Race/Ethnic Disparities in Childhood Obesity: Environmental Influences

The prevalence of overweight children in the United States has become an increasing public health concern. Sixteen percent of children 6-11 years of age were classified as overweight in 1999-2002, four times the percentage in 1965 (Hedley, et al., 2004). Although child obesity is potentially harmful to children's social development, its correlation with later adult obesity and its myriad of deleterious health outcomes has made it one of the most pressing current public health issues (Clarke, Woolson & Lauer, 1986; Shinha, Fisch G & Teague, 2002; Rodriguez, Winkleby MA & Ahn, 2002; Mallory, Fiser DH & Jackson, 1989; Guo & Chumlea, 1999). A recent report calculated the annual U.S. medical bill for obesity to be $93 billion (Finkelstein, Fiebelkorn & Wang, 2003). In response to the rising obesity rate for children, the American Academy of Pediatrics is now recommending that "At any age, an excessive rate of weight gain relative to linear growth should be recognized, and underlying predisposing factors should be addressed with parents and other caregivers" (American Academy of Pediatrics, 2003).

What is not usually cited, but is clear from an examination of overweight and obesity across race/ethnic groups, is the very large disparity in overweight among children from different race/ethnic groups. There are clearly race/ethnic differences in the propensity to be overweight (Ogden, Flegan, Carroll & Johnson, 2002). Two groups of children, in particular, stand out for their higher proportion overweight: black girls and Hispanic boys (Table 1). For example, the prevalence of overweight among African American girls 6-11 years old is much higher than for non-Hispanic white girls (23% vs 13%). Among 6-11 year old Mexican boys, rates of obesity are 27% versus 14% for white non-Hispanics. Rates are similar for adolescents (Centers for Disease Control and Prevention, 2003). Research has shown differences in both diet and activity patterns among racial/ethnic groups. African American children consume more daily fast food than their white counterparts (Bowman, Gortmaker, Ebbeling, Pereira & Ludwig, 2004) and are less likely to participate in organized physical activities in a given week (Centers for Disease Control and Prevention, 2003). In addition, a higher percentage of African American children than non-Hispanic white children watched 4 or more hours of television per day, while Mexican American children were intermediate in television viewing time (Anderson, Crespo & Bartless, 1998). These differences in diet and activities may be partly explained by differences in average income levels between groups, with white families having higher median yearly incomes than African American and Hispanic families (U.S. Census Bureau, 2001). However, a recent study concluded that reducing the disparity of education and income among race/ethnic groups would not reduce disparities in overweight prevalence (Gordon-Larsen, Adair & Popkin, 2003). Another factor may be the importance of physical activity relative to other activities within the racial/ethnic group (Seefeldt, Malina & Clark, 2002). Asian girls, for example, have unusually low overweight prevalence (Gordon-Larsen, et al., 2003). More research is needed to fully understand variations in physical activity among race/ethnic groups and the extent to which they may be linked to contexts in which they live.

<u>Framework for Examining Race/ethnic disparities</u>

The factors proximal to overweight are energy intake and energy expenditure. An imbalance in energy intake and expenditure is believed to have contributed to the rising obesity rate among children. Although genes may interact with the environment to increase risk, increased obesity is likely due to changes in lifestyle and habits, including what we do, whom we do it with, and where we do it—the social context.

The causes are believed to be environmental and social because large increases in obesity have occurred over a very short 40 years. Frequently cited as one of the causes of increased child obesity is the broad shift over the last 30 years from physically challenging activities to more sedentary leisure activities (Popkin, 2001). Although children's television use has remained the same over the same period, time spent in front of the computer screen, watching videos and DVDs, and playing electronic games has increased (Hofferth & Sandberg, 2001; Roberts, Foehr, Rideout & Brodie, 1999). Recent studies report that 9-12 year-olds spend one-quarter of their leisure time watching television, 2-3 hours per day (Hofferth & Sandberg, 2001). Increased sedentary activity has occurred concurrently with increases in energy intake for children via more fast and convenience foods and larger portion sizes (Harnack, Jeffrey & Boutelle, 2000).

After laying out the statistics on race/ethnic disparities in childhood obesity, this paper will examine two environments of children - the family and the community – that may lead to differential obesity in children of different race and ethnicities. Because so little is known about race/ethnic differences in environments, this paper provides a framework for examining race/ethnic differences in eating behavior and in physical activity, the two proximal factors contributing to obesity. It then reviews the literature on family and community differences that could contribute. It reviews interventions that have attempted to alter these environments so as to increase physical activity or change eating patterns of children so as to reduce the risk of overweight and obesity. Finally, the proposed study will analyze data from the child Development Supplement to the Panel Study of Income Dynamics and the Youth Media Campaign (CDC) on the relationship between family and community characteristics and child obesity. These studies have information not only on child and parent height and weight but also on time use, expenditures on food and on physical activities, and family attitudes towards and barriers to physical activity.

Family Context

Obesity has a shared family component, resulting from common genes, a common environment, or their interaction. Children of obese parents are at risk of developing obesity; parental obesity more than doubles the risk of adult obesity among children less than 10 years of age (Whitaker, Wright, Pepe, Seidel & Dietz, 1997). Treuth and colleagues (Treuth, Butte & Sorkin, 2003a) have shown that girls from families with obese parents are at significant risk for becoming obese between ages 8 and 10 even when they start out at baseline with similar levels of energy expenditures during normal activities and normal weight. Considerable research has been conducted on the influence of family behaviors on diet, but physical activity is also known to be powerfully linked to family context. In the Framingham study, children with two active parents were 5.8 times more likely to be active than children with inactive parents (Moore, et al., 1991).

Structural and functional social supports established during childhood and adolescence are known to exert a moderating and formative influence on youth physical

activity (Prochaska, Rodgers & Sallis, 2002) and parental influence has been found to play a particularly crucial role (Davison, Cutting & Birch, 2003; Welk, Wood & Morss, 2003b). Recent research also shows a significant correlation among siblings in activities (Hofferth & Curtin, 2005), supporting the inference that the family is an important context for determining activities, activity levels, and, consequently, obesity. A gap in the literature exists in determining the family factors and contexts that directly influence physical activity and obesity. Existing research on some of the possible factors is summarized below.

The employment status of the parents is frequently cited as a possible predictor of child weight status. The theory is that children of working parents tend to have less supervision of their diet and activity behavior. One set of investigators (Anderson, Butcher & Levine, 2003) found children were more likely to be overweight if their mothers worked more hours, and this was particularly deleterious for higher socioeconomic status mothers. However, that study did not take the joint marital and employment status of the mother into account. Because single mothers are more likely to be employed, their children may lack supervision in diet and physical activity behavior. Recent research by our group has found that children of employed single mothers had higher levels of obesity than any other group (Hofferth & Curtin, 2005). Children in two-parent families were not more likely to be overweight if their mother was employed.

Socioeconomic status and education of parents have also been shown to influence children's participation in organized community activities (Santos, Esculcas & Mota, 2004) and to predict child overweight (Sobal & Stunkard, 1989). However, Hofferth and Sandberg (2001) found that differences among children in activities are mainly due to educational differences between their parents that affect preferences, not to income differences. The effect of income and education on childhood obesity is not clearly established. Although low income adults appear more likely to be overweight, the same relationship may not hold for children. One study found that children in families below the poverty line and those in high-income families were least likely to be overweight, with children in families with incomes between poverty and 300 percent of the poverty line the most at risk of overweight (Hofferth & Curtin, in press).

Gender differences in obesity and activities are also important. Research has found that, in 1997, girls 9-12 spent more time in household work, shopping, and art activities, and less time in sports than boys. There was no difference in the amount of passive leisure time, however, or in time spent watching television, reading or studying (Hofferth & Sandberg, 2001). A recent study by the CDC that assessed physical activity among 9-13 year-old children reported that, although equal proportions of boys and girls participated in organized physical activity during the preceding 7 days (about 38 percent each), a significantly higher proportion of boys than girls participated in free-time physical activity (81% vs 74%) (Centers for Disease Control and Prevention, 2003).

Community Context.

The impact of the "built" environment has received considerable attention in the research literature on physical activity. Although a number of studies have examined the impact of the physical environment on adults (Ewing, Schmid, Killingsworth, Zlot & Raudenbush, 2003; Frank, Andresen & Schmid, 2004; Frank, Schmid, Sallis, Cahpman & Saelens, 2005), the impact of the environment on children's physical activity has not

been studied as extensively (Krizek, Birnbaum & Levinson, 2004). One key factor is the walkability of communities. Urbanization and suburbanization have increased distances between children and their schools. Although many children are bused, parents today tend to drive children to school and as they become of age, children drive themselves to school (Anderson & Butcher, 2005). This has greatly reduced physical activity levels of children. Parent-reported concerns about neighborhood safety are cited as a barrier to this type of free-living physical activity (Hofferth & Curtin, 2005). In neighborhoods characterized by high community violence, children may be more likely to be confined to their homes after school rather than allowed to go outside (Randolph, Koblinsky & Roberts, 1996). Race/ethnic composition of the community may affect the types of opportunities available for children to be physically activity. Because their resources tend to be lower, minority communities may not have the types of recreational facilities that majority communities have.

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Table 1. Overweight children and adolescents 6-19 years of age, according to sex, age, race, and Hispanic origin: United States, selected years 1963-65 through 1999-2002

(Data are based on physical examinations of a sample of the civilian noninstitutionalized population)

Age, sex, race, and Hispanic origin[1]	1963-65 1966-70[2]	1971-74	1976-80[3]	1988-94	1999-2002
6-11 years of age			Percent of population (standard error)		
Both sexes[4]	4.2	4.0	6.5	11.3 (1.0)	15.8 (1.1)
Boys	4.0	4.3	6.6	11.6 (1.3)	16.9 (1.3)
Not Hispanic or Latino:					
White only	---	---	6.1	10.7 (2.0)	14.0 (1.5)
Black or African American only	---	---	6.8	12.3 (1.4)	17.0 (1.5)
Mexican	---	---	13.3	17.5 (2.4)	26.5 (2.2)
Girls[5]	4.5	3.6	6.4	11.0 (1.4)	14.7 (1.6)
Not Hispanic or Latino:					
White only	---	---	5.2	*9.8 (2.0)	13.1 (2.3)
Black or African American only	---	---	11.2	17.0 (1.6)	22.8 (2.5)
Mexican	---	---	9.8	15.3 (2.5)	17.1 (2.0)
12-19 years of age					
Both sexes[4]	4.6	6.1	5.0	10.5 (0.9)	16.1 (0.8)
Boys	4.5	6.1	4.8	11.3 (1.3)	16.7 (0.9)
Not Hispanic or Latino:					
White only	---	---	3.8	11.6 (1.9)	14.6 (1.3)
Black or African American only	---	---	6.1	10.7 (1.4)	18.7 (1.7)
Mexican	---	---	7.7	14.1 (1.8)	24.7 (1.9)
Girls[5]	4.7	6.2	5.3	9.7 (1.1)	15.4 (1.2)
Not Hispanic or Latino:					
White only	---	---	4.6	8.9 (1.7)	12.7 (1.8)
Black or African American only	---	---	10.7	16.3 (2.1)	23.6 (1.8)
Mexican	---	---	8.8	*13.4 (3.1)	19.6 (1.9)

*Estimates are considered unreliable. Data preceded by an asterisk have a relative standard error of 20-30 percent.
---Data not available.
NOTES: Overweight is defined as body mass index (BMI) at or above the sex- and age-specific 95th percentile BMI cutoff points from the 2000 CDC Growth Charts: United States. Advance data from vital and health statistics; no 314. Hyattsville, Maryland: National Center for Health Statistics. 2000. Age is at time of examination at mobile examination center.
Crude rates, not age-adjusted rates, are shown.

SOURCES: Centers for Disease Control and Prevention, National Center for Health Statistics, National Health and Nutrition Examination Survey, Hispanic Health and Nutrition Examination Survey (1982-84), and National Health Examination Survey (1963-65 and 1966-70).