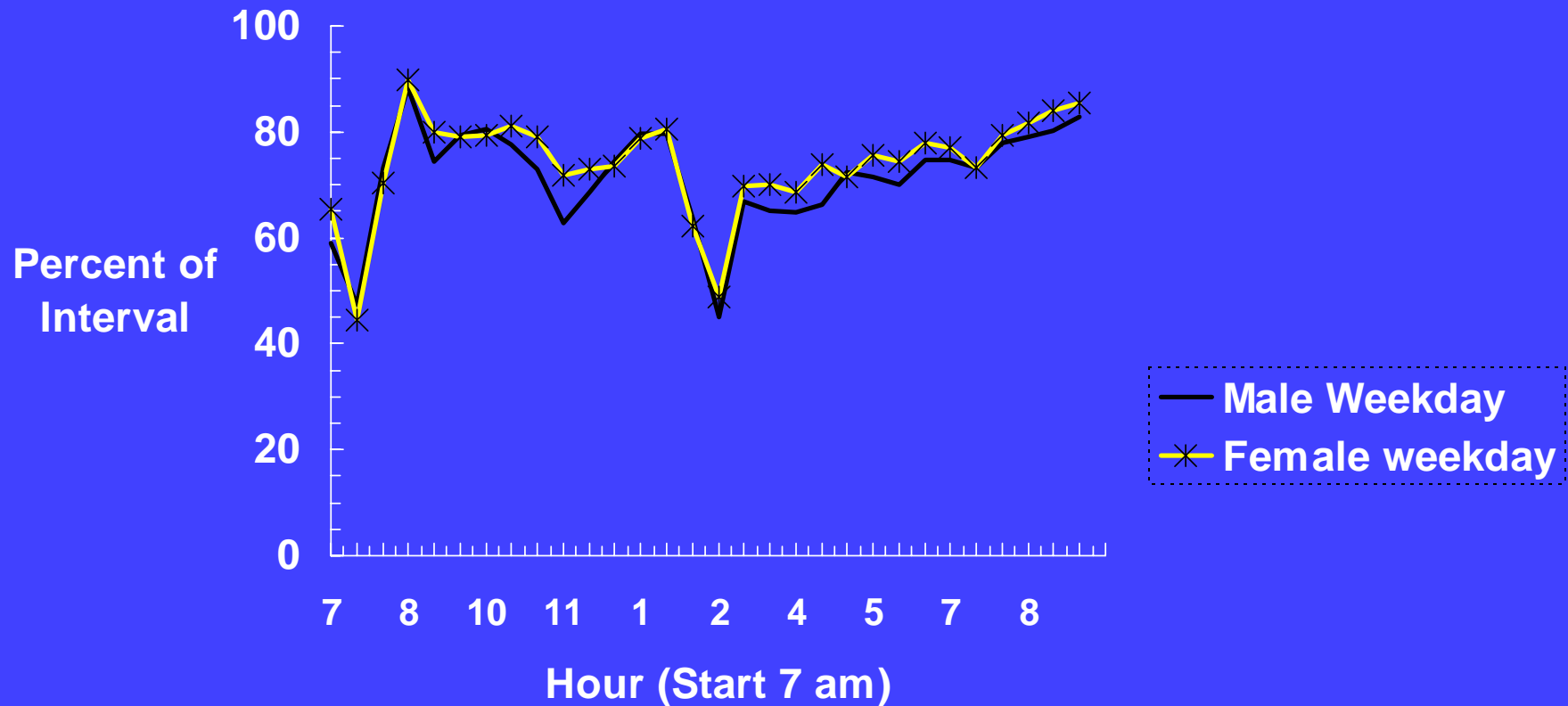
Relationship of School Safety and Children Watching 5+ Hours/Day*



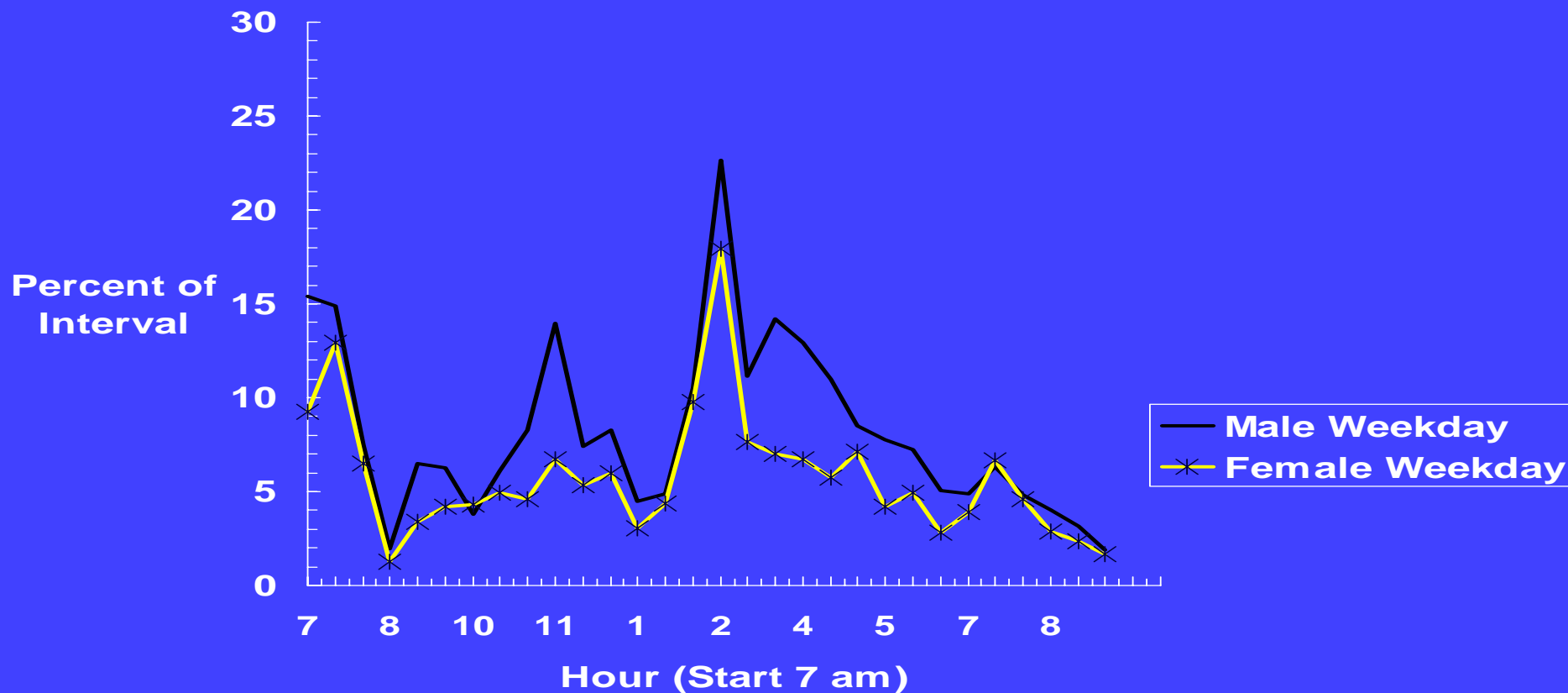
Tritrac R3D Activity Monitors

- Monitors provide estimates of movement in 3-planes using minute intervals - signals processed and stored read every minute
- Random sample of 139 7th-8th grade students from 5 schools in Massachusetts
- Wore monitors on waist (like "Walkman") for four days each
- Results based on 1,017,421 person/minutes of observation

Figure 1: Percent of Half-Hour Weekday Time Periods With Tritrac Vector Magnitude <250 (~1.5 MET); N=139; 1,017,421 person/minutes



**Figure 2: Percent of Half-Hour Weekday Time
Periods With Tritrac Vector Magnitude >1000 (~3.0
MET); N=139 ; 1,017,421 person/minutes**



Note the two “high” points of inactivity and moderate/vigorous activity on weekdays:

1) after school at 2 PM

2) before school at 7:30 am

Time spent at ≥ 3.0 METS

1) averages 1.1 hours/day for males,
0.9 hours/day for females

2) Most bouts of activity are of
short duration

Time spent at ≤ 1.5 MET during waking hours:

1) averages 11 hours/day

2) Television viewing about 30% of this time

The Importance of Surveillance: Communities Must See There is a Problem If They are to Begin to Address the Problem

- **No State at this point can tell you rates of obesity among children**
 - **Yet school nurses collect massive amounts of weight and height data that are never tabulated**
 - **This is an opportunity to do less and do better!**
-