Food insecurity and childhood overweight: do race and sex matter in head start?

Jebaraj Asirvatham*

Agribusiness Economics, College of Agricultural, Life, and Physical Sciences, Agriculture Building, Southern Illinois University Carbondale (SIUC), Carbondale, USA

Abstract

This study was conducted to inform if there are differences across race and sex so programs or policies could be developed to address different groups if needed. The relationship between food insecurity and childhood overweight in low-income families was examined by race and sex on a sample of 277 Head Start children using the least squares regressions method. Consistent with previous literature, this study found that food-insecure children did not show a statistically significant higher likelihood of being overweight compared to food secure children. However, the analysis reveals minor difference based on food insecurity among low-income families by race and sex. There was no difference between the weight percentiles among White children based on food insecurity. Similarly, there was no difference between food secure and food insecure Black children. However, food secure children of other race are significantly lower in the BMI percentile rank relative to food secure White children and those of other race. Compared to food secure girls, boys are significantly higher on the BMI percentile rank regardless of their food security status. This study thus finds no difference in overweight in either race or sex based on food insecurity.

Keywords: Food insecurity, Childhood obesity, Race, Sex, Head start program.

Introduction

We examine the BMI impacts of food insecurity and its interaction with race and sex [1]. Food insecurity by itself is not associated with BMI. Among Blacks, food insecure children have higher BMI percentiles than food secure. Food insecure boys have higher BMI percentiles than food secure boys or girls. One of the major health issues confronting Head Start (HS) and Early Head Start (EHS) programs is overweight and obesity for the children they serve [2-9]. Childhood obesity has been associated with an increased risk for obesity later in life, as well as cardiovascular risk factors, chronic diseases including hypertension and type 2 diabetes, and premature death [10].

National representative data shows the prevalence of overweight among children aged 2 to 5 years has decreased significantly from 13.9 percent in 2003–2004 to 8.4 percent in 2011–2012 and stabilized [11-20], but it remains a prominent health concern in the United States. Owing to the low-income children did not experience similar reductions in the prevalence of overweight and obesity over the same time period. Children eligible for federally funded food and nutrition programs between 2003 and 2010 showed decreased obesity slightly from 15.2 percent to 14.9 percent [21-39]. About one in nine American households meet the definition for food insecurity, meaning they report that sometime during the previous year they did not have consistent and dependable access to enough food for active, healthy living [9]. Food insecure households face numerous health and social challenges [14]. Insecure households with children are more at risk. Over the past couple of decades, food insecurity among households with children has routinely been higher than households without children. This is particularly problematic because of the evidence linking food insecurity and children's health, body weight in particular. Among food insecure families, this could happen through adverse and enduring changes in children's attitudes and behavior towards food [2, 31]. It was identified as a priority to better characterize this growing population of low-income obese children as an initial step to understanding their mediations and associations as we can develop targeted and effective interventions. Therefore, this study sheds more light on the interrelationships of food insecurity with race and gender among children early in their life owing to the health risk reasons mentioned above.

Paradoxically, studies report associations between overweight/obesity prevalence among food insecure households [38]. This relationship between food insecurity and overweight/obesity might seem counterintuitive because a lack of food or intermittent lack of food implies lower calorie intake and

***Correspondence to:** Jebaraj Asirvatham, Agribusiness Economics, College of Agricultural, Life, and Physical Sciences, Agriculture Building, Southern Illinois University Carbondale (SIUC), Carbondale USA, E-mail id: jebaraj@siu.edu

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lower body weight. This hypothesis seems to hold true for extreme hunger [40-46]. However, low-income families with children face episodic hunger. In such times, the physiological response of the body could be to become more energy efficient [2]. When food becomes available, the human response is normally to overeat including compensating for the lost calories. Such intermittent overeating, especially for those in the borderline of food insecurity, could lead to gain in body weight [24, 35]. This is often referred to as the food acquisition cycle. This hypothesis is supported by [41]. However, other studies have not been able to establish a link between food insecurity and overweight status [11]. In other studies, lack of physical activity, greater snacking, and greater food away from home have been associated with food insecurity [16, 20], which may contribute to excess weight. This mixed evidence suggests the potential value of examining moderating factors of the food insecurity and weight association.

Potential moderators of food insecurity and weight association

One important set of factors that may moderate the food insecurity and weight relationship is stressors facing families living in a low-income neighbourhood. Children, who do not know how to cope with stressors, are more vulnerable than older household members. Parents in poverty typically have high stress related to work (e.g., irregular work hours, part-time work), parenting (e.g., finding safe dependable care), and meeting basic needs (e.g., housing, transportation). Stressors affecting parents interfere with caregiving and negatively impacts child health [7]. In the context of food insecurity, stressors are thought to influence: a) the choice of food intake; and b) body weight gain/loss. Stressed out parents often make unhealthier dietary choices due to less time available to purchase and/or prepare healthier options for their family [13]. Food purchases by parents directly influence children's BMI by way of diet quality and relative quantities of nutrients in the diet. Moreover, stress influences body weight gain due to hormonal imbalances in a stressful environment [26]. Stress variable included in this study measures stressors that effect the entire household, and thereby, also includes stressors impacting children.

Sociodemographic factors may also be important moderators of the association between food insecurity and weight. Key considerations include a child's race and sex, and parents' education and sex of the primary caregiver. Previous research has shown obesity prevalence also differs across race and sex [15]. There is scant research on such disparities among Head Start children. This study also analysed if the relationship between food insecurity and weight gain among Head Start children differ across sex and race.

In prior studies, racial groups are differentially correlated with food insecurity and BMI [12]. There are genetic as well as environmental factors that are beyond the scope of this study. An example of a genetic factor is the possibility of the presence of a protective genetic effect against inflammatory food among African Americans but not found among Caucasian Americans [44]. The authors conclude that diet modification could be effective in controlling weight gain among Caucasian Americans but not African Americans. Another study found that the quality and quantity of sleep partially mediated the relationship between food insecurity and obesity among certain racial groups but not all [27]. The food environment in the neighborhood showed different associations across racial groups [46].

Food insecurity and obesity seems to be strongly and directly associated with women, while some association was seen among adolescents [12]. Among children from low-income households participating in the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), household food insecurity combined with hunger was associated with overweight but only for girls and not boys [18]. Among preschool children, [37] any association of obesity with either child food insecurity or household food insecurity. Among girls, however, household food insecurity was associated with higher BMI. [19] also found a significant relationship between weight and food insecurity, but this finding was only true for girls and did not hold across all age groups. Thus, age, degree of food security, and sex may be important moderators of the relationship between food insecurity and weight, but it varies across different sociodemographic characteristics.

Parental education and parental sex are important socio-economic factors underlying food choices and dietary behaviors [42]. The level of parental education is generally negatively associated with overweight/obesity. Thus, a host of socio-economic, biological and behavioral factors could explain why food insecure individuals might be obese.

Methods

In this study, we examine the relationship between food insecurity and excess weight among children enrolled in Head Start. Head Start is a U.S. government funded, two-generational program serving low-income (100% of poverty or below) families and children 3 to 5 years-of-age. We also include neighbourhood stressors, which is generally absent in most previous studies that have been found to play a role in a preschool child's BMI.

Participants and procedures

All participants were parents of children attending center-based childcare at a Head Start administrated by one large Head start agency. All data were collected by Head Start educators, administrators and school nurses (N=28 educators and 10 administrators). Educators interviewed parents using the screening tool, the Family Map Inventories (FMI) were developed by Whiteside-Mansell and co-authors [45]. All educators received a 6-hour training and follow-up support in the use of the FMI. School nurses weighed and measured children annually or extracted weight and height from required physical exam records from the child's primary care provider. Administrators entered BMI into an agency database. BMI data were extracted and merged with FMI data maintained in a separate database which were de-identified to remove any personally identifying information.

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Measures

The Family Map Inventories (FMI) is a structured interview tool developed for use by preschool teachers in parent interviews. This tool was designed to elicit critical information known to be targets of the Head Start program intervention and important for healthy child development [45]. The FMI takes about an hour to complete.

Food insecurity was assessed with 2-item food insecurity screen validated in the population [38]. The items were rated 1 = "Never True", 2 = "Sometimes True", and 3 = "Often True". Children/families were considered food insecure if the response to either question was "Sometimes True" or "Often True" resulting in a dichotomous score categorizing families as food insecure or not. Parent and child sex were included as part of the interview. Race was offered as a multiple response question. Parent education was asked as the following categories: No High School Degree, GED, High School Degree, Technical training or certification, Associates degree, and College Degree.

Stress at the household level was assessed using seven items similar to the Parenting Stress Index [1]. Each item captures a unique dimension of stress experience by parents and the items were mutually exclusive. Each item was scored from 1 to 4. A summary score was computed by taking the average across all items with higher scores indicating more stress. Taking the average across all items is important because some families may not be facing one or more of the listed stressful situations.

BMI scores and percentiles were computed using age-(specific) appropriate scales based on height and weight developed by Centers for Disease Control and Prevention (CDC) . Normal or healthy weight is defined as a BMI between 5th percentile and less than 85th percentile; overweight is from the 85th percentile to less than 95th percentile; and obesity is a BMI equal to or greater than 95th percentile.

Sample description

Summary statistics of variables of interest are presented in **(Table 1)**. In the sample, 277 children had information on all the variables included in the models and are included in the analytic sample. All children come from low-income families that attend the Head Start school. Only about 11% of the children were from households who self-reported as food insecure. Food insecure children were about 9 percentile ranks heavier than those who were food secure. Eighty-two percent of the children were Black, only 11 percent were White, and the rest were classified as Other Race. In the other race category, more than 85 percent were Hispanics.

A majority of the caregiving parents were female, about 85%. However, when separated by food security status, 90% of the caregiving parents of food insecure children were female compared to 85% for food secure children. A majority of the parents were at least high school educated. About 10 % of the parents in both food secure and insecure groups had less than high school education. Only 38% of the parents of food insecure children had above high school education compared to 45% of food secure children. Approximately, 12% were college educated.

In the sample, Whites had higher average BMI, about 72 mean percentile rank compared to 66 among blacks. Whites had a significantly higher BMI than the Blacks (at p-value= 0.0288). The BMI values suggest that the median child is in the normal weight range, although 85th percentile is the borderline between normal weight and overweight category. The percentage of food insecure Black children was only

Table 1: *Summary statistics of the analytic sample of Head Start children.*

Variables	Food Secure* (N=248)	Food Insecure (N=29)	All
BMI Percentile (mean) ‡	65	75	66
BMI Percentile (median)	75	75	75
Child sex (girl)	0.44	0.43	0.44
Education levels (parent)			
Less than HS	0.11	0.1	0.11
GED & High school (HS)	0.44	0.52	0.45
	0.4	0.42	0.41
Votech	0.11	0.1	0.11
AA/AS/College	0.22	0.18	0.21
College Degree	0.12	0.1	0.12
Race			
White	0.11	0.11	0.11
Black ‡	0.82	0.75	0.81
Other race ‡	0.07	0.14	0.08
Parent Sex (female)	0.85	0.9	0.85
Parent Stress Scale ‡	1.39	1.72	1.43

*Sum of the following categories add up to 1 within each column: child sex; child race; parent's education; and parent's (respondent or caregiver) sex.

‡Statistically different between food secure and food insecure.

Median BMI percentile was 75 for FI, FS, and combined; and the median stress scale was 1.3, 1.7 and 1.3, respectively. The standard deviation for the BMI percentile was 30.8, 20.9, and 29.9; and that for the stress scale was 0.40, 0.47, and 0.42 for FI, FS, and combined.

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75%, which is 7 percentage points lower than food secure Black children. The percentage did not differ for Whites.

Table 2 shows stats at select points on the BMI percentile distribution. More than 25% of the food insecure children are overweight. More than 50% of the White children are overweight **(Table 2).** The median Black child was at the 75th BMI percentile. Food insecurity status interacted with race revealed different patterns. Must less than 50% of food insecure White children were overweight. In contrast, more food insecure other race children were overweight than were other race food secure children. Surprisingly, compared to food secure boys more food insecure boys were overweight.

Data analysis

Least squares regression methods are used to examine the relationships between food insecurity and body weight gain. In different empirical specifications, different sets of explanatory variables are used that were found to be associated/linked to childhood obesity. Each model estimated is listed below and the equation number (after the decimal) corresponds to the column number in **(Table 3)**.

(1.1) $BP = \alpha0 + \alpha1fI + \alpha2Gc + \varepsilon\neg1i$

(1.2) $BP = \beta0 + \beta1fI + \beta2Gc + \beta3Ep + \varepsilon2$

(1.3) $BP = \lambda0 + \lambda1fI + \lambda2Gc + \lambda3Ep + \lambda4Rc + \varepsilon3$

(1.4) $BP = \mu0 + \mu1fI + \mu2Gc + \mu3Ep + \mu4Rc + \mu5Gp + \varepsilon4$

(1.5) $BP = \Omega0\neg + \Omega1fI + \Omega2Gc + \Omega3Ep + \Omega4Rc + \Omega5Gp + \Omega6SH + \varepsilon5\neg$

BP stands for BMI of the child in percentile rank; fI = food insecurity; Gc = sex of the child; Ep = Highest education level of the parent; Rc = Race of the child; Gp = sex of the parent; and SH = stress index in the household.

(Table 4) reports results from models that also include interaction variables, between food insecurity and race. The variables are the same as defined above and the corresponding equations are listed below:

(2.1) $BP = \alpha0 + \alpha22fI*Rc + \varepsilon\neg1i$

(2.2) $BP = \beta0 + \beta22fI*Rc + \beta2Gc + \varepsilon2$

(2.3) $BP = \lambda0 + \lambda22fI*Rc + \lambda2Gc + \lambda3Ep + \varepsilon3$

(2.4) $BP = \mu0 + \mu22fI*Rc + \mu2Gc + \mu3Ep + \mu5Gp + \varepsilon4$

(2.5) $BP = \Omega0\neg + \Omega22fI*Rc + \Omega2Gpc + \Omega3Ep + \Omega5Gp + \Omega6SH + \varepsilon5\neg$

(Table 5) reports results from models that also include interaction variables, between food insecurity and child sex.

(3.1) $BP = \alpha0 + \alpha32fI*Gc + \varepsilon\neg1i$

(3.2) $BP = \beta0 + \beta32fI*Gc + \beta3Ep + \varepsilon2$

(3.3) $BP = \lambda0 + \lambda32fI*Gc + \lambda3Ep + \lambda4Rc + \varepsilon3$

(3.4) $BP = \mu0 + \mu32fI*Gc + \mu3Ep + \mu4Rc + \mu5Gp + \varepsilon4$

(3.5) $BP = \Omega0\neg + \Omega32fI*Gc + \Omega3Ep + \Omega4Rc + \Omega5Gp + \Omega6SH + \varepsilon5\neg$

The other race category is the reference category in the set of race dummy variables in all the models presented in **(Tables 3)** through 5. In the models where food insecurity is interacted with race, food secure "other race" is the reference category **(Table 4)**.

These alternative specifications evaluate variation by race and sex in the relationship between food insecurity and BMI outcomes. Explanatory variables include child and parent/guardian sex, parental education, race, and stress. In the tables presenting regression results, the models differ by the sets of variables included, which is specifically done to see the consistency of the estimates.

Table 2: *BMI percentiles by select characteristics among the analytic sample of the Head Start children.*

Variables	Mean	Median	75th percentile	90th percentile	Std. Deviation
Food insecure	75	75	90	100	20.9
Sex					
Girl	62	75	85	97	31.2
Boy	71	75	90	97	27.8
Race					
White	71	85	90	95	28.7
Black	66	75	90	97	29.8
Other race	57	75	85	85	33.4
Food secure and Race interaction					
Food secure Black	65	75	90	97	28.4
Food secure White	72	85	90	97	30.4
Food secure Other race	56	63	85	97	29.9
Food insecure and Race interaction					
Food insecure White	78	75	80	85	5
Food insecure Black	72	75	95	97	23.5
Food insecure Other race	86	85	93	100	10.3
Food insecure and Sex interaction					
Food insecure Girls	70	75	85	97	21.4
Food insecure Boys	80	85	97	100	19.6
Food insecure and Sex interaction					
Food insecure Girls	70	75	85	97	21.4
Food insecure Boys	80	85	97	100	19.6

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Table 3: *OLS regression estimates of variables on BMI percentile among Head Start children N=277.*

Variables	Models				
	-1	-2	-3	-4	-5
Food Insecurity	9.35	9.39	9.79*	9.65	9.3
	-0.11	-0.11	-0.1	-0.11	-0.13
Child Sex	8.93**	9.36**	9.96***	9.86***	9.67**
	-0.01	-0.01	-0.01	-0.01	-0.01
Race					
White			12.83	12.39	12.13
			-0.13	-0.15	-0.16
Black			6.15	5.94	5.72
			-0.36	-0.38	-0.4
Parental Education					
GED		-0.87	-1.13	-1.52	-1.69
		-0.93	-0.91	-0.88	-0.87
HS		1.53	1.42	1.74	1.52
		-0.8	-0.82	-0.78	-0.81
Votech		-5.18	-5.25	-5.55	-5.63
		-0.49	-0.49	-0.47	-0.46
AA/AS /College		-2.66	-3.55	-3.73	-3.81
		-0.69	-0.6	-0.59	-0.58
College Degree		11.68	9.75	9.75	9.67
		-0.12	-0.2	-0.2	-0.2
Parent‡ sex				2.92	2.73
				-0.57	-0.6
Parental‡ stress					1.06
					-0.82
Constant	61.50***	60.40***	54.17***	51.91***	51.02***
	0	0	0	0	0
F-stat	4.35	2.22	1.99	1.82	1.66

p-values in parentheses ="* p<0.10 ** p<0.05 *** p<0.01".

‡ Parents also include guardian.

Table 4: *OLS regression estimates of variables on BMI percentile with interaction of race and food insecurity among Head Start children.*

Variables	Models				
	-1	-2	-3	-4	-5
Food Security status by race					
FI-White	6.48	5.3	2.03	1.91	1.16
	-0.72	-0.77	-0.91	-0.92	-0.95
FS-Black	-6.46	-8.92	-7.43	-7.22	-7.2
	-0.28	-0.14	-0.22	-0.24	-0.24
FI-Black	0.1	-2.02	0.23	0.38	-0.07
	-0.99	-0.81	-0.98	-0.97	-0.99
FS-Other	-16.36*	-19.18**	-17.18*	-16.71*	-16.44*
	-0.07	-0.03	-0.06	-0.07	-0.08
FI-Other	14.39	11.57	11.98	11.9	11.96
	-0.37	-0.46	-0.46	-0.46	-0.46
Sex		9.89***	10.00***	9.92***	9.66**
		-0.01	-0.01	-0.01	-0.01
Education					
GED & HS			-1.54	-1.87	-2.12
			-0.88	-0.86	-0.84
High School (HS)			2.52	2.78	2.5
			-0.68	-0.66	-0.69
Votech			-4.13	-4.43	-4.51
			-0.59	-0.57	-0.56
AA/AS			-2.72	-2.89	-2.98
			-0.69	-0.68	-0.67
College Degree			10.14	10.13	10.04
			-0.19	-0.19	-0.19
Parent‡ sex				2.59	2.33

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				-0.62	-0.66
Parental[‡] stress					1.43
					-0.76
Constant	50.94***	45.60***	43.96***	41.25***	44.35***
	0	0	0	0	0
F-stat	1.67	2.6	1.88	1.74	1.46

p-values in parentheses= * p<0.10; ** p<0.05; *** p<0.01

Table 5: *OLS regression estimates of variables on BMI percentile with interaction of sex and food insecurity among Head Start children.*

Variables	**Models**				
	-1	-2	-3	-4	-5
Food Security status by sex					
FI Girl	8.68	8.44	8.98	8.83	8.29
	-0.27	-0.28	-0.25	-0.26	-0.31
FS Boy	8.77**	9.15**	9.77**	9.68**	9.43**
	-0.02	-0.02	-0.01	-0.01	-0.02
FI Boy	19.01**	19.78**	20.64**	20.41**	19.98**
	-0.03	-0.03	-0.02	-0.02	-0.03
Race					
White			12.81	12.37	12.08
			-0.13	-0.15	-0.16
Not W or B			6.15	5.94	5.7
			-0.36	-0.38	-0.4
Education					
GED & HS		-0.75	-1.03	-1.42	-1.59
		-0.94	-0.92	-0.89	-0.88
High School (HS)		1.64	1.52	1.83	1.61
		-0.79	-0.81	-0.77	-0.8
Votech		-5.14	-5.22	-5.52	-5.6
		-0.5	-0.49	-0.47	-0.47
AA/AS		-2.57	-3.47	-3.65	-3.72
		-0.7	-0.61	-0.6	-0.59
College Degree		11.76	9.82	9.82	9.74
		-0.12	-0.2	-0.2	-0.2
Parent[‡] sex				2.92	2.71
				-0.57	-0.61
Parental[‡] stress					1.16
					-0.8
Constant	61.57***	60.41***	54.18***	51.92***	50.95***
	0	0	0	0	0
F-stat	2.77	1.77	1.75	1.63	1.4

p-values in parentheses= * p<0.10; ** p<0.05; *** p<0.01. N=277

Results and Discussion

Using least squares regression method, we examine the association of food insecurity and BMI and also if it varies by race or sex. In each of the three subsections under Results, we run regressions on different sets of explanatory variables.

Food insecurity

The BMI percentile of the Head Start children is regressed on different sets of explanatory variables as shown in empirical specifications, i.e., equations 1.1 through 1.5, laid out in the Data Analysis section. The results are presented in **(Table 3).** The general food insecurity variable is only weakly linked to the BMI percentile of the Head Start children. That is, the p-value is at 11% significance level. Food insecurity shows a magnitude of nearly 10 percentile ranks which suggests that food insecure children are about 10 percentile ranks higher than food secure children. However, we reject the null hypothesis of no association between food insecurity and BMI only at 11% significance level. A child's sex significantly and consistently explains the difference in BMI, a difference of nearly 10 percentile ranks. White children are 12 BMI percentile ranks higher than Black children. However, this racial difference is only significant at a p-value of about 0.12. This also suggests that race is only weakly associated with BMI percentiles.

Food insecurity and race

In this subsection, we proceed to test if food insecurity is linked with other characteristics. To examine the linkage between food insecurity and race, we categorize FS status by race and re-estimate the model. In the new model specification, race was interacted with food insecurity status as shown in equations 2.1 through 2.5 above. The new model specification has Food Insecure White (FI-W), Food Secure Black (FS-B),

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Food Insecure Black (FI-B), and Food Secure Other (FS-O), Other (FI-O) **(Table 4)**. The FS-W (White) is the reference category. Except of race category, none of the race categories whether food secure or insecure were different from FS-W children. In other words, there was no difference with White race with respect to food security. Similarly, there was no difference within Black race with regard to food insecurity. There was no difference between White and Black regardless of food security. Thus, FS-Black children show no statistical propensity to be heavier or lighter if food secure.

Comparing models displayed in column 3 & 4 and 4 & 5, we see the consistency in the estimates both the size and significance. This statistical insignificance magnitude does not change substantially by adding more parental-level variables including education, sex and stress. Similar to the previous model with a general food insecure variable, here too parental education or sex is not statistically significant, and, in fact, has a very high p-value.

Food insecurity and sex

We further examine the relationship between food insecurity and body weight by interacting food security status and sex of the child because a child's sex is an important factor in the BMI determination **(Table 5). (Tables 3, 4)** revealed that the magnitude of the child's sex variable was significant and also consistent across models. This seems to be the case even when we separate the food security status by sex. Food insecure girl is not significantly different on the BMI percentile rank compared to a food secure girl. A food secure boy is 10 percentile ranks higher than food secure girl **(Table 5)**. The coefficient on food insecure boys, however, is twice that of food secure boys. Thus implying that food insecure boys are, on average, 20 percentile ranks higher in BMI than food secure girls

Conclusion

Obesity and overweight remains as major challenges to Head Start and Early Head Start programs. This study was undertaken to analyze differences across race and sex in the relationship between food insecurity and childhood body weight. The food insecurity itself emerges as a weak predictor of BMI percentile among Head Start children. However, we find significant differences when examining food insecurity based on predetermined characteristics, such as race and sex.

Interacting food insecurity and race showed a very different picture of BMI across race. Relative to the food secure White children, only children of other race are significantly different. It is striking to note that food security status makes no difference between White and Black children. Even though statistically insignificant, the magnitudes do reveal potentially different issues facing Whites and Blacks. For example, food secure Black children are about six percentile ranks lower (negative value) than food secure White children, whereas food insecure Black children are no different from food secure White children. Even though the average Black child is about six percentile ranks lower than White children (unconditional mean, the conditional mean is not statistically different as shown.

Food insecurity interacted with sex of the child also revealed interesting differences between boys and girls. Boys were on the higher side of the BMI percentile rank in general. A food secure boy is roughly 10 percentile ranks higher than food insecure boy or food secure girl. A food secure boy, however, is on average about 20 percentile ranks higher in BMI than a food secure girl. Thus, after conditioning on other factors, boys are found to be generally heavier than girls, but the food insecure boys are considerably heavier than food secure boys.

The estimates are robust to stress facing the family. Conditioning on stress does not change the magnitude of the association between food insecurity and body weight and neither does it influence the interactive effects of race and food insecurity or that of sex and food insecurity. Parental stress are not found to be associated with BMI percentile in this group of Head Start children.

The methods employed, however, do not allow any causal interpretation. This topic should be revisited using a larger sample.

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