

Childhood Obesity Reduction by School Based Programs

Abstract. *Childhood obesity has become one of the most common health problems facing children in America. Results from the Third National Health and Nutrition Examination Survey reveal that ethnic minority children in the United States are at particular risk for development of cardiovascular disease due to their disproportionate levels of obesity. In treating childhood obesity among ethnic minorities, practitioners need to be mindful of the cultural norms surrounding body size. Additional concerns that must be addressed include the effects of target marketing of unhealthy foods toward ethnic minorities and environmental deterrents to outside physical activities, to name a few. Strategies given to address the problem of childhood obesity among ethnic minorities include, increasing the child's physical activity, reducing television viewing and the adoption and maintenance of healthy lifestyle practices for the entire family.*

Key Words: *Childhood Obesity; Ethnic Minorities; Children; Overweight; Culture*

According to the Third National Health and Nutrition Examinations Survey (NHANES III), obesity is now an epidemic in the United States. An estimated 97 million adults in the US and one in five children between the ages of 6 and 17 is overweight. In the thirty years since NHANES I was conducted, the number of children in the United States who are overweight has more than doubled (Winkleby, Robinson, Sunquist, and Kramer, 1999; Strass & Knight, 1999). Once obesity develops, it is difficult to treat, and obese children are more likely to become obese adults (Power, Lake, & Cole, 1997; Serdula, Ivery, Coates, Freeman, Williamson, & Byers, 1993).

Obesity has been positively identified as a major determinant of adverse serum lipid and lipoproteins and blood pressure levels, even in children (Berensen, Srinivasan, Wattigney, and Hersha, 1993; Aristimuno, Foster, Vouis, Srinivasan, & Berensan 1984). According to Berensan, et al, because obesity begins in childhood, it is important to determine the level at which obesity begins to influence cardiovascular risk. In childhood, obesity is

associated with high blood pressure levels, higher insulin levels, increased heart rate and cardiac output, and high level of very low-density lipoprotein cholesterol (HDL). These factors have all been observed to have a major impact on the future development of cardiovascular disease (Lauer, Bunts, Clark, & Mahoney, 1991; Webber, Osganian, Luepker, Feldman, Stone, Elder, Perry, Nader, Parcel, Broyles, & McKinlay, 1995; and Moussa, S. Kaik, Selwanes, Yaghy, & Bin-Othman, 1994, McMurray, Harrell, Levine, & Gansky, 1995).

Cultural Variations in Obese Children

Among African American and Mexican American girls, the early onset of obesity and high insulin levels may be precursors of the higher incidence of diabetes mellitus seen in these groups in adulthood (Berensen, et al, 1993, Alexander, Sherman, & Clark, 1991). Culturally, attitudes toward obesity are found to be more lenient in African American communities (Kumanyika, Wilson, & Guilford-Davenport, 1993; Davis, Northington, & Kolar, 2000).

Data from CATCH, the Child and Adolescent Trial for Cardiovascular Health, of the National Heart, Lung, and Blood Institute which sponsored multicenter school-based intervention programs, revealed several significant differences along cultural lines in the children. The CATCH population consisted of 3,530 Anglo-American children, 674 African-American children, and 708 Latino children, in the third grade in the states of California, Louisiana, Minnesota, and Texas. HDL cholesterol levels were highest in African-American (55.5 mg/dl) compared with 50.7 mg/dl for Anglo Americans and 51.3 mg/dl ($p < 0.0001$) for Latinos. Further, Latino children had the largest body mass index ($p < 0.05$); however, blood pressure levels were similar for boys and girls among the three races (Webber, et al, 1995).

Similarly, findings from the Third National Health and Nutrition Examination, 1998-1999, study which included a total of 2,769 black, 2,854 Mexican American, and 2,063 white children and young adults ages 6 to 24 years revealed that the Body Mass Index (BMI) levels were significantly higher for black and Mexican American girls than for white girls; These differences were evident as early as ages 6 to 9 (a difference of approximately 0.5 BMI

units) and widening thereafter (> 2 BMI units among 18 to 24 year olds). Regarding dietary intake from fat, intake was significantly higher for black than for white boys. Blood pressure levels were higher for black girls than for white girls in every age group, and glycosylated hemoglobin levels were highest for black and Mexican girls and boys in every age group (Winkleby, Robinson, Sundquist, & Kraemer, 1999). Clearly, the obese child is placed in a high-risk category for development of cardiovascular disease and diabetes.

Chu, Rimm, Wong, Liou, and Shieh (1998) evaluated the clustering of cardiovascular disease risk factors among 1,366 randomly selected junior high school (aged 13.34) children in Taipei, Taiwan. Results of the study revealed that boys had a higher body mass index, systolic blood pressure, and glucose concentration than girls. However, girls had higher lipid and lipoprotein concentration than boys. Following adjustment for age, obese boys had a significantly higher B/P, ratio of total to HDL cholesterol, and glucose, cholesterol, triacylglycerol, HDL cholesterol, LDL cholesterol, and apolipoprotein B concentrations than non-obese boys. For girls in the study, B/P, HDL cholesterol, LDL cholesterol, and ratio of total to HDL cholesterol were significantly different between non-obese and obese girls. Approximately 70% of the obese boys had one significant risk factor for CVD and 25% of the boys had two or more significant risk factors for CVD. Lastly Chu, et al found an association between obesity and higher B/P and between obesity and blood glucose and lipid concentrations for both sexes.

Fifth through eight graders (aged 10 to 14) in Minneapolis, Minnesota were surveyed in 1986 and again in 1996. In this multicultural study of 8,222 children in 1986 and 10,241 children in 1996, systolic blood pressure was significantly higher in 1996 than 1986 and diastolic pressure was lower in 1996 than 1986 in all ethnic and gender groups (African American, Hispanic, Native American, Asian, and non-Hispanic white groups). Additionally, weight and body mass indexes were significantly higher in all groups in 1996. Researchers submit that while there is no conclusive evidence to explain the drop in diastolic blood pressures of the group, possible explanations offered included treatment of hypertension, physical activity and decrease salt consumption in the adult population. What is evident from the study is that across ethnic lines, children are heavier as evidenced by their body mass indexes and that there is a corresponding increase in systolic blood pressures. The significance of these increases lend themselves to increasing the prevalence of hypertension and cardiovascular disease as the children move into adulthood (Luepker, Jacobs, Prineas, & Sinaiko, 1999).

The Jackson, Mississippi CRRIC study echoed the findings of previous studies of obese children. Two hundred and forty-six African American children in the third, fourth, and fifth grades comprised the sample. Results revealed that 16% of the boys had systolic blood pressures at or above the 90th percentile for sex and age and 13% had abnormally high diastolic blood pressures at or above the 90th percentile for sex and age. For girls, 8% exhibited systolic blood pressures and 21% had diastolic blood pressures at or above the 90th percentile. BMI correlated significantly with triceps measurements ($r=.402$, $p<.0001$ and $r=.26$, $p<.002$, respectively). Body mass index levels revealed that 39% of the boys and 49% of the girls

had BMIs at or above the 85th percentile for age and sex (Davis, et.al, 2001).

School-Based Plan for Reduction of Childhood Obesity

While few would disagree with Golan, Weigman, Apter and Fainam (1998) that treatment of childhood obesity with parents as the exclusive agents of change is the superior approach, the reality is that many parents of obese children are themselves obese and thereby need an outside change agent to intervene. A school-based plan for reducing childhood obesity is posited as one agent to address the epidemic of childhood obesity.

Under the direction of Dr. Joanne S. Harrell of the University of North Carolina Chapel Hill, the research team evaluated 600 students aged 11 to 14, from several rural areas in North Carolina. Children were divided into four groups. One group participated twice a week in a knowledge/attitude program involving classroom instruction on issues related to nutrition, smoking, fitness, and cardiovascular health. Another group participated in a physical activity program for 20-30 minutes three times a week. The third group of students participated in both programs and a fourth group served as the control group. Lipid profiles were measured on each student before starting and after completing the program. Results indicated that the total cholesterol and LDL levels in students participating in the knowledge/attitude program only were reduced. Students in the physical activity group also had significant reductions in LDL levels. However, the greatest reduction in total cholesterol were achieved by the students who participated in both programs (Harrell, Frauman, McMurray, & Bangdiwala, 1992; McMurray, Bradely, Harrell, Berenthal, & Bangdiwala, 1993 ; McMurray, Harrel, Bangdiwala, & Gansky, 1995; and Harell, McMurray, Bangdiwala, Frauman, Gansky & Bradley, 1996) though there was not a reported weight loss, there was a significant reduction in one of the risk factors for cardiovascular disease by use of this school-based approach. This study is a subset of the larger Cardiovascular Health in Children (CHIC) program which includes 18 elementary schools throughout the state of North Carolina (McMurray, Bradley, Harrel, bernthal, Frauman, & Bangdiwala, 1993; McMurray, Harrell, Levino, & Gansky, 1995).

Resnicow (1993) reports that more than 95% of American youth, ages 5-17, are enrolled in school, and no other public institution has as much continuous and intensive contact with children during their first two decades of life. Further, children eat from one to two meals per day in school. Hence, it is proposed that the cafeteria can be a natural laboratory where students can learn and practice positive nutritional habits. Other components of the school which are not available in the home to promote obesity reduction includes social support from teachers and peers, behavioral counseling conducted by school nurses or allied health professionals, and physical education programs (Resnicow, 1993).

The Heart-Smart Program, under the direction of Dr. Gerald Berensen, an outgrowth of the Bogalusa Heart Study, as developed by the Tulane Center for Cardiovascular Health (Berensen, 1993), is a school-based program which based on the premise that adult heart diseases begin in childhood, and that these diseases are strongly related to lifestyles. An equally strong premise is that there is a tremendous potential for preventing adult heart disease and other chronic diseases if efforts are begun early. The

curriculum of Heart Smart is designed to serve as a guide to help students understand the importance of heart disease, and to develop the ability to recognize and choose healthy lifestyles. The central goal of the program is to prevent excessive heart disease in society.

Major components of the curriculum center on: 1) improving nutrition, 2) encouraging exercise, 3) preventing obesity, and 4) discouraging unhealthy lifestyle practices such as smoking, alcohol and drug use.

The curriculum of Heart-Smart can be delivered by the classroom teacher during science. However, lessons can be incorporated in other subject areas such as language arts, math, art, etc. Five modules make up the Heart-Smart curriculum.

1. General Health and Physiology
2. Nutrition
3. Exercise
4. Coping skills (decision-making, problem solving, assertiveness training and coping strategies)
5. "It's me" (to raise self-esteem and encourage student to take responsibility for his/her own mental and physical health. (Berenson, 2000)

CRRIC, Cardiovascular Risk Reduction in Children, is an emerging program under the direction of Dr. Sheila P. Davis of the University of Mississippi Medical Center. This program seeks to identify children in the third, fourth and fifth grades of Jackson Public Schools who are at risk for cardiovascular disease. Indices for at risk include, for purposes of this study, body mass index indicative of overweight, triceps and subscapular skin fold measurements, family history of significant cardiac events at or before the age of 55 of a first line relative, and blood pressure measurements, physical activity measures and significant environmental history.

Based upon data compiled from a pilot study of nearly four hundred children, CRRIC proposes to work cooperatively with both community and school officials to implement a school-based program in Jackson, similar to the Heart Smart Program of Tulane. Members of CRRIC include a pediatric endocrinologist, pediatric nurse practitioner, pediatric clinical nurse specialist, cardiovascular clinical nurse specialist, nutritionist, nephrologist, experimental psychologist, associate dean of academic affairs and a certified health educator.

As a first step, CRRIC produced a fully illustrated animated booklet on a child named Al. This booklet has been widely distributed in schools and public organizations to bring attention to the childhood obesity epidemic. Each child who participates in the study also receives the booklet. This booklet has been highlighted in the statewide newspaper and in several papers of smaller circulations (Davis, 1999).

The National Institute of Health recently funded the largest study ever undertaken of cardiovascular disease in African Americans (Hall, Jones, Ward-Fletcher, Mehrotra & Mehrola, 1999). This study of nearly 6000 adult African Americans located in Jackson, Mississippi involves the collaborative efforts of two historically black colleges: Jackson State University and Tougaloo College and a historically white university, the University of Mississippi Medical Center. The project director of the Jackson Heart Study, Dr. Herman Taylor, serves as a consultant to the CRRIC committee (<http://hvwv.nhlbi.nih.gov/about/jackson/2nduQl>). It is anticipated that the Jackson Heart Study will serve to heighten the public awareness of the magnitude of

cardiovascular disease in our state. At present, the state of Mississippi ranks in the top of the nation for deaths due to cardiovascular disease.

Authors recommend that before launching a city wide, school based program, it is important to gain support of key people in the community and of those who represent the rank and file of the community. This may mean presenting your program to churches, sending materials to community organizations, and involvement of the community in an advisory capacity of your committee. The Centers for Disease Control and Prevention issues the following seven recommendations for ensuring a quality school program to promote lifelong healthy eating (<http://wv-v.cdc.Rov/nccdphu/dash/nutraaQ.htm>).

1. Policy

Seek input from all members of the school community to develop a coordinated school nutrition policy that promotes healthy eating through classroom lessons and a supportive school environment. The policy should seek to commit the school to:

- Provide adequate time for nutrition education.
- Offer healthy, appealing foods (such as fruits, vegetables, and low-fat grain products) wherever food is available and discourage the availability of foods high in fat, sodium, and added sugars (such as soda, candy, and fried chips) in school grounds and as part of fund-raising activities.
- Discourage teachers from using food to discipline or reward students.
- Provide adequate time and space for students to eat meals in a pleasant, safe environment.
- Establish referrals with professionals who can provide counseling for nutritional problems, refer families to nutritional problems, refer families to nutrition service, and plan health promotion activities for staff.

2. Curriculum

Implement nutrition education designed to help students adopt healthy eating behaviors as part of a sequential, comprehensive health education curriculum that begins in preschool and continues through secondary school. Such education should:

- Help students learn specific nutrition - related skills, such as how to plan a healthy meal and compare food labels.
- Ensure that students also learn general health skills, such as how to assess their health habits, set goals for improvement, and resist social pressures to make unhealthy eating choices.

3. Instruction

Provide nutrition education through activities that are fun, participatory, developmentally appropriate, and culturally relevant. These activities should:

- Emphasize the positive, appealing aspects of healthy eating rather than the harmful effects of unhealthy eating.
- Present the benefits of healthy eating in the context of what is already important to students.
- Give students many chances to taste foods low in fat, sodium, and added sugars and high in vitamins, minerals, and fiber.

4. **Program Coordination**
Coordinate school food service with nutrition education and with other components of the school health program to reinforce messages about healthy eating.
5. **Staff Training**
Provide staff who are involved in nutrition education with adequate orientation and an ongoing in-service training that focuses on teaching strategies for promoting healthy behaviors.
6. **Family and Community Involvement**
Involve family members and the community in supporting and reinforcing nutrition education.
7. **Evaluation**

Practical Consideration for School-based Cardiovascular Assessments.

- Parameters to assess for a school-based cardiovascular program will be determined by numerous factors such as length of the study, Institutional Review Board guidelines, permission given by parents, school officials, school administrators, cooperation of teachers, secretaries, etc. Assent by children (> 7 y/o), number and knowledge level of co-researchers, budget for equipment needs, physical space, make up days, etc. Suffice it to say, one has to factor in multiple scenarios in at this type of assessment.
- Once the above areas have been addressed, one can order equipment, schedule time for screening, send out and collect permission slips and commence the training of co-researchers. Listed below are tips for including the following parameters in assessment:

Skin fold thickness

Involves the measurement of a fold of subcutaneous fat at one or sites which can then be analyzed by using previously validated prediction equations into an estimate of fat mass. Sites most often used for children are triceps and subscapular. The selection of the site and the nature of the measure allow for significant differences between observers. However, a single observer method can yield more valid results. Skin fold thicknesses are probably the most widely used technique for estimating fat mass (Jebb & Elia, 1993). This technique is relatively inexpensive.

Circumference

Can be used to quantify either inter-individual differences or changes in an individual overtime. Arm circumferences, especially in association with triceps skin fold thickness, have been used to estimate mid-arm muscle circumference as an indicator of protein energy malnutrition. One would need a tape measure that does not stretch and is sufficiently long to encompass the body. The site at which the measurement is to be made should be carefully defined with respect to an anatomical landmark where possible. It should also be noted that the position of the subject, whether supine or standing, can have a major effect on the measurement at some sites. The World Health Organization standards for waist and hip circumferences are based on measurements made in the standing position (Jebb & Elia, 1993).

Bioelectrical Impedance

A small current, usually 800 MA, is passed between electrodes on the hand and foot and the voltage drop is measured to give an estimate of the body resistance or impedance. This technique allows researchers to predict fat-free body mass and percent fat. This measurement is much more precise than triceps, skin fold measurements, and is strongly correlated with underwater weighing (Houtkooper, Lohman, Going, & Hall, 1989). Advantages of use of bioelectrical impedance are, it is a painless procedure, the equipment is portable, and results highly reliable. A disadvantage may be the cost of the equipment and environmental constraints.

Quetelet's body mass index (BMI)

Derived by dividing weight (kilograms) by height (in meters squared), is posed by Smith, Corey, Quebedeau, and Skelton (1997) as a good but not perfect method of accounting for weight gain owing to linear growth in a still-growing child. The advantages of this index are that it is inexpensive, noninvasive, easy to calculate in a clinical setting and very reliable provided that height and weight are accurately measured.

Height

Use of a portable stadiometer with the child standing with the head positioned in a Frankfort plane is suggested. The measure should be taken from the platform of the stadiometer to the highest point on the skull (Webber, Osganian, Luepker, Feldman, Stone, Elder, Perry, Nader, Parcel, Broyles, & McKinlay, 1995).

Weight

Use of a Detecto Medic Scale, with the child standing motionless in the center is the scale is recommended. Scales must be calibrated each time they are moved (Webber, et al).

Blood Pressure

Have child to void if necessary then rest in the examiner's chair at least two minutes before the pressure is taken. The child's forearm should be supported on a table so that the upper arm is approximately at heart level. Place the center of the cuff directly over the brachial artery. It is recommended that the average of three or more readings be recorded. (Voors, 1975; Weber et al). Training of personnel is necessary regardless of what technique employs to take pressures (automatic or manual).

Summary and Conclusions

In the 30 years since the first national health and nutrition study was conducted, the number of overweight children in the United States has doubled. Because obesity begins in childhood, it is important to determine the level and magnitude at which obesity begins to influence cardiovascular risk. It is known from several national and international studies of cardiovascular risk factors in children that obesity is strongly positively correlated with higher blood pressures, higher insulin levels, higher heart rates and cardiac outputs, and higher levels of lipoprotein cholesterol levels, to name a few.

Among African American and Mexican American girls, the early onset of obesity and higher insulin levels maybe

precursors of the higher incidence of diabetes mellitus seen in these groups. Both CATCH and NHANES III found BMI levels higher for Black and Mexican American Girls. More than 95 % of American youth ages 5 - 17 are enrolled in schools. As such, the school represents the one public forum where the masses of children can be reached in an effort to impact their health. Further, children eat from one to two meals per day in school. Other components that make the school an ideal center to positively impact health are the social support that can be derived from teachers, peers, behavioral counseling conducted by school nurses, and physical education programs. Several school based health promotion programs were presented as models. These included the CHIC - Cardiovascular Health In Children program, of the University of North Carolina Chapel Hill, the Heart Smart Program of Tulane University, New Orleans, Louisiana and the emerging, CRRIC- Cardiovascular Risk Reduction in Children program at the University of Mississippi Medical Center, Jackson, Mississippi. The Centers for Disease Control and Prevention gives seven recommendations for ensuring a quality school program to promote lifelong healthy eating. These recommendations pertain to 1) Policy issues, 2) the Curriculum, 3) Instruction, 4) Program Coordination, 5) Staff training, 6) Family and Community Involvement, and 7) Evaluation.

Lastly, practical tips are presented to ensure that data gathered from school based assessments are valid and reliable. A few of the suggestions included use of a portable stadiometer to assess heights, use of Detecto Medic Scales to assess heights use of a bioelectrical impedance manometer to determine fat composition. One must be prepared to be patient with the system. Although you may feel a tremendous passion for the health of the children and recognize that the snack machines should be removed along with the chicken skins, change takes time. Far more will be accomplished if the 'system' emerges as players in constructing and implementing the health enrichment programs than if an expert university-based committee comes to them with all of the answers. Contact program directors who have been successful with school based programs to determine their strategies for success. CRRIC has found both the CHIC and Heart Smart programs extremely willing to share their expertise and resources. And, please free to contact us at the University of Mississippi Medical Center: 2500 North State Street, School of Nursing, Jackson, Mississippi 39216-4505; email: sdavis@son.umsmed.edu. Attention: Sheila P. Davis, PhD, RN.

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