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 & Adolescence
- 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
~90% of smokers start before age 18.

Teenagers who Smoke:
• Early addiction
• Lifetime smokers
• Early risk of Lung Cancer, CVD and Pulmonary Disease


About 443,000 U.S. Deaths Attributable Each Year to Cigarette Smoking*

- Lung Cancer 128,900
- Ischemic Heart Disease 126,000
- Chronic Obstructive Pulmonary Disease 92,900
- Other Diagnoses 44,000
- Stroke 15,900
- Other Cancers 35,300

* Average annual number of deaths, 2000–2004.
Source: MMWR 2008;57(45):1226–1228.
EXAMPLES OF EPIDEMIOLOGIC STUDIES

THE MUSCATINE STUDY

BOGALUSA HEART STUDY

PATHO BIOLOGICAL 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.

Blood Pressure Increases with Age: The Muscatine Study

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

Source: Berenson GS et al. NEJM, 338 (23) 1650-6, 1998.
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.

Bao Am J Htn 1995, The Bogalusa Heart Study
Pathobiological Determinants of Atherosclerosis in Youth (PDAY)

- Collected 3,000 cases (arteries and risk factor data).
- Grading and analyses in central labs.
- Organized by 14 centers.

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

<table>
<thead>
<tr>
<th>Age</th>
<th>Nonsmoking</th>
<th>Smoking</th>
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<tbody>
<tr>
<td>15-24</td>
<td>n=753</td>
<td>n=317</td>
</tr>
<tr>
<td>25-34</td>
<td>n=633</td>
<td>n=507</td>
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</table>
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.

National Growth and Health Study

![Graph showing decline in physical activity during adolescence]

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.

- 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

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.
SUPPLEMENT ARTICLE


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

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 Hospital Medical Center