Youth Subjective Social Status (SSS) is associated with Parent SSS, Income, and Food Insecurity but not Weight Loss among Low-Income Hispanic Youth

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Abstract

Objective: Subjective social status (SSS), perceived rank in the social ladder, is associated with weight, but determinants of SSS in youth remain unknown. We investigated relationships between youth SSS and income, food insecurity, parent SSS, and BMI change during an obesity intervention.

Methods: Data came from a family-centered, community-based obesity intervention for low-income families. Parent and youth SSS were assessed using a validated, age-appropriate SSS

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scale. Food insecurity and socioeconomic factors were assessed in parents; child and parent weight-related data were measured at baseline and post-intervention.

Results: Participants included 110 primarily Hispanic (97%), low-income youth and their parents. Food insecurity was reported in 66.4% of families. Youth SSS was positively associated with parent SSS (p=0.0014). In both parents and children, the association between income and SSS was moderated by food insecurity such that lower income was more strongly associated with lower SSS among food insecure households (p=0.0286 and p=0.0327, respectively). Youth SSS was not associated with youth BMI reduction.

Conclusions: Youth SSS was not predictive of weight loss in this intervention. Intriguingly, the association between income and SSS was modified by food insecurity, suggesting that food insecurity shapes the contribution of socioeconomic factors to one's perceived social status.

Keywords

socioeconomic status; obesity; Hispanics; education; family-based behavioral treatment program

Introduction

Socioeconomic status (SES), an objective measure of social rank based on education, income and occupation, is a significant predictor of health outcomes.[1, 2] However, methodological shortcomings in the use of traditional SES measures in youth are noted.[3–8] Shortcomings include traditional SES measures only reflecting the education, income, and occupational of a child's parents at a single point in time and a failure to assess the child's own perceived future trajectories and opportunities.[9] Research has demonstrated that subjective social status (SSS), a measure of one's perceived relative social standing, is valuable for exploring social standing in adolescents and predicts health outcomes independently of SES.[3, 7]

Unlike traditional measures of SES, subjective measures of social status can account for earlier life circumstances, family history, perceived prospects for social mobility, and internalization of relative social standing and/or subordinate status.[10–12] SSS is associated with a wide range of physical and psychological health outcomes including diabetes[13], depression[13], and mental health[14, 15] in adults, and risk for cardiovascular disease in both adults and adolescents.[3, 13, 16] Thus, it is important to characterize factors that influence this construct among overweight Hispanic youth who face potential disparities in each of these health outcomes.

In adults, SSS is influenced by traditional measures of SES (i.e. education, income, and occupation) and psychosocial variables including depression, neighborhood satisfaction, and self-rated health.[17] Throughout child development, it has been posited that perceptions of one's social rank may move from being primarily parent-based toward one's own concept of social rank through experiential maturity and peer influence.[4] However, little is known about what factors influence youth determination of SSS.

Given that adult SSS is predicted by traditional measures of SES and psychosocial variables, [17] and a child's perceived social rank may be influenced by parents' perceived rank[4], we

hypothesize parent SES and SSS will be positively associated with youth SSS. Given previous research[17] indicating that psychosocial factors predict SSS in adults, we further hypothesize that food insecurity is positively associated with youth SSS. Food insecurity has been associated with adverse physical and psychosocial development issues among youth[18, 19] and emotional distress among parents.[20] Additionally, food insecurity is often accompanied by obesity and is more prevalent in Hispanic households than in non-Hispanic white households.[21] Although many negative associations between food insecurity and health outcomes have been noted[22, 23], the relationship between SSS and food insecurity remains unclear.

In youth, SSS is associated with academic achievement[24], depression[24], and obesity[3]. Independent of SES, SSS has also been associated with weight status cross-sectionally[4] and longitudinally[6] in non-Hispanic black and white youth. Internalization of low perceived social status may be a psychosocial stressor that negatively alters health-related behaviors[25], such as eating and physical activity[26], which can impact obesity-related outcomes. Though both SES and SSS are associated with weight outcomes in free-living black and white youth, to our knowledge, no research has evaluated the relationship between SSS and BMI following an intervention, nor examined SSS among a Hispanic pediatric cohort with many Spanish-speaking parents.

The objective of this study was to explore the extent to which traditional SES factors and food insecurity predict SSS in youth, the concordance of parental and youth SSS, and whether SSS predicts BMI reduction in youth enrolled in a family-centered, community-based weight obesity prevention and treatment program delivered to a primarily Hispanic, low-income population. We hypothesized that low SES and food insecurity would be associated with low youth SSS and that higher youth SSS would be associated with greater BMI reduction at conclusion of the weight loss intervention.

Methods

Sample

Data were provided by participants in the Healthy Living Program (HeLP), a community-based obesity prevention and treatment program for children and their families referred by primary care providers. The program has been described previously.[27] HeLP served the majority Hispanic, low-income population cared for by safety-net clinics in a contiguous area of northern Denver and western counties in Colorado. Briefly, HeLP consisted of twelve, 2-hour sessions held twice per week indicating intensive program involvement for a total of 6 weeks, followed by monthly to bimonthly visits for up to 2 years offered by primary care providers trained in obesity counseling (24+ contact hours). HeLP included discussions about nutrition, parenting, and goal-setting combined with hands-on cooking classes and fitness sessions. In addition to targeting healthy weight, the curriculum was designed to build skills for cooking, shopping, and meal-planning to decrease food insecurity. Children aged 10 to 18 years with BMI >85th percentile[28], a sibling in this age range (if available), and one parent were invited to complete the surveys for this study during the enrollment period. At the first HeLP session, a trained research assistant requested a written consent or assent, as appropriate, of one parent who was the primary

caregiver, the referred child aged 10–18 years with a BMI > 85th percentile[28], and one sibling in this age range (if available). Participants in this study were enrolled in HeLP from January 2014 through May 2016 (n=110 child-parent dyads) and were given questionnaires to assess SSS, our main variable of interest. Children who had a diagnosed developmental delay and/or were unable to complete the SSS survey were excluded. A parent completed additional surveys of food insecurity and demographics. During the first and last HeLP intervention sessions, each child was weighed, measured, and asked to complete surveys. All surveys were provided in either English or Spanish based on participant preference. The observational study of HeLP was approved by the Colorado Multiple Institutional Review Board (#13–3106). Families were reimbursed $30 for completing surveys at baseline and again at conclusion of the program, for a total of $60. No reimbursement for time or travel was provided. Small gifts to support program goals including measuring cups and jump ropes were given.

Perceived Social Status

At baseline, child and parental perceptions of social status were assessed using the youth and adult MacArthur SSS scales, respectively.[4] The MacArthur SSS scales assess one's perceived social rank within American society as well as within their community (which for youth is defined as their school). Only children and parents who completed these questionnaires were included in our analyses. The youth version of the MacArthur SSS scale uses one picture of a 10-rung ladder that represents American society. Children are asked to choose the ladder rung that best represents their *family's* place in American society. Higher scores indicate higher perceived family social status. Additionally, another picture of a 10-rung ladder represents the child's school. Children are asked to choose the ladder rung that best represents *their* place on their school's social ladder. The youth version of the MacArthur scale was developed and validated in a similar study population and two-month test-retest reliability demonstrated an intraclass correlation of 0.73 for the society ladder and 0.79 for the community (school) ladder.[4]

The adult SSS scales are similar and include one 10-rung ladder pictured to represent American society and the other 10-rung ladder pictured to represent the family's community. Parental participants were asked to choose the location on each ladder that best represents their personal perception of current social standing taking into account the traditional measures that represent SES including income, education, and occupation. Higher scores indicate higher perceived social status.[29]

Objective SES

SES was measured through self-reported maternal education and household income. Maternal education included categories: 8th grade, <high school, high school, or some college and above. Gross monthly household income was self-reported using a dichotomous scale with income identified as below or above the US federal poverty level for a family of four at the time of study conception in 2013.[30] In our sample, 93.38% of families had a family of four or greater.

Food Insecurity

Food insecurity was assessed using the validated 2-item screen.[31] We chose this 2-item screener because it is becoming a standard-of-care in clinical settings and we believe the interpretation of the results will be more salient to clinicians who often refer youth to weight loss interventions. The items include: "Within the past 12 months, we worried whether our food would run out before we got money to buy more" and "Within the past 12 months, the food we bought just did not last and we did not have money to get more". A 3-point scale was used as the response mechanism and respondents were considered food insecure if either 'sometimes' or 'always' was selected in response to either question.[31]

Health Measures and Demographics

Date of birth and sex were assessed in demographic questionnaires. Race and ethnicity were reported as two separate variables. Because 97% of our sample self-identified as Hispanic and overwhelmingly selected "other" as a race, we report race categories as white and "other." Parent and child height and weight were measured at baseline and post-intervention by trained research assistants following a written protocol using a LifeSource™ UC-321 Precision Scale and a Charder HM200P Portstad Stadiometer. CDC guidelines were used to determine child and adult weight classification categories.

Statistical Analyses

Normality assumptions were evaluated and met for all dependent variables. Mean and standard deviations are presented for continuous variables and two-sample t-tests and ANOVA were performed to test the significance of mean differences between groups. Categorical variables were summarized as count and percent and a Chi-Square test was conducted for comparison between sex and race. Spearman correlation coefficients were assessed between SSS, SES, and food insecurity measures. The Wilcoxon rank sum test and Kruskal-Wallis test were performed to compare the medians between independent groups for non-normally distributed independent variables. Multiple logistic regression models were used to model the association between weight change and SSS scores, adjusting for child age and sex. Multivariable general linear models were used to model the relationship between SSS and SES, adjusting for maternal education. Interaction terms explored the effect of food insecurity on the strength of the relationship between SES and SSS. We hypothesized a stronger relationship between objective and perceived social status for those with food insecurity, since running out of money for food may make living with low-income especially salient in a child's consciousness and increase the impact of poverty on SSS. Generalized linear mixed models were applied for all models accounting for clustering of siblings in the study. All the covariates in multivariable models were predefined with clinical and social relevance regardless of statistical significance. A p-value < 0.05 was considered statistically significant and all analyses were performed using SAS V9.4.

Results

Sample Characteristics

Table 1 includes characteristics of youth (n=110) and their parents. Details are included for the overall sample as well as stratified by child sex and race. Mean age of child participants was 12.6 (± 1.8) years and 40% of child participants were female. Additionally, 97% of child participants identified as Hispanic.

The majority of mothers in the sample completed high school or less (69.8%). On average, family members living at home included 2.2 (± 0.8) adults and 2.7 (± 1.0) children, with 89% of homes having at least two adults (data not shown). The majority of participants had a household income under $1,962 per month (59.8%). The mean societal SSS for parents was 4.6 (± 1.7) and 5.8 (± 1.9) for children on a scale of 1–10 with 1 representing the lowest possible SSS and 10 representing the highest possible SSS of their family relative to other families in American society, respectively. Mean parent community SSS was 5.1 (± 1.9), while mean youth community (school) SSS was 6.8 (± 2.1) on an identical 1–10 scale with 1 representing the lowest possible SSS and 10 representing the highest possible SSS. For adults, community SSS was based on their perception of status in the community in which the adult participants lived whereas for children, community SSS was based on the child's perception of status at their school. Sixty-six percent of all families reported food insecurity and 29% indicated use of food stamps/SNAP-ED. Food bank use was reported in 8% of families and 17% of families used Women, Infants, and Children (WIC) services.

The majority of parents were classified as having at least class 1 obesity, and 31% of female parents had class 2 or 3 obesity. The majority of children had overweight/obesity (17% with overweight, 51% with non-severe obesity and 13% with severe obesity). When stratified by sex, obesity and severe obesity were more prevalent in boys (71%) than girls (52%). Obesity and severe obesity were also less prevalent in whites (59%) than in all other races (65%).

Table 2 includes data on weight changes from baseline (week 1) to week 6 of the weight loss intervention among the total sample of youth (n=110) and among youth with overweight or obesity (n=89). Among youth with overweight or obesity, we observed a significant decrease in BMI percent of 95th percentile change from week 1 to week 6 ($p = 0.0271$) but not BMI ($p = 0.1067$). Among the total sample, which included the siblings with normal weight, we did not observe a significant decrease in BMI percent of 95th percentile change or BMI from week 1 to week 6.

Associations of Parent and Child SSS, SES, and Food Insecurity

Spearman correlation coefficients among variables of SSS, SES, and food insecurity are reported in Table 3. Child SSS society was significantly correlated with child SSS school, parent SSS society, parent SSS community, and monthly income ($p < 0.05$) and was nearly significantly correlated with maternal education and food insecurity ($p < 0.10$). The child SSS school was significantly correlated with monthly income ($p = 0.0190$) and was nearly significantly correlated with parent SSS community and food insecurity ($p < 0.10$). Parent SSS society was significantly correlated with parent SSS community and maternal education ($p < 0.05$) and was nearly significantly correlated with monthly income ($p = 0.0691$). Parent

SSS community was significantly correlated with monthly income and maternal education ($p = 0.0056$ and $p = 0.0001$, respectively). Food insecurity was significantly correlated with monthly income and maternal education ($p = 0.0252$ and $p = 0.0448$, respectively).

Results of multiple linear regression modeling the associations of parent SSS on youth SSS (Model 1) and SES and food insecurity on youth SSS (Model 2) are reported in Table 4. In Model 1, youth societal SSS was significantly associated with parent societal SSS (β = 0.49; $p = 0.0014$). There were no significant relationships between parent society SSS or community SSS with child school SSS.

In Model 2, maternal education 8th grade was significantly associated with lower parental SSS both in society (β = −1.48; $p = 0.0032$) and in their community (β = −1.24; $p = 0.0350$). The association between household income and SSS in society was moderated by food insecurity of parent-child dyads such that lower household income was more strongly associated with lower parental (β = −1.73; $p = 0.0286$) and youth (β = −2.05; $p = 0.0327$) SSS in society among households with food insecurity. Additionally, 18 families (36 children) had siblings enrolled in the study (36/110=32.7%). Thus, we ran all models accounting for clustering of siblings in the dataset and though parameter estimates were changed slightly, no difference was observed in the conclusion of our reported findings.

Table 5 includes odds ratio estimates for the association of youth SSS and BMI reduction following the HeLP. Youth SSS was not associated with change in child BMI relative to the 95th percentile or BMI z-score during the weight loss intervention.

Discussion

We characterized sociodemographic factors that inform the construct of SSS and assessed the extent to which youth SSS predicts weight loss following participation in a family- and community-based pediatric weight loss intervention. In our cohort of low-income, primarily Hispanic youth with overweight/obesity (OW/OB), we observed that parental perception of their position on the social ladder in society was related to their child's perception of their family rank in the societal milieu. In both parents and children, the association between household income and SSS was moderated by food insecurity, indicating that lower household income was more strongly associated with lower SSS among families with food insecurity. Contrary to our hypothesis, youth SSS was not predictive of child weight loss outcomes, perhaps because of the intervention's heavy focus on skill-building to ameliorate food insecurity.

The adult participants consisted of low-income, primarily Hispanic parents of youth with OW/OB who participated in the intervention. Additionally, almost 90% of parents had OW/OB. The average parent SSS was 4.6 and 5.1 in relation to society and their community, respectively, lower than non-Hispanic white women (SSS mean=6.8) and African American adults (societal SSS=6.2 and community SSS =7.6) in other studies.[29, 32] Differences in SSS by race have previously been reported[17], but our sample was consistent with another study of low-income Hispanic adults who appear to report the lowest perceived social rank among racial/ethnic groups in the United States.[14]

In our low-SES adult cohort, parents' view of themselves in society was only significantly correlated with maternal education, whereas parents' view of themselves within their community was significantly correlated with monthly income and maternal education, but not food insecurity. In adjusted models, however, household income was not associated with SSS (either society or community among participants who did not report being food insecure). This is congruent with findings from other adult populations.[29, 33] The use of services including food banks, WIC, and food stamps/SNAP-ED was also not predictive of parent SSS (data not shown). However, SSS was positively associated with maternal education such that SSS was higher among those with a college degree compared to those with a high school education or less. The association between household income and parent SSS in society was moderated by food insecurity, such that lower household income was more strongly associated with lower reported parental SSS in society among families with food insecurity. A previous study in socioeconomically diverse non-Hispanic black and white adults demonstrated that SSS was associated with traditional measures of SES (i.e. income and education), but that only men (but not women) perceived employment status as important in defining their position in the social hierarchy.[17] Several psychosocial variables including self-rated health, neighborhood satisfaction, and depressive symptomology have also been related to adult SSS[17], but we are not aware of any studies that have considered the relationship of food insecurity or services utilized (i.e. food banks, WIC, and food stamps/SNAP-ED). Additionally, we are not aware of any studies characterizing predictors of the SSS construct among low-income, Hispanic adults. Our data suggests that among low-income Hispanic adults whose children have OW/OB, low levels of education and the experience of both poverty and food insecurity can negatively impact SSS.

Our child cohort in the HeLP intervention was comprised of low-income, primarily Hispanic youth with OW/OB (80.9%) who were referred by their primary care provider. In youth, the mean society SSS was 5.8 and the mean school SSS was 6.8, which is consistent with previous research in youth[4, 6], but higher than what their parents reported. Higher scores in the children relative to their parents may be because subjective measures of social status have the ability to account for perceived prospects for social mobility.[10–12] Thus, though these children lived in low-income households, they may have perceived themselves to be on a different trajectory than parents. Regardless, in both correlational models and adjusted models, youth society SSS was positively related to parent society SSS, such that parents who reported a higher society SSS were more likely to have a child who reported a higher society SSS. This may be due to the wording of the youth society SSS question, which asks children to choose the ladder rung that best represents their *family's* place in American society, not their own as the school SSS does. Thus, the children were likely reporting on their perception of their collective family's social standing, but may not have internalized this as their own personal social standing. This hypothesis is supported by our findings that youth school SSS was not significantly associated with parent society or community SSS, nor was it related to any measure of SES alone, including income, education, food insecurity, or services the family utilized (i.e. food banks, WIC, and food stamps/SNAP-ED; data not shown). This differs from previous research in non-Hispanic black and white adolescents, which observed statistically significant, yet weak, correlations between youth SSS and parent socioeconomic factors.[4] This may be due to differences in

the low-income status of our cohort or a difference due to race/ethnicity, as previous reports indicate differences in how SSS is determined by race.[17] However, consistent with this relationship in parents, we observed an association between household income and youth society SSS that was moderated by food insecurity. This suggests that food insecurity has important effects on the SSS of youth in the lowest income households.

SSS has been associated with weight status cross-sectionally[4] and longitudinally[6] in non-Hispanic black and white youth. Additionally, when compared with SES, SSS is a stronger predictor of weight status in non-Hispanic black and white youth[4, 6], however, this relationship has not been assessed in Hispanics. The examination of the relationship between SSS and weight loss following an intervention is reasonable, as internalization of low perceived social status may be a stressor that negatively alters health-related behaviors[25], such as eating and physical activity[26], which can hinder a person's ability to lose weight during a weight loss intervention. In fact, recent work from our research group demonstrated Hispanic young adults experimentally randomized to a scenario simulating a low social status position consumed 130 additional calories at one meal and showed a significant increase in percent of daily calorie needs and saturated fat consumed.[34] This relationship has been confirmed in other populations as well[35, 36], suggesting that low SSS may impact eating behavior. Contrary to our hypothesis, we did not see a significant relationship between youth SSS variables and changes in child BMI percentile or child BMI z-score. This may be for a variety of reasons including: (1) we did not have the power to detect such changes with a sample size of 110, (2) SSS has no bearing on a person's desire or physiological capacity to lose weight, or (3) the intervention provided skills to overcome food insecurity and social support for lifestyle change among those with low baseline SSS and SES. In order to target health disparities, weight management programs should seek effectiveness among low SSS/SES populations. However, widely disseminated childhood obesity programs have shown significantly worse outcomes among lower SES participants. [37, 38] If the association between obesity and SSS is causal, our results suggest that the relationship may be explained more by the role of SSS in weight gain rather than its role in prevention of effective treatment. Further research is needed to investigate the extent to which SSS plays a role in weight loss, especially in populations facing obesity-related health disparities.

Our study has limitations which must be considered. Our cohort was comprised of low-income, primarily Hispanic families participating in a family- and community-based pediatric weight loss intervention, so the population was biased by treatment-seeking. Additionally, the findings from this study may not be generalizable to other racial/ethnic or sociodemographic populations. Although we accounted for traditional measures of SES (income, education), measures related to SES (food insecurity, use of food banks, WIC, and food stamps/SNAP-ED), and parental SSS in our various models, there are a variety of psychosocial influences that significantly predict adult SSS that we did not assess.[17] These include depressive symptomology, neighborhood dissatisfaction, and self-rated health.[17] Further research should examine the extent to which additional psychosocial variables influence SSS in youth.

This study has important implications. Traditional measures of SES have been used pervasively for studying health disparities over the life course, but methodological shortcomings in the use of traditional SES measures in youth are important to note.[3–8] Youth may not be privy to information regarding parental or household income and may not accurately report parental education or occupation. Additionally, traditional SES fails to capture the child's own perceived future trajectories and opportunities.[9] Thus, we encourage researchers to capture both measures of SES and SSS whenever possible. Given the easily obtained single ladder questions that can reflect both family and youth SSS, it is highly feasible to include in future research.

Our study demonstrated that a parent's perception of their position on the societal social ladder was associated with the child's perception of their family's position on the social rank ladder. Additionally, in both parents and children, the association between household income and SSS was moderated by food insecurity, suggesting that food insecurity is an important influence on perceived social status. Youth SSS was not predictive of child BMI outcomes among low-income Hispanic youth participating in this weight loss intervention.

Acknowledgements

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Study Importance Questions

What is already known about this subject?

- Subjective social status (SSS), a measure of one's perceived relative social standing and internalization of subordinate status, may be a better measure for exploring social standing in adolescents than objective measures of socioeconomic status (SES).

- In adults, the factors that predict SSS include traditional measures of SES (i.e. education, income, and occupation) and psychosocial variables including depression, neighborhood satisfaction, and self-rated health. Characterization of the factors that influence the construct of SSS in youth is needed.

- SSS has also been associated with weight status cross-sectionally and longitudinally in non-Hispanic black and white youth.

What does your study add?

- Youth SSS was positively associated with parent SSS, suggesting that parents' perceptions of their social standing may influence their child's perception of their social standing.

- In both parents and children, the association between income and SSS was modified by food insecurity, suggesting that food insecurity shapes the contribution of socioeconomic factors to one's perceived social status.

- Youth SSS was not predictive of youth weight loss among low-income Hispanic youth in this family-based weight management program.

Table 1.

Characteristics of Parents and Children Enrolled in the Healthy Living Program, Mean (SD) or percentages

	Total Sample N=110	By Child Sex			By Child Race		
		Girls N=44	Boys N=66	p-value	White N=22	Other N=88	p-value
Demographics							
Child age in years	12.6 (1.8)	12.7 (2.0)	12.5 (1.7)	0.5001	12.8 (2.1)	12.5 (1.7)	0.4845
Child sex (% Female)	40%				45.4%	38.6%	0.5593
Child ethnicity (% Hispanic)	96.6%	95.4%	96.9%	0.9999	81.8%	100%	**0.0014**
Objective Socioeconomic factors							
Maternal Education (%)				0.6098			0.7197
<= 8th Grade	17.9%	23.8%	14.1%		9.1%	20.2%	
< High School	23.6%	23.8%	23.4%		31.8%	21.4%	
High School	28.3%	26.2%	29.7%		22.7%	29.8%	
College	30.2%	26.2%	32.8%		36.4%	28.6%	
Household Income (%)				0.4357			0.9351
under $1962 per month	59.8%	52.8%	64.2%		11 (61.1%)	44 (59.5%)	
between $1962–2943 per month	32.6%	36.1%	30.4%		6 (33.3%)	24 (32.4%)	
over $2943 per month	7.6%	11.1%	5.4%		1 (5.6%)	6 (8.1%)	
Subjective Social Status (SSS)							
Parental SSS, Society	4.6 (1.7)	4.5 (1.7)	4.6 (1.8)	0.8392	4.5 (1.3)	4.6 (1.8)	0.8751
Parental SSS, Community	5.1 (1.9)	5.0 (1.7)	5.1 (2.0)	0.7191	5.2 (1.7)	5.0 (1.9)	0.8096
Youth SSS, Society	5.8 (1.9)	5.8 (1.7)	5.8 (2.0)	0.9949	5.9 (2.0)	5.7 (1.9)	0.7906
Youth, SSS, School	6.8 (2.1)	7.0 (2.1)	6.7 (2.2)	0.6300	5.8 (2.8)	7.0 (2.0)	0.1011
Food Insecurity	66.4%	54.6%	74.2%	**0.0322**	72.7%	64.8%	0.4800
Use of Services							
WIC Program	17.3%	13.6%	19.7%	0.4101	9.1%	19.3%	0.3534
Food Stamps/SNAP-ED	29.1%	27.3%	30.3%	0.7317	22.7%	30.7%	0.4625
Food Banks	8.2%	13.6%	4.6%	0.1523	9.1%	8.0%	0.9999
Parent Weight Status							
Female BMI Classification, N=101				0.5398			0.1795
%Healthy Weight	12.2%	15.2%	10.2%		23.5%	9.2%	
%Overweight	26.8%	33.3%	22.4%		17.7%	29.2%	
%Class 1 Obesity	30.5%	24.2%	34.7%		17.7%	33.9%	
%Class 2 or 3 Obesity	30.5%	27.3%	32.7%		41.1%	27.7%	
Male BMI Classification, N=9				0.9999			0.4444
%Healthy Weight	--	--	--		--	--	
%Overweight	44.4%	50%	40%		0%	57.1%	
% Class 1 Obesity	55.6%	50%	60%		100%	42.9%	
%Class 2 or 3 Obesity	--	--	--		--	--	
Child Weight Status							
Child BMI z-score	1.7 (0.8)	1.6 (0.8)	1.7 (0.8)	0.3300	1.5 (1.1)	1.7 (1.5)	0.3086
Child BMI percentile-for-sex-and-age				0.0830			0.5015
%5th-<85th Normal Weight	19.1%	22.7%	16.7%		27.3%	17.1%	

	Total Sample N=110	By Child Sex			By Child Race		
		Girls N=44	Boys N=66	p-value	White N=22	Other N=88	p-value
%85th-<95th Overweight	17.3%	25.0%	12.1%		13.6%	18.2%	
%95th-99th Obesity	50.9%	36.4%	60.6%		40.9%	53.4%	
%>99th Severe Obesity	12.7%	15.9%	10.6%		18.2%	11.3%	

Mean and standard deviation or percentages are presented. Two-sample *t*-tests were used to compare the mean differences between comparison groups. Categorical variables (e.g. maternal education) were summarized as count and percent and Chi-Square test was conducted for comparison between sex and race. Significance of P-value<0.05 is shown in bold.

Table 2.

Weight Changes from Baseline to Week 6 among Youth participating in the Healthy Living Program Intervention

	Pre (Week 1)	Post (Week 6)	Mean Difference	P-value
Total Sample (n=110)				
BMI	26.83 (5.3)	26.77 (5.3)	−0.08	0.7220
BMI Percent of 95th Percentile	107.45 (20.8)	106.47 (20.6)	−0.82	0.4210
Youth with Overweight and Obesity (n=89)				
BMI	28.34 (4.4)	28.03 (4.8)	−0.30	0.1067
BMI Percent of 95th Percentile	113.64 (16.7)	11.68 (17.9)	−1.75	**0.0271**

Mean and standard deviation are presented. Significance of P-value<0.05 is shown in bold.

Table 3.

Spearman Correlation Coefficients among Variables of Subjective Social Status, Socioeconomic Status, and Food Insecurity

	Child SSS Society	Child SSS School	Parent SSS Society	Parent SSS Community	Monthly Income	Maternal Education	Food Insecurity
Child SSS Society	-						
Child SSS School	0.31	-					
	0.0023						
Parent SSS Society	0.35	0.11	-				
	0.0006	0.2800					
Parent SSS Community	0.47	0.17	0.73	-			
	<.0001	0.0962	**<0.0001**				
Monthly Income	0.30	0.26	0.20	0.30	-		
	0.0057	**0.0190**	0.0691	**0.0056**			
Maternal Education	0.17	0.05	0.28	0.38	0.20	-	
	0.0927	0.6426	**0.0041**	**0.0001**	0.0628		
Food Insecurity	−0.18	−0.18	−0.02	−0.13	−0.23	0.20	-
	0.0732	0.0793	0.8275	0.1805	**0.0252**	**0.0448**	

Significance of P-value<0.05 is shown in bold.

Table 4.

Multiple Linear Regression results for the association of Youth Subjective Social Status (SSS) with Parent SSS (Model 1) and Youth SSS with Socioeconomic Status and Food Insecurity (Model 2)

Total Sample (n=110)	Youth Society SSS		Youth School SSS		Parent Society SSS		Parent Community SSS	
Independent Variables	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value	β (SE)	P-value
Model 1[*]								
Parent Society SSS	0.49 (0.15)	**0.0014**	0.20 (0.18)	0.2762	-	-	-	-
Parent Community SSS	0.01 (0.14)	0.9569	0.01 (0.14)	0.9334	-	-	-	-
Model 2[**]								
Monthly Income <$1962	0.46 (0.78)	0.5619	−.033 (0.87)	0.7088	0.66 (0.63)	0.2987	0.31 (0.74)	0.6747
Maternal education, less than 8th grade	−0.75 (0.61)	0.2222	−0.41 (0.68)	0.5521	−1.48 (0.49)	**0.0032**	−1.24 (0.58)	**0.0350**
Food Insecurity	0.35 (0.62)	0.5807	−0.75 (0.69)	0.2818	−0.04 (0.53)	0.9441	0.24 (0.62)	0.7016
Monthly Income <$1962 and Food Insecurity	−2.05 (0.94)	**0.0327**	−0.53 (1.05)	0.6143	−1.73 (0.77)	**0.0286**	−1.13 (0.90)	0.2163

[*] Multiple Linear Regression model included independent variables, Parent Community SSS and Parent Society SSS

[**] Multiple Linear Regression model included independent variables, monthly income <$1962, maternal education, food insecurity, and an interaction between monthly income <$1962 and food insecurity

Significance of P-value<0.05 is shown in bold.

Table 5.

Odds Ratio Estimates for the association of Baseline Youth Subjective Social Status (SSS) and Weight Loss Outcomes Following the Healthy Living Program Intervention[*]

Total Sample (N=110)	Change in Child BMI Percent of 95th Percentile			Child BMI Z-score Change		
Independent Variables	Point Estimate	95% CI	P-value	Point Estimate	95% CI	P-value
Youth Society SSS	1.28	0.90–1.8	0.1680	1.35	0.93–1.95	0.1101
Youth School SSS	1.09	0.84–1.40	0.5343	1.11	0.86–1.44	0.4363

[*] Multiple logistic regression models were employed to model the association between weight change and SSS scores while adjusting for child age and sex.