A comparison of family effects on the overweight status of children and adolescents

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Introduction:

Thanks primarily to the Add Health data set we know a fair amount about the social correlates of adolescent obesity. Researchers have found that age, ethnicity, exercise, hours spent viewing television, and gender are all related to the odds that an adolescent is at risk for being overweight, or is overweight (Crossman et al, 2006; Dietz and Gortmaker, 1985; Nelson et al, 2007). Adolescent obesity is an important health concern because of the long-term consequences of adolescent obesity. Rates of coronary hearth disease, Type 2 diabetes, high blood pressure and mortality are all higher among obese than non-obese adults (Field et al, 2005: Freedman, et al., 2001; Flegal et al, 2005), and adolescent obesity is a strong predictor of adult obesity (Gordon-Larsen et al, 2004; McTigue et al, 2002). Adolescent obesity has other negative consequences including stigmatization (Neumark-Sztainer et al, 1998), inability to find marital partners, and employment in low wage jobs (Gortmaker et al., 1993).

One of the major predictors of adolescent obesity is childhood obesity. It is important to understand the social correlates of obesity in children, because it may still be possible to change children's eating and lifestyle behaviors before they become too ingrained. Further, the natural growth spurt that occurs in adolescence allows children to burn more calories as they become teens. Thus, it is important to understand the causes of obesity in children so that we can develop policies to help overweight children attain healthy weights during adolescence.

Some of the factors that have been suggested to explain childhood obesity include parental weight, parental eating patterns and knowledge of parents about nutrition (Garn et al, 1989; Locard et al, 1992; Whitaker et al, 1997; Strauss and Knight, 1999; Variyam, 2001). Overweight parents are likely to have overweight children. The relationship of

family type and SES to childhood obesity shows mixed results. In some studies, children in low SES households and two parent households were more likely to be overweight (Wolfe et al, 1994), while other studies have found children in single parent households to be more overweight (Strauss and Knight, 1999). One study of socioeconomic status and obesity found that the patterns vary by gender but SES is often important, although trends may change over time (McLauren, 2007), while other studies have reported that males in higher income families are less likely to be overweight but family income was not important for females (Dowda et al, 2001). Health related behaviors and other types of activities have also been found to be related to rates of overweight. Behaviors such as eating or skipping breakfast, watching television or playing video games, and amount of physical activity are important. Skipping breakfast (Wolf et al, 1994), high rates of watching television or playing video games (Gable and Lutz, 2000; Locard et al, 1992) and limited physical activity (Gordon-Larsen et al, 2004; Kimm et al, 2005) are all behavior patterns that are associated with higher probabilities of being overweight. Some studies that have looked in greater depth at physical activity level and its relationship to weight status have found that both team sport and exercise program participation participants are less likely to be overweight (Dowda et al, 2001) and that computer usage and total hours in sedentary behavior were linked to being overweight (Arluk et al, 2003).

Most of the recent studies of children's obesity using large national data have used the Third National Health and Nutrition Examination (NHANES III) or the National Longitudinal Survey of Youth (NLSY). These surveys provide excellent data for the analysis of overweight and obesity because of their large sample sizes and because they are longitudinal which allows one to examine changes in weight over time.

Only one major academic study (McKay, et. al 2007) has used the data from the National Survey of Children's Health (2003) to examine children's obesity. The focus on that study was on state-level differences. The NSCH is representative for each state and has primarily been used in state chartbooks (i.e.U.S. Department of Health and Human Services, 2003; Liu, et al, 2007). Although the NSCH is not longitudinal, it is still a valuable data source for studying children's overweight and obesity. The survey contains measures of several social factors, such as family's SES, children's exercise and television watching which have been linked to children's overweight status. The major advantage of this data set is its size and recency. With a 2003 sample size of over 74,000 children ages 5-17 one can examine differences in the social correlates of overweight and obesity among the racial and ethnic groups, and we can also study interactions of race/ethnicity with gender, family structure, poverty status, and children's behaviors such as television viewing and exercise. We can look at the influence on generational status on obesity for Hispanic children. Smaller studies have suggested that acculturation may be associated with greater obesity (Duerksen, et al, 2007). We can also compare the predictors of overweight in childhood to the predictors of overweight in adolescence using the same large scale, nationally representative survey. Such comparisons are important because many studies have found large differences in the prevalence of overweight by race/ethnicity, gender, and age groups and it is important to document such differences from the same survey so that sampling, measurement, and time differences do not influence the comparisons.

Data and Measures -

Data

We used data from the 2003 National Survey of Children's Health (NSCH) which was a multistage cluster design sample of children less than 18 years of age selected from each of the 50 states and the District of Columbia. The purpose of the NSCH was to produce national and state-specific prevalence estimates for a variety of children's health indicators and experiences with the health care system (U.S. Department of Health and Human Services, 2005). We selected children aged 5-17 because we were interested in the comparison of school-age and adolescent predictors of overweight and obesity. The NSCH was conducted from January 2003 to July 2004 and a total of 102,353 interviews were completed. Our sample of 5-17 year olds with BMI data is 69,000.

Measures

BMI. The 2003 NSCH provided the age- and gender-specific weight status designation (i.e., underweight, normal weight, at risk of overweight, and overweight) derived from original information on children's age, weight, and height and based on the CDC's BMI-for-age gender-specific growth charts (http://www.cdc.gov/growthcharts/). Specifically, NSCH children aged 2-17 years were classified as either underweight (i.e., gender-specific BMI-for-age is in the 5th percentile or lower), normal weight (BMI-for-age 5th percentile to < 85th percentile), at risk for overweight (i.e., gender-specific BMI-for-age is in the 85th percentile or greater but lower than the 95th percentile), or overweight (i.e., gender-specific BMI-for-age is in the 95th percentile or greater). We are interested in the top categories so combined at risk and overweight versus under and normal weight. Because of use of parent-reported heights and weights BMIs are believed to be over-estimated for children under 10 years of age. However, since we combined the

at risk and overweight categories and are interested in predictors of BMI rather than state-level prevalence, these biases should have a minimal effect on our results

Race/ethnicity. The NSCH reports children's race as **white-only, black-only**, **other-only** and **multiracial**. We have used all of those categories, but have also defined as **Hispanic**, a child who was reported to be of Hispanic origin regardless of race. The race variables are included as dummy variables with non-Hispanic white omitted as the reference group.

Immigration status. Children was coded as **first generation** if they were born outside of this country and as **second generation** if they were born in the U.S. but at least one parent was born outside of the U.S. The reference group is **third generation** and is defined as children who were born in the U.S. and have U.S. born parents. We anticipate that immigrant status will serve as a protective factor against overweight status.

Family structure. Children's family status is defined as **two-parent** vs. **single parent.** Two parent includes both biological-parent and step-parent households. We hypothesize that children from single parent households are at greater risk of overweight because single parent households may be more pressed for time and more likely to rely on fast-food which tends to have a high fat content.

Age. We divide our sample into schoolage children (5-12) versus adolescents (13-17). Since age may also have effects within the child and adolescent categories, the age of the child is included in the regression models.

Income. Federal guidelines for determining household poverty status were used to determine family's financial status. The NSCH variable is based on comparing the family's income to the poverty guideline and ranges from 1 (less than federal standards) to 8 (at or above 400% of the federal poverty guidelines.

Education is measured by the highest level of education of anyone in the household and is less than high school (1), high school (2), more than high school (3).

South is a dummy variable measured 1 if the child lived on one of the federally recognized southern states (including the District of Columbia) and 0 if they did not.

Number of Household Children is coded from 1 to 4 with 4 representing four or more children. **Male** is coded 1 for male and 0 for female.

Mother's Exercise is a dummy variable with 1 representing mothers who responded yes to regularly getting enough exercise to make them breathe hard, heart beat fast, or sweat for 20 minutes or more, and 0 indicating mother's who responded no to the question.

Child's Exercise is measured as the number of days during the past week that the child exercised or participated in sports that made him or her breathe hard or sweat for 20 minutes or more.

Child's TV hours is the number of hours per school day that the child usually spends watching television. This is measured on a zero to four scale with four indicating four or more hours.

Analytical Methods

Survey statistical techniques in the Stata statistical package are used to estimate proportions (Figure 1) and conduct logistic regression (Table 1). These survey techniques adjust the standard errors for the clustered sampling design of the NSCH survey.

Results

Figure one provides the percentage of 5-12 year-olds and 13-17 year-olds who are at risk for being overweight or overweight (at risk/overweight) by race and sex. Racial differences are large. Fifty-six percent of black girls age 5-12 compared to 36% of white girls of the same age are at risk/overweight. Sex differences are also considerable. For example, 17.5 percent of white adolescent girls (aged 13-17) compared to 27.2 percent of white adolescent boys are at risk/overweight. Age groups differences within the same sex and race/ethnicity group are also large. For example, 81.4 percent of black boys ages 5-12 are at risk/overweight, whereas only 35.6% of Black boys ages 13-17 are at risk/overweight.

Model 1 of Table 1 provides the logistic regression results using the survey programs to control for the clustered sampling design for the prediction of at risk/obesity separately for 5-12 year-old children and 13-17 year old adolescents. We find that Black, Hispanic, and multi-racial children are more likely to be at risk/overweight than non-Hispanic white children. Males are more likely to be overweight both as children and teens than females. Within each age group older children are less likely than their younger counterparts to be at risk/overweight. In this basic model which does not include controls for family SES, the effects of immigration status are not statistically significant.

Model 2 of Table 1 adds variables representing family SES and structure. Children and teens from wealthier and better educated families are less likely than those from poorer families to be at risk/overweight. Controlling for parental education and income, family structure are not associated with children's BMI weight category. The more children in the household, the less likely the child or adolescent is to be overweight. Perhaps these children are more active than children from smaller families, or perhaps parents are less likely to serve large portions to children in large families. Living is the

South is associated with a greater level of overweight for teenagers, but not for younger children. Since race, education, and income have been controlled, overweight may be associated with cultural differences in the South, such as southern cooking which tends to be higher fat than the diets in other parts of the country. The presence of the family SES and structure variables have few effects on the background variables. However, the effects of being black or Hispanic hare been reduced some by this inclusion and the effect of being multi-racial has become insignificant, indicating that some of the race/ethnicity effects on children and teens overweight status are tied to social class. In contract, controlling for social class, 5-12 year-old first generation immigrant children are less likely than third or latter generation children to be at risk/overweight. . Since children are more likely than teens to be eating most of their meals with their families, the effect of first generation status for children is probably due to the mothers of these children being very recent immigrants and not having acculturated.

Model 3 adds a variable for whether or not the mother gets regular exercise. We hypothesize that this variable is a proxy for a family focus on healthy behaviors. [We plan to add additional family socialization variables in the final models.] Having a mother who exercises regularly is associated with lower rates of at risk/overweight for both younger children and teens. The addition of the mother's exercise variable does not change the other variables in the model noticeably.

Model 4 of Table 1 adds variables representing the child's (teen's) hours spent watching TV and the amount of exercise that the child (teen) obtains regularly. Both of these variables are predictors of child's weight status, with children who exercise more being less likely and children who watch more TV being more likely to be at risk/overweight. Controlling for the child's level of exercise, the effect of mother's

exercise is no longer significant, which is expected. Mother's role modeling of exercise should indirectly influence the child's weight through the child's exercise and TV watching behaviors. Most of the other variables are not affected by the inclusion of these variables representing children's behaviors. However, the effect of being black is reduced, suggesting that part of the reason that black children are heavier than white children is because they exercise less and/or watch more television than white children.

The final version of the paper will include additional analyses including testing interactions between race and immigration status with the family structure and children's behavior variables.

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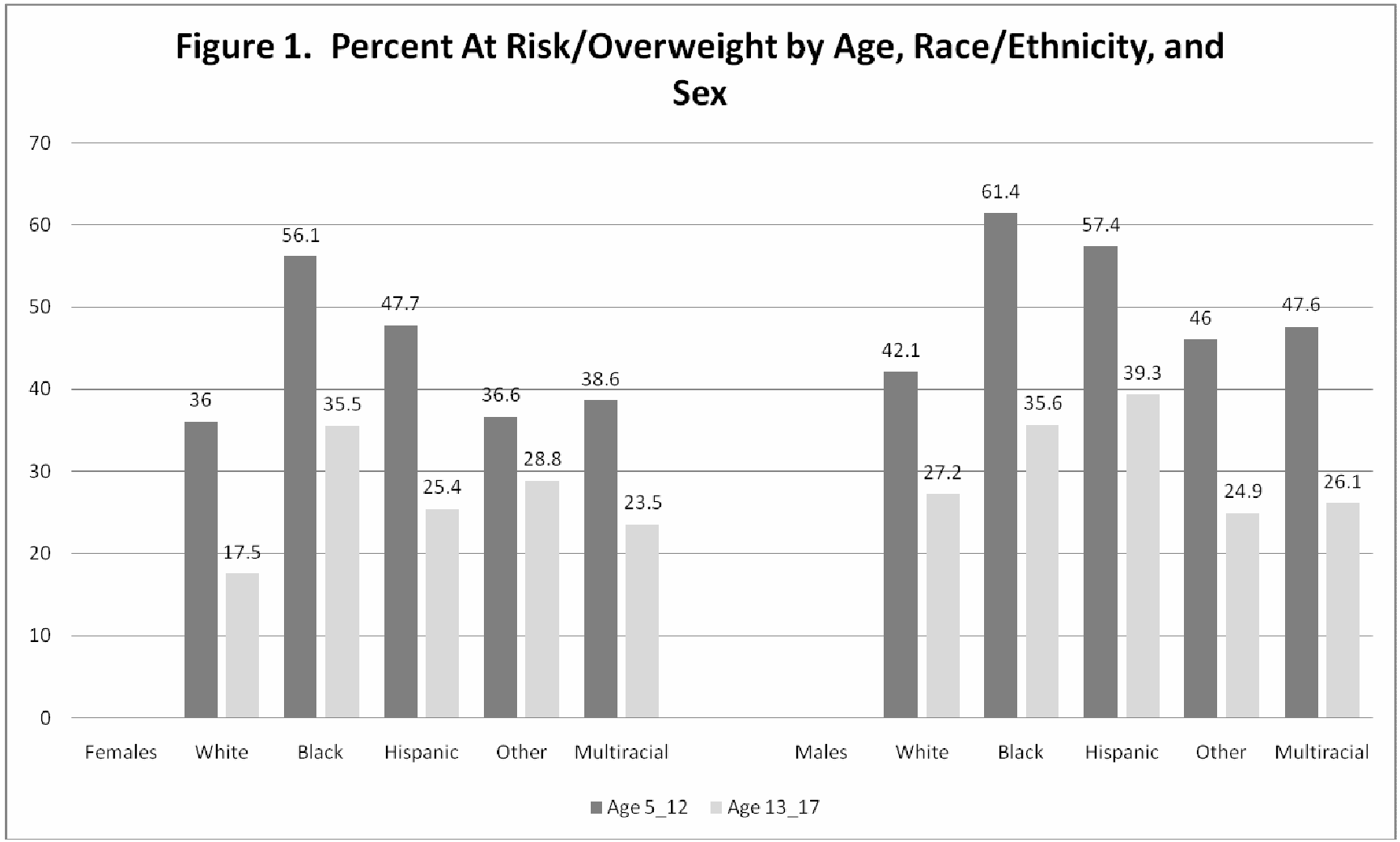
Figure 1. Percent At Risk/Overweight by Age, Race/Ethnicity, and Sex
70
60
50
40
30
20
10
0
36
17.5
56.1
35.5
47.7
25.4
36.6
28.8
38.6
23.5
42.1
27.2
61.4
35.6
57.4
39.3
46
24.9
47.6
26.1
Females
White
Black
Hispanic
Other
Multiracial
Males
White
Black
Hispanic
Other
Multiracial
Age 5_12
Age 13_17

Table 1. Race, Generation Status and Other Predictors of Children's and Adolescent's At Risk/Overweight Status

	M1: Background Effects		M 2: Family Structure		M3: Family Socialization		M 4: Children's Variables	
	Age 5-12	Age 13-17	Age 5-12	Age 13-17	Age 5-12	Age 13-17	Age 5-12	Age 13-17
Black	2.22 **	1.90 **	1.89 **	1.59 **	1.91 **	1.56 **	1.77 **	1.48 **
Hispanic	1.85 **	1.77 **	1.53 **	1.40 **	1.57 **	1.32 **	1.48 **	1.28 **
Other	1.16	1.28	1.14	1.21	1.08	1.14	1.04	1.18
Multiracial	1.21 *	1.19	1.17	1.13	1.17	1.09	1.16	1.04
Male	1.34 **	0.40 **	1.32 **	1.55 **	1.30 **	1.56 **	1.32 **	1.63 **
Child's Age	0.92 **	0.90 **	0.92 **	0.90 **	0.92 **	0.89 **	0.90 **	0.88 **
First Generation	0.80	0.97	0.74 *	1.94	0.69 **	0.99	0.70 **	0.98
Second Generation	0.92	0.85	0.95	0.90	0.94	0.85	0.96	0.86
Income			0.94 **	0.91 **	0.94 **	0.91 **	0.95 **	0.91 **
Two Parent Family			0.92	1.02	0.95	1.03	0.94	1.03
Education			0.82 **	.88 **	0.83 **	0.88 **	0.82 **	0.92
South			1.01	1.11 *	1.02	1.12 *	1.06	1.12 *
N. HH Kids			0.92 **	0.84 **	0.91 **	0.84 **	0.89 **	0.86 **
Mom Exercise					0.89 **	0.89 *	0.92	0.94
Child's TV Hours							1.06 **	1.15 **
Child Exercise							0.95 **	0.92 **
N	36440	26216	33965	27279	32533	25961	28498	25595