

Cardiovascular Health Risk Behaviors Among Children and Adolescents: An Overview



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OUTLINE

- Background-Cardiovascular (CV) Risk Factors in Childhood and Adolescence
- Epidemiologic Studies of CV Risk Factors Tracking into Adulthood
- Trials of Nutrition, Physical Activity, and Obesity
- Expert Panel on Integrated Guidelines for CV Health and Risk Reduction in Children & Adol
- Summary

Cardiovascular Risk Factors in Childhood

- Cardiovascular disease (CVD) is the #1 cause of death in adults in the U.S. and other nations.
- Risk factors and risk behaviors that increase CVD begin in childhood.
- CVD risk reduction delays progression of CVD.
- Timing is critical in childhood and adolescence.
- Primordial (Prevention of risk factor development)
- Primary Prevention (Modification of risk factors once they are established).

Cardiovascular Risk Factors in Adults are Similar to those in Childhood and Adolescence

- Family history
- Age/Gender
- Hypertension
- Abnormal Blood Lipids
- Diabetes
- Obesity
- Perinatal Factors
- Sleep Disorders
- Metabolic Syndrome
- Inflammatory Markers

- Primary lifestyle components:
 - Poor dietary patterns
 - Physical inactivity/sedentary behavior
 - Tobacco Exposure

Genetics ↔ Lifestyle ↔
Environmental Exposure

Health Risk of Smoking in Youth

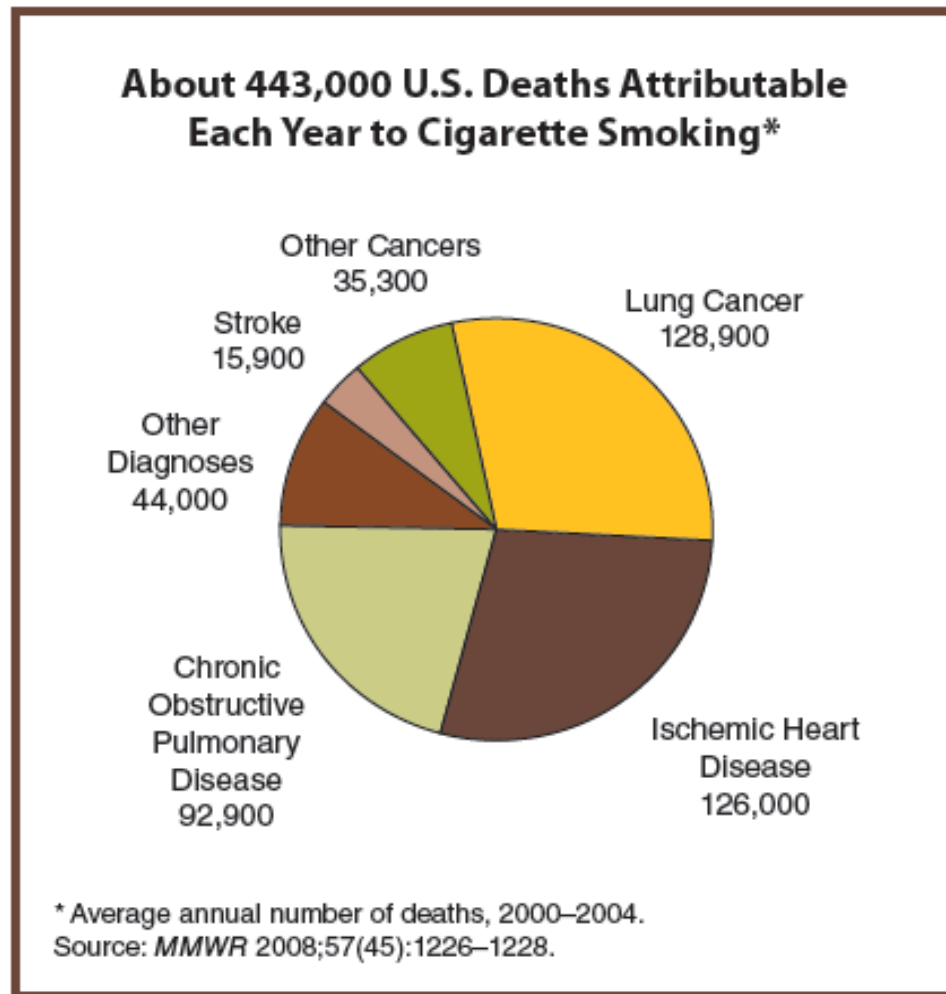
~90% of smokers start before age 18.

Teenagers who Smoke:

- Early addiction
- Lifetime smokers
- Early risk of Lung Cancer, CVD and Pulmonary Disease

Source: Preventing Tobacco use among youth and young adults, a Report of the Surgeon General, 2012.

[Http://www.cdc.gov/tobacco](http://www.cdc.gov/tobacco)



EXAMPLES OF EPIDEMIOLOGIC STUDIES

THE MUSCATINE STUDY

BOGALUSA HEART STUDY

PATHOBIOLOGICAL DETERMINANTS OF ATHEROSCLEROSIS
IN YOUTH (PDAY)

THE NATIONAL GROWTH AND HEALTH STUDY

The Muscatine Study- IOWA, 1970+

- Epidemiology of CHD risk factors in ~ 5,000 school children 6-18 yrs; 96% White.
- **BP ↑ with age- tracked through adolescence**
- 50% 14-18 yr olds had TC >180mg/dl
- Obese children > CVD risk factors
 - ↑SBP, DBP, Plasma TG and ↓HDL-C
 - CVD risk factors tracked from childhood to adulthood
 - **Obesity tracked into adulthood**; predictive of the development of CVD risk.

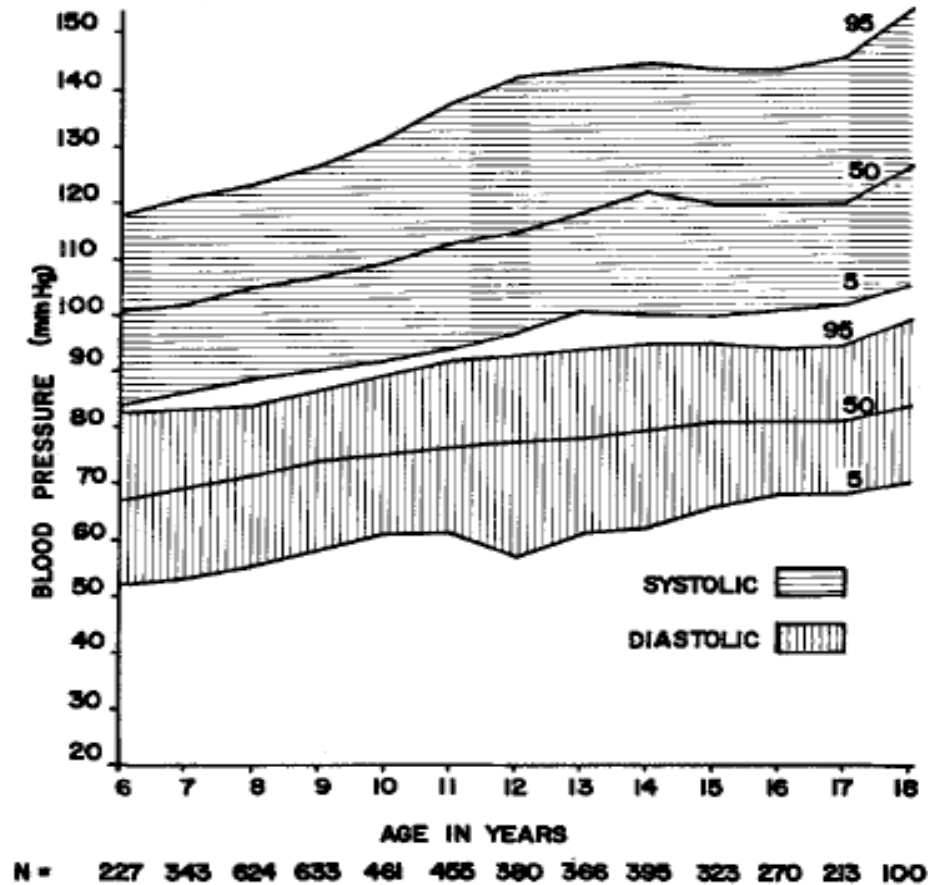
Source: Lauer RM et al. Coronary heart disease risk factors in school children: the Muscatine Study. J. Pediatr. 1975, 86 (5): 697-706;

Blood Pressure Increases with Age: The Muscatine Study

The Journal of Pediatrics
May 1975

↑ 2.6 mm Hg/yr in boys

↑ 1.8 mm Hg/yr in girls

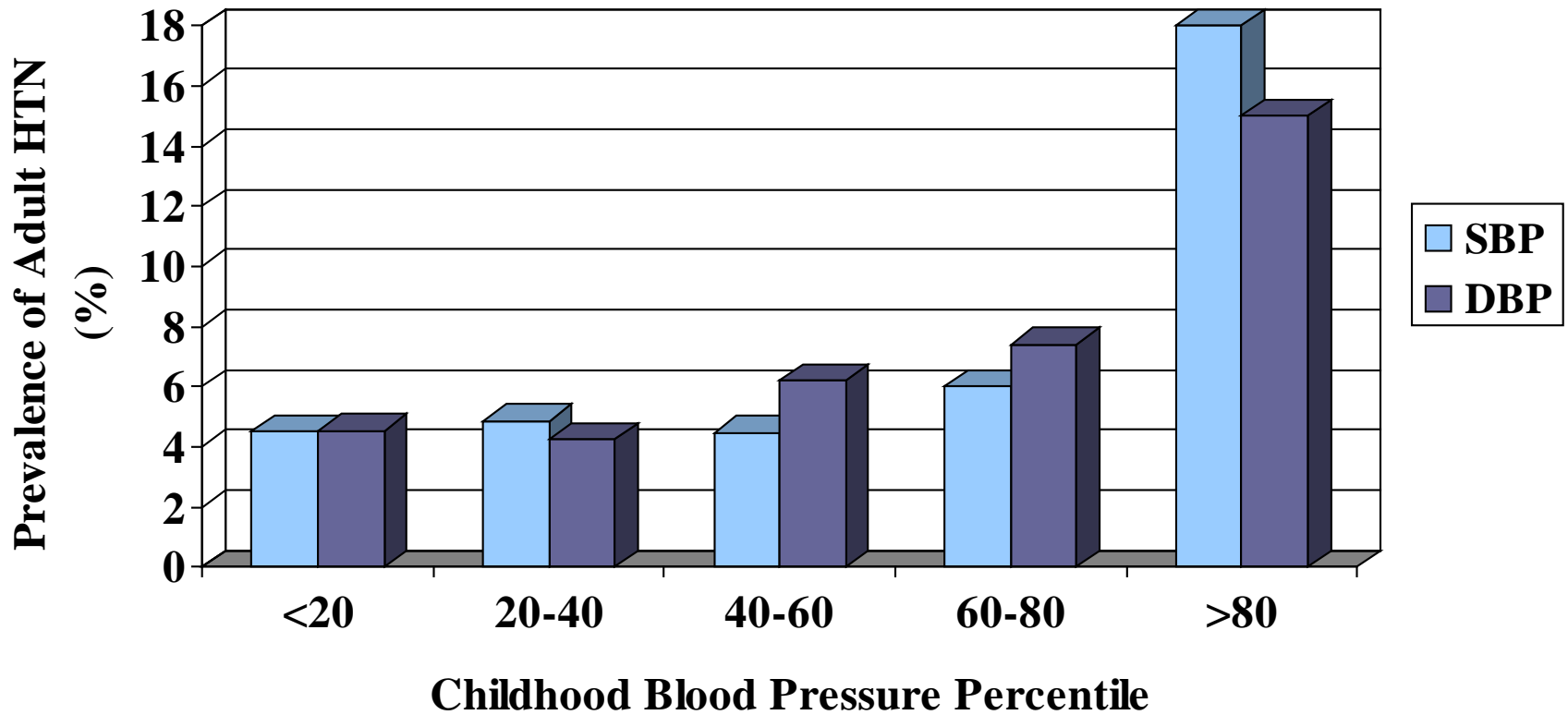


Bogalusa Heart Study (BHS)

Louisiana, 1973+

- Multiple cross-sectional study of youth from birth to 40 yr.
- Natural history of HD and CV risk factors; 65% W; 35% Black; autopsy data.
- ↑ BMI, BP, TG, LDL-C, diabetes & smoking associated with ↑ CVD risk.
- Offspring of parents with early coronary artery disease were
 - Overweight in childhood
 - Developed adverse CVD risk profile at ↑ rates.
- Study established lifelong adverse effects of lifestyle factors on CVD risks

Childhood Blood Pressure Predicts Adult Hypertension



- Children with BPs > 80th% had 3.6 times ↑ risk adult HTN.
- Children with 4 or 5 BP elevations, had nearly 50% chance of having clinically diagnosed HTN as an adult.

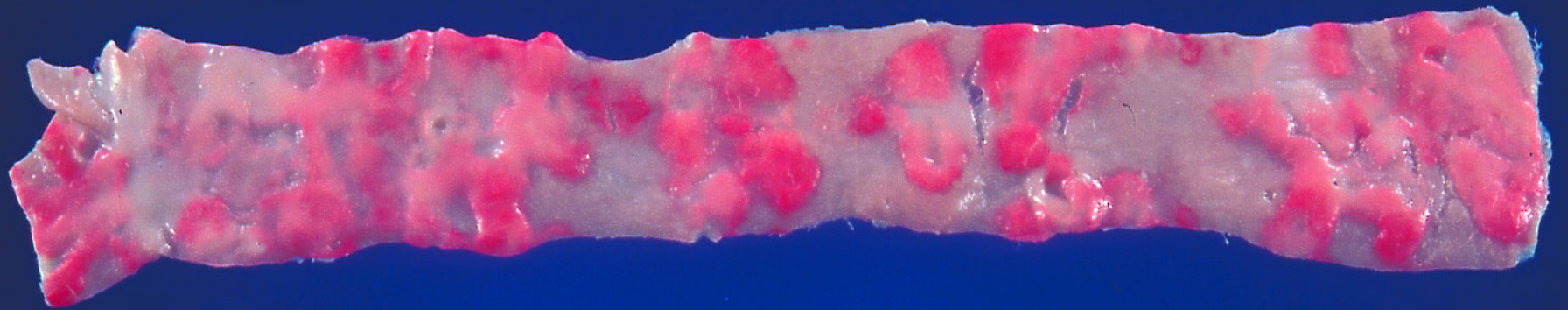
Pathobiological Determinants of Atherosclerosis in Youth (PDAY)

- Study of atherosclerosis in 15-34 year old, 1987-1994.
- Collected 3,000 cases (arteries and risk factor data).
- Grading and analyses in central labs.
- Organized by 14 centers.

Source: Strong JP et al, Prevalence and extent of atherosclerosis in adolescents and young Adults: implications for prevention from PDAY. JAMA 1999;281 (3), 495-501

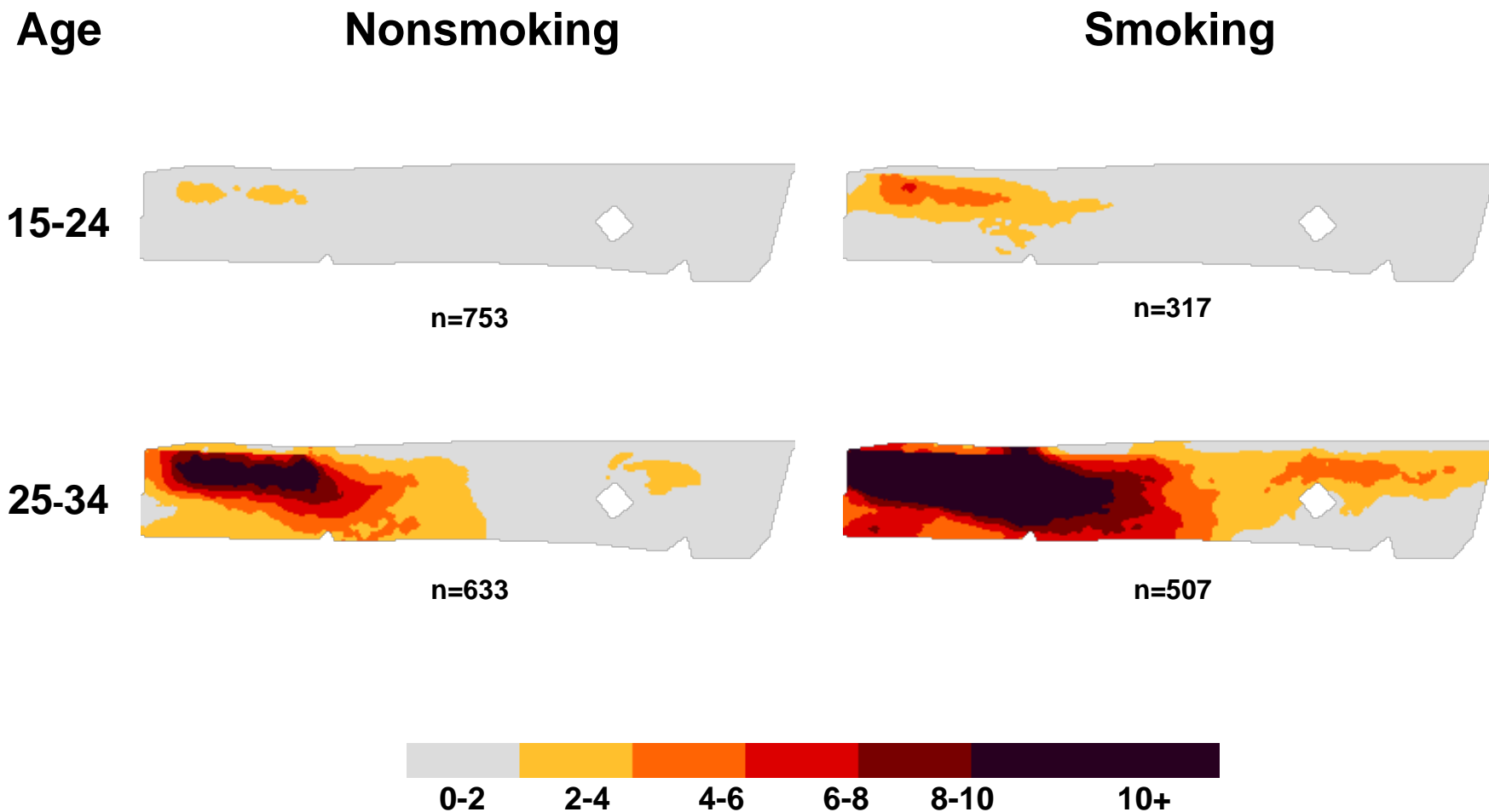


F41041
19 Year Old
White Male



F75735
28 Year Old
White Male

Prevalence Map of Raised Lesions of Abdominal Aorta by Age and Smoking



National Growth and Health Study-1985

- A longitudinal epidemiologic study of black and white girls, age 9-19.
- Leisure time physical activity ↓ throughout adolescence.
- Fast food consumption ↑ in adolescence, especially in overweight youth.
- Poor dietary patterns, physical inactivity associated with overweight.
- Overweight girls 10X ↑SBP; 2X↑LDL-C and TG; 6X ↓HDL-C compared to leaner girls.

Sources: Kimm SYS et al. N Engl J Med 2002;347:709-715;

Kimm SYS et al. Pediatrics 2001;107:e34. DR et al.. J Pediatr 2007;150(1):18-25.

National Growth and Health Study

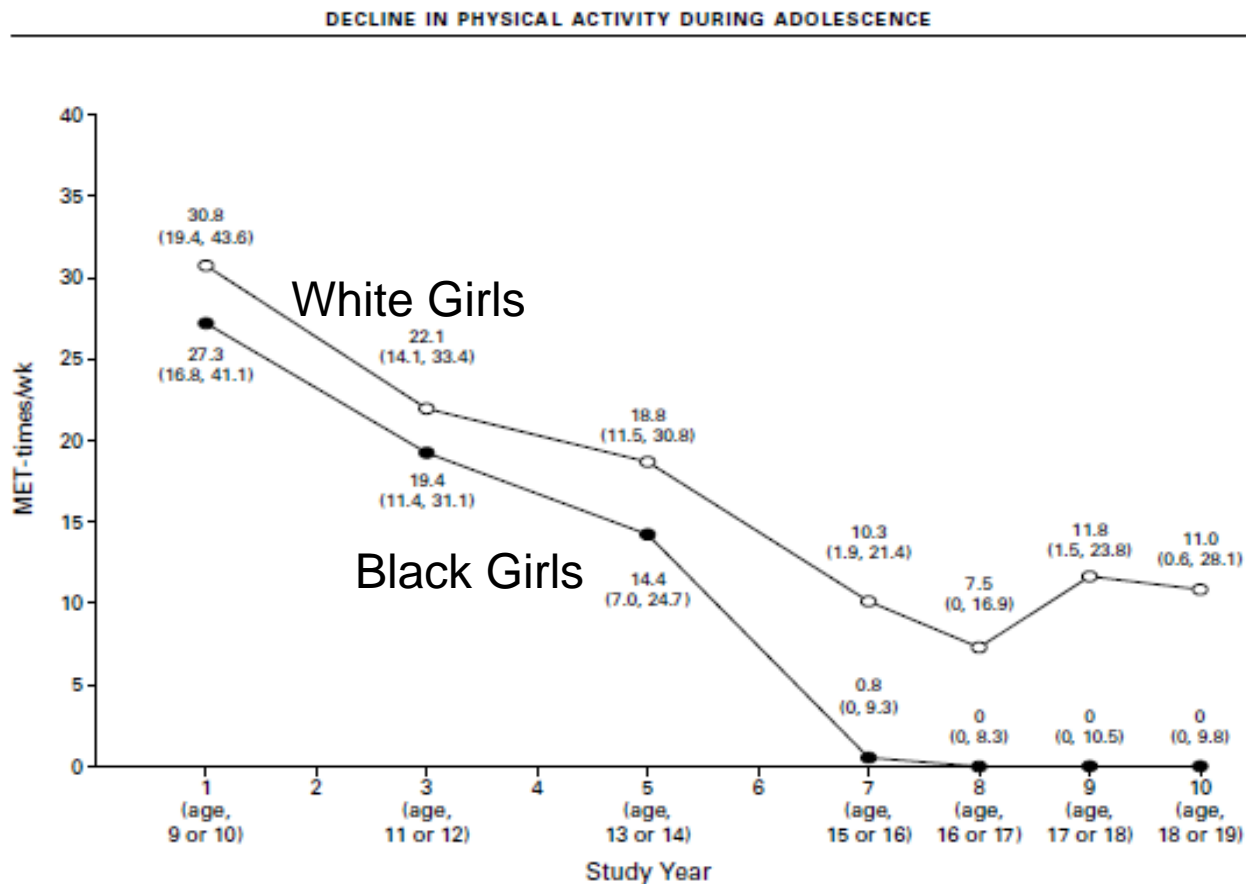


Figure 2. Median Habitual Activity Questionnaire Scores According to Year of Study and Race. Scores are expressed in MET-times per week. Solid circles represent black girls, and open circles white girls. Values in parentheses are the 25th and 75th percentiles.

Summary of Epidemiologic Studies

- Atherosclerosis begins in childhood
- Associations of CVD risk with poor dietary patterns, physical inactivity and smoking
 - Develop early in life
 - Track from childhood to adulthood
 - Physical activity patterns decrease from childhood through adolescence
- Childhood cardiometabolic factors predict adult CVD risk.

- Trials of Nutrition, Physical Activity, and Obesity in Youth

DIETARY INTERVENTION STUDY IN CHILDREN (DISC)

CHILD AND ADOLESCENT TRIALS FOR CV HEALTH (CATCH)

GIRLS HEALTH MULTI-SITE STUDIES (GEMS)

TRIAL OF ACTIVITY FOR ADOLESCENT GIRLS (TAAG)

The Dietary Intervention Study in Children (DISC)

- A 3-year dietary intervention ↓ LDL-C in children ages 8-10 yr with higher than normal blood cholesterol levels.
- Intervention ↓ dietary total fat, sat fat, and LDL-C vs usual care group.
- No adverse effects; children can be fed 28% Kcal from fat and 8% SF.

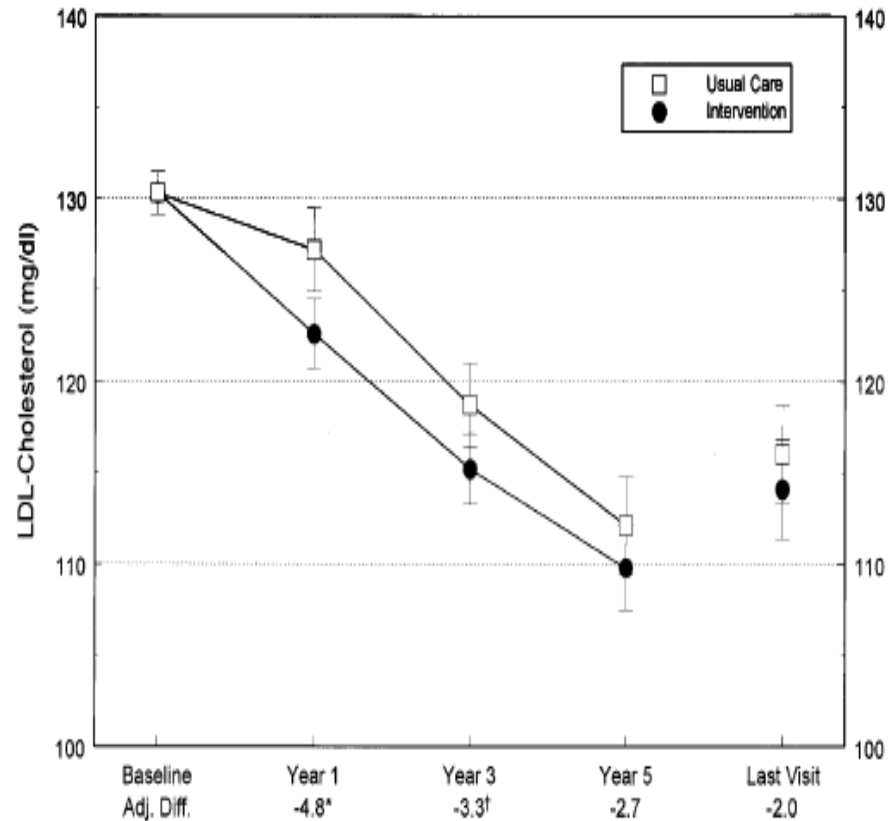
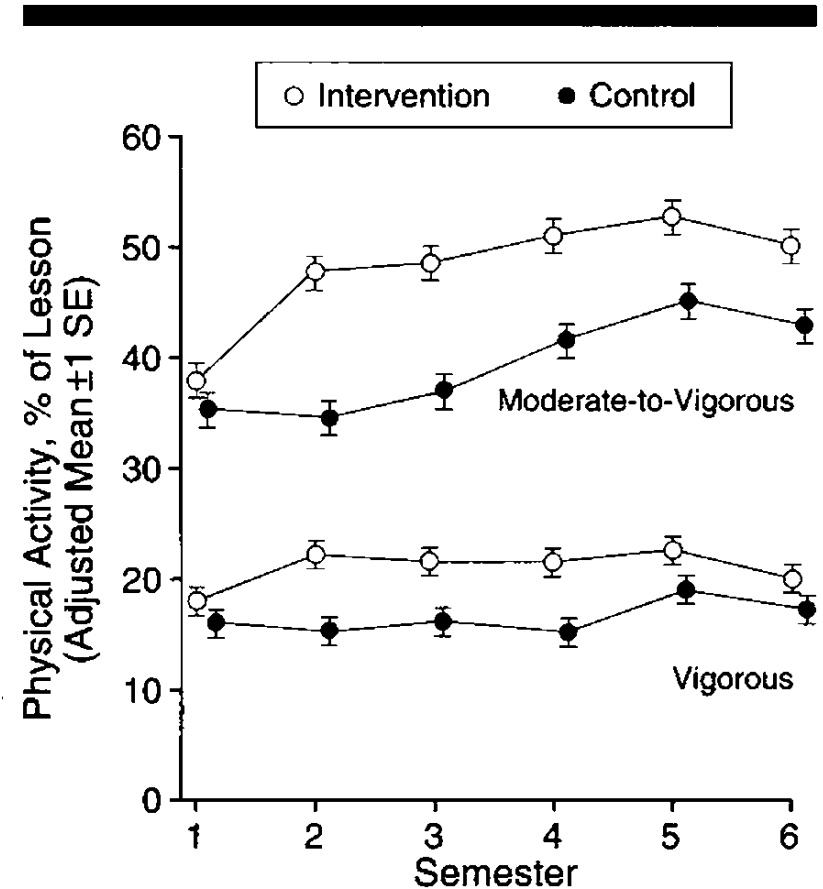


Fig 2. Primary efficacy outcome: serum LDL-C (means and 95% CIs; * $P < .001$; † $P < .05$). Differences adjusted for baseline LDL-C level, sex, and age at last visit (for last visit only).

Child and Adolescent Trials for CV Health (CATCH)

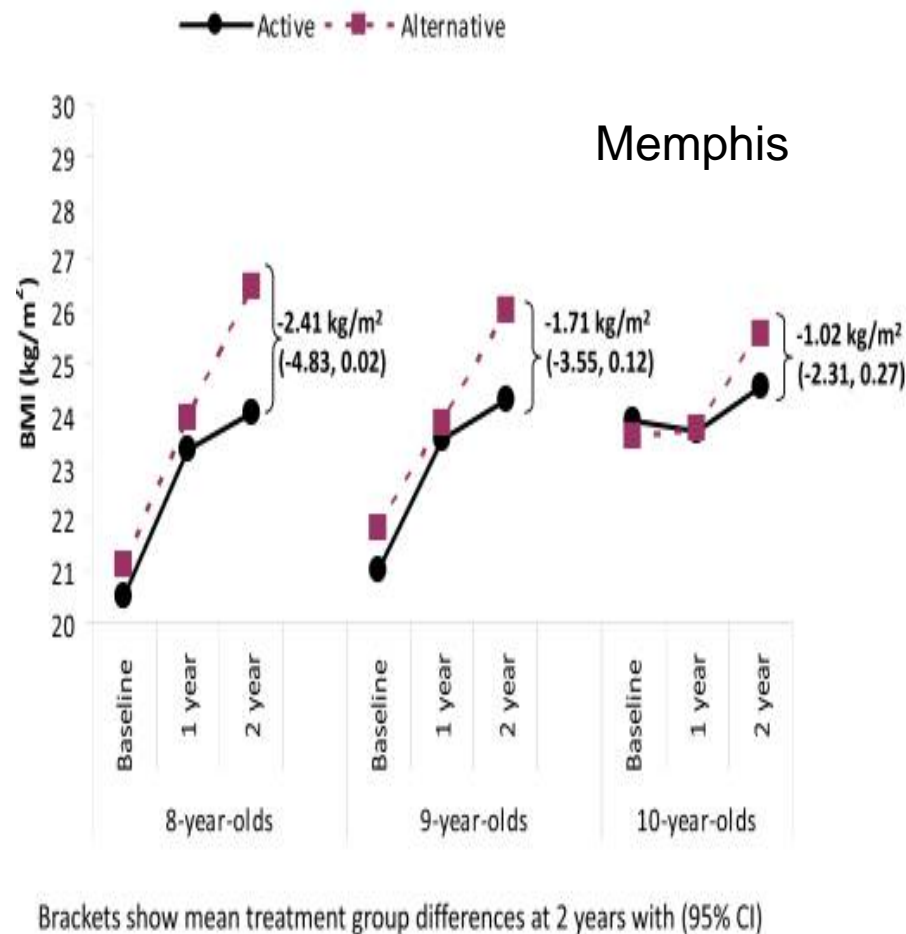
<http://jama.jamanetwork.com/> on 06/29/2012

- N=5106 3th-5th graders; 56 (I); 40 (C) schools
- School food service dietary fat modification, PA, health education
- Alternate: Above + family component
- ↓Dietary fat 39%-32%
- ↑Physical activity 58.6 vs 45.6 min



Girls health Multi-site Studies (GEMS) (Stanford and Memphis)

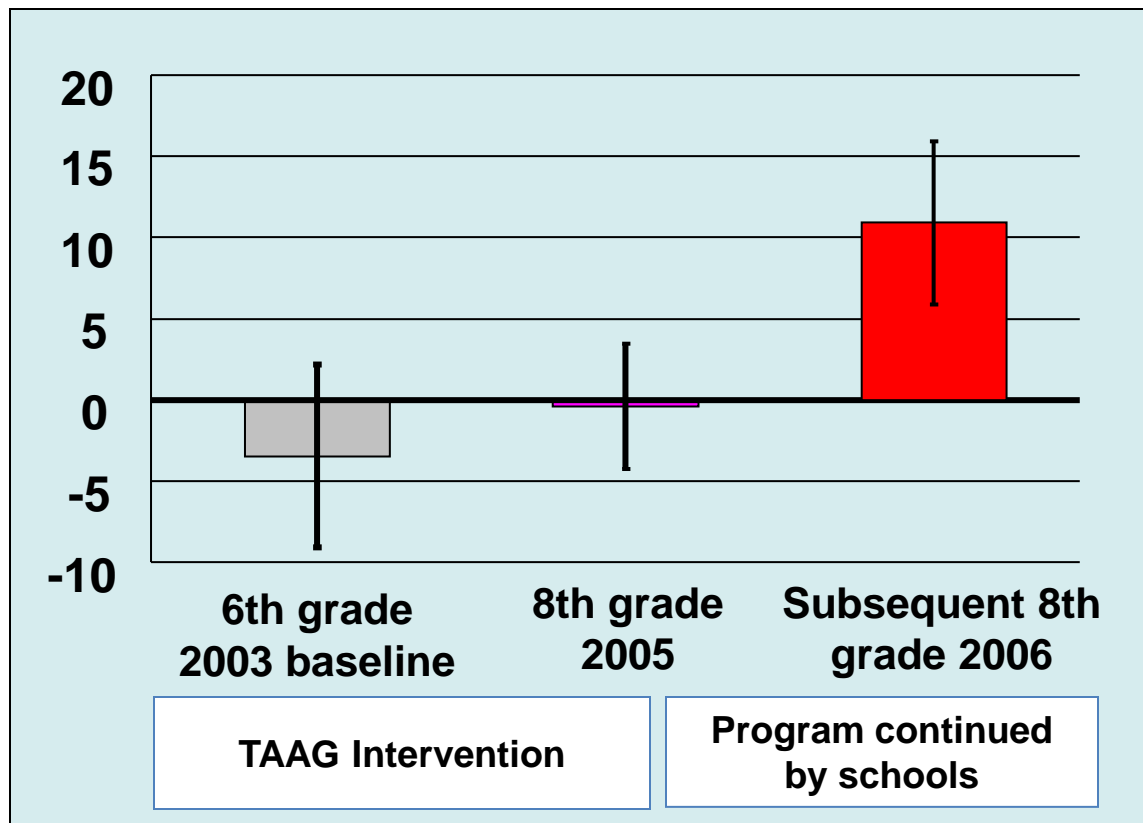
- After-school hip-hop dance classes, ↓ screen media use, behavioral counseling.
- No significant BMI effect
- Stanford: ↓ TC, LDL-C and depressive symptoms
- Memphis: ↓ BMI in younger (-2.41 kg/m²) compared to older (-1.02 kg/m²) girls



Trial of Activity in Adolescent Girls

A school-based and community-linked physical activity intervention that is directed by school- and community champions modestly improves physical activity in middle school girls.

An intervention effect ~ 80 calories more per week.



Each bar = difference in activity (intervention – control)

Summary

- Trials to modify nutrition and physical activity behaviors have shown modest effects.
- Diet and physical activity modification to reduce childhood obesity prevalence can be effective (Cochrane Reviews, 2011).
- Obesity continues to be a major public health threat, especially in boys. (Ogden et al., NCHS Data Brief, 2012 Jan;(82):1-8).
- Primordial and primary prevention to modify diet and physical activity, and smoking cessation.

Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents

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SUPPLEMENT ARTICLE

Expert Panel on Integrated Guidelines for Cardiovascular Health and Risk Reduction in Children and Adolescents: Summary Report

EXPERT PANEL ON INTEGRATED GUIDELINES FOR CARDIOVASCULAR HEALTH AND RISK REDUCTION IN CHILDREN AND ADOLESCENTS

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December 2011, 128, Supplement 5. www.pediatrics.org

Take Home Message

- CVD begins in childhood therefore its reduction should begin in childhood and adolescence.
- Persistence of Poor Diet, Physical Inactivity, Sedentary Behavior, and Smoking could worsen CVD risk.
- Current obesity prevalence rate of 17% (12.5 million) in children and adolescents could exacerbate CVD.
- Healthy People 2010 goal of 5% Childhood Obesity Prevalence not yet accomplished.

Looking to the Future



THANK YOU!

- Dr Henry McGill, University of Texas Health Science Center, San Antonio
- Dr. Sam Giddings, NEMOURS
- Dr. Laura Hayman, University of Massachusetts, Boston
- Dr. Elaine Urbina, Cincinnati Children's Hosp. Medical Center



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