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Community-level Obesity Prevention is Not Associated with Dieting Behaviors and Weight Dissatisfaction in Children: The Healthy Communities Study

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Abstract

Background.—Within the context of high childhood obesity prevalence, there is concern that community efforts intended to reduce childhood obesity may lead to unintended adverse outcomes.

Objective.—This analysis examined relationships between community programs, policies and environmental changes (CPPs) for obesity prevention with unhealthy dieting behaviors and body weight satisfaction in children.

Methods.—Using the Healthy Communities Study 2013 to 2015 survey sample of 5,138 U.S. children aged 4 to 15 years old , multi-level models examined associations between standardized CPP intensity scores and child dieting behaviors and weight satisfaction, adjusting for community and child-level covariates and clustered study design.

Results.—In fully adjusted models, higher total, physical activity, and nutrition CPP intensity scores were associated with lower odds of dissatisfaction with weight (1 year total CPP OR: 0.41, 95% CI 0.22, 0.73; 6 year total CPP OR: 0.48, 0.29, 0.80). Higher physical activity CPP intensity over the past year was associated with greater odds of weight satisfaction (OR: 1.77, 95% CI: 1.10, 2.84). No associations were observed with dieting behaviors.

Conclusions.—Results suggest that community efforts focusing on nutrition and physical activity to prevent childhood obesity may be associated with weight satisfaction and not with unhealthy dieting behaviors.

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Keywords

weight; obesity; community; programs; policies; children

Childhood obesity is a public health concern given the high prevalence [1] and adverse physical and psychosocial outcomes associated with both obesity and weight stigma [2]. In response, a variety of community programs, policies and environmental changes (CPPs) have been implemented to promote healthy eating and physical activity behaviors in children [3]. Evidence suggests that health education messages which focus on obesity and weight-control, as opposed to those which focus on promoting a healthy lifestyle, can reduce a child's self-esteem and lead to poor body image [4,5]. Weight-based discrimination has increased in recent years [6] and has been associated with unhealthy dieting behaviors and body dissatisfaction [7]. Some obesity prevention efforts could therefore inadvertently increase adverse outcomes [8,9].

Few investigations, however, have assessed whether efforts intended to prevent obesity also cause harms [8,10]. In a comprehensive review of child obesity prevention interventions, only eight of 55 studies assessed outcomes such as unhealthy dieting behaviors, weight-based teasing, or body image [11]. In a 12-week pilot program targeting physical activity and healthy eating to either 8–10 year old African American girls or their parents (n=60), Beech et al. [12] found a significant decrease in concern about weight in the girls in the intervention compared to the control group. In none of the other seven trials were significant effects on adverse outcomes detected.

Previously it has been shown in the national Healthy Communities Study (HCS) that more intense CPPs implemented over 10 years to support healthy eating and physical activity, and prevent obesity were associated with lower child BMI; an average BMI difference of −1.4 kg/m^2 was observed between communities with the highest versus lowest intensity of CPPs [13]. The purpose of this paper is to build upon this finding by examining associations between CPP intensity with harmful dieting behaviors and body satisfaction in children in the HCS. Based on the literature [11], we hypothesized the CPP intensity would not be associated with unintended harms.

Methods

Study design.

The NIH funded the HCS to examine how characteristics of CPPs were associated with childhood obesity-related factors [14,15]. This observational study was of mixed design, collecting cross-sectional data on diet and physical activity from children between 2013 and 2015, and retrospective data from the prior ten years on CPPs and child BMI. Communities were selected using a hybrid method that combined stratified national probability-based sampling with inclusion of additional communities known to be engaged in obesity prevention. The 130 communities selected represent a range of community sizes and geographic regions across the U.S. [16].

To identify eligible children, up to four public elementary and middle schools were selected in each community. Approximately 40 children 4–15 years old in each community, restricted to one child per family, were recruited through the selected schools. A stratified random selection process, maintaining balance of sex, grade, and race/ethnicity for each community, resulted in a total sample of 5,138 children. Institutionalized or non-ambulatory children and children residing in the community for less than one year were excluded. Parents provided written informed consent. The HCS was approved by the U.S. Office of Management and Budget and the Battelle Memorial Institute IRB. In addition, an Observational Study Monitoring Board provided oversight on participant burden, safety, and study progress.

Community programs, policies and environmental change.

CPPs were defined as programs (e.g., cooking classes at an afterschool program), policies (e.g., PE requirements adopted by a school district), or other environmental changes (e.g., new park) related to nutrition, physical activity, or childhood obesity prevention targeting or benefiting 4–15 year olds in the defined community during the prior 10 years [17,18]. CPP scores for each community were based upon data obtained from key informant interviews. Key informants were identified through web-based searches using program descriptors, types of organizations, and geographic terms [15]. Those with stated knowledge of CPPs were recruited from targeted sectors including schools, health organizations/coalitions, government, and non-profit organizations. Key informants were also asked to identify others knowledgeable about CPPs; using this snowball technique a total of 10–14 informants per community were interviewed. Interviews were conducted by trained field staff using a semi-structured script. Data obtained directly from key informants were augmented by review of reports and written policies provided by key informants.

To compare communities instituting different efforts over varied periods of time, all documented CPPs were scored using a common rubric. To ensure coding quality, a sample of 10% of CPPs was randomly selected and independently coded by a second researcher. The level of interobserver agreement was above 87% across all CPP variables. The intensity of CPPs was conceptualized based on prior community measurement methods [19] to reflect three characteristics: a) behavioral intervention strategy (e.g., impacting the environment weighted higher than providing information); b) duration (e.g., an ongoing effort weighted higher than a one-time event); and c) reach (e.g., reaching 20% or more of the population rated higher than one reaching 5% or less) (Table 1). To derive CPP intensity scores, yearly scores were summed and then scores were standardized from 0 (lowest intensity) to 1 (highest intensity) [17]. CPP intensity scores were generated for the prior one, three, six and ten year periods. Because associations between CPP intensity and measures of unintended harms were similar over time, only the prior one and six years are presented.

In addition to assessments of total CPPs, categories of CPPs were identified depending on whether they addressed physical activity or nutrition behaviors. CPPs that addressed both nutrition and physical activity were included in both categories. Whether body weight management or weight-based stigma were directly addressed by CPPs was not documented.

Physical activity CPPs targeted at least one of 13 activity-related behaviors [20]. Physical activity CPPs included those designed to increase: walking or biking to or from school;

frequency and duration of physical education; moderate to vigorous physical activity in physical education; physical activity during school recess or classroom instruction; participation in school sports teams; participation in community-based sports teams; participation in community-based physical activity lessons, classes or clubs; participation in home/family physical activity; and/or physical activity in afterschool programs. Also included CPPs were designed to decrease: television watching; recreational computer/internet use; time spent playing physically unengaging electronic games; and/or CPPs that targeted any other activity-related behavior.

Nutrition CPPs targeted at least one of 11 nutrition-related behaviors designed to increase: consumption of fruit and vegetables; consumption of whole grain foods such as breads, rice, pasta, cereals; eating breakfast; consumption of water; and/or breastfeeding/improved infant health [21]. They also included CPPs designed to decrease: consumption of sugar sweetened beverages; consumption of fast food; consumption of fat; consumption of high calorie snacks, desserts, sweets, and candy; calories from all food; and/or CPPs that targeted any other nutrition-related behavior.

The HCS identified a total of 9,459 CPPs for the past six years in the 130 study communities. Of these, 2,546 (27%) addressed only nutrition, 5,433 (57%) addressed only physical activity, and 1,480 (15%) addressed both. Mean intensity scores over the prior one and six years for total, physical activity, and nutrition CPPs ranged from 0.30 to 0.38 on the standardized 0 to 1 scale (Table 2).

Unintended harms.

Five measures of potential harms were included based on input from an HCS subcommittee of approximately 20 nutrition experts as well as the HCS Observational Study Monitoring Board. Dieting behaviors and body image questions were derived from the CDC Youth Risk Behavior Surveillance Questionnaire, the Minnesota Adolescent Health Survey, and the Project Eat-I Survey [21]. All questions were age-appropriate, and were administered at one point in time in the child's home. For children aged 4–8 years, a parent/adult served as proxy respondent, with child assistance; children aged 9–11 years were their own respondent, with parent/adult assistance, and children 12 years or older were their own respondent, with parent/adult assistance if needed.

The five child measures were separately examined as dichotomous variables as follows:

1) **Trying to lose weight**: 12–15 year olds only were asked a question from the Centers for Disease Control and Prevention (CDC) Youth Risk Behavior Surveillance Survey about what he/she was currently trying to do about his/her weight [22]. Answer options included lose, gain, stay the same, or not doing anything. Trying to lose weight was considered adverse; although weight loss may be an appropriate goal for some children, it is not preferable for most growing children [23].

2) **Skipping meals to lose weight:** 12–15 year olds only were asked about the number of days in the past week that meals were skipped in order to manage weight using a question

from the Project Eat-I Survey [24]. Responses were converted to skipped at least one day per week vs. no skipped meals.

3) **Weight-based teasing**: 12–15 year olds only were asked how many times in the past year someone said something about weight or eating that made them feel badly, based on a question from the Project Eat-I Survey [25]. Responses were converted to at least a few times a month in the past year vs a few times per year or less.

4) **Satisfied with weight**: All ages were asked a question from the Project Eat-I Survey [24] using a 1 to 5 response scale from very satisfied to not at all satisfied. Responses of 1 or 2 were counted as being satisfied with weight.

5) **Dissatisfied with weight**: Responses of 4 or 5 from the above question were counted as being dissatisfied with weight.

Covariates.

Both child-level and community-level covariates were included in the models to control for potential confounding. Child covariates included child sex (male [ref]), age, race/ethnicity (white, not Hispanic [ref]), BMI category (BMI < 85th percentile for age and sex [ref]), household income ($100,000 [ref]), maximum biological parental education (graduate degree [ref]), and employment status (full time [ref]). Child sex was collected during study enrollment by research staff. All other child-level variables were collected during the household interview. Each interview was conducted by trained data collectors using a hand-held tablet and took approximately half an hour. Heights and weights also were measured by trained data collectors and BMI category was based on CDC growth chart percentiles for age and sex: BMI below the 85th percentile, at or above the 85th percentile and below the 95th percentile, and above the 95th percentile [26,27]. BMI Z-score was explored as a covariate instead of BMI category but results did not change and are therefore not shown.

Community-level covariates were comprised of estimates from the 2009–2013 5-year American Community Survey. The percent of each census tract that fell within the community catchment area was used to area-weight community-level variables [16]. Community-level variables included: U.S. region (Midwest, Northeast, South, and West [ref]), minority tract (at least 30% African American, at least 30% Hispanic, or not a minority tract [ref]), urbanicity (rural [ref], suburban, urban based on USDA Rural-Urban Commuting Area classifications), proportion of population unemployed, and proportion of population living below the federal poverty level.

Statistical analysis.

To account for missing data, 20 iterations of multivariate imputation by chained equations was used [28]. A three-level generalized linear mixed model with binomial distribution and logit link was used to estimate odds ratios (OR) and 95% confidence intervals (CI) for the association between CPP intensity scores over the past one or six years with current dieting behaviors and weight satisfaction. Models accounted for correlation of children nested within schools nested within communities, as well as for child-level and community-level covariates using least absolute shrinkage and selection operator techniques [29]. P-values

less than 0.05 were considered statistically significant, unadjusted for multiple comparisons. Data were analyzed using SAS version 9.4 (SAS Institute Inc. Cary, NC, 2013) and R version 3.3.0 (R Development Core Team, 2016).

Models were adjusted for child-level and community-level covariates and seasonality of interview. Age was included in the model either as a continuous variable of age in years, or as a vector of age plus age squared, when determination by Wald test indicated a non-linear expression of age better fit the data. In addition we explored including interaction terms of the main exposure with sex and race/ethnicity, but statistical power was insufficient to provide meaningful estimates. Our final analysis consisted of 30 multivariate models without interaction terms: one model for each combination of the 5 outcomes with each of the 3 varieties of CPP scores (physical, nutrition, and total), repeated for both the 1 year and 6 year periods.

Results

Sample characteristics.

Child age and sex were evenly distributed with one third 4–6 years old, one third 8–10 years old, and one third 11–15 years old (Table 3). The sample was relatively racially and ethnically diverse, with slightly over 20% African American and almost 45% Hispanic. Over one quarter of children were from households with annual incomes less than $20,000, and almost half of households had a maximum parent education level of high school or less. The majority of children (73%) had at least one parent with full-time employment. One-quarter of children had a BMI $\geq 95^{th}$ percentile; nearly one-sixth were $<95^{th}$ but $\geq 85^{th}$ percentile.

The largest proportion (42%) of study communities was located in the Southern U.S. Communities from the other three regions (Midwest, Northeast, and West) ranged from 15% to 22%. Most children lived in urban (38%) or suburban (39%) areas as opposed to rural areas (23%).

Unintended harms.

At the time of the household interview, of the 1,303 children 12–15 years, 46% reported currently trying to lose weight (Table 3). Nearly 21% of children 12–15 years reported skipping at least one meal one or more days per week in order to lose weight, and 15% reported being teased about weight a minimum of a few times per month in the prior year. About 61% of all 5,138 children ages 4–15 years indicated (with parents reporting for children 4–8 years) that they were satisfied with their weight, while 21% reported being dissatisfied.

Table 4 presents the odds ratios (OR) and 95% confidence intervals (CI) for current dieting behaviors and weight satisfaction in relation to CPP intensity scores for the prior one and six years. After adjusting for covariates, the odds of a child being dissatisfied with weight from a community with the highest CPP intensity total score was approximately half that of a child from a community with the lowest CPP intensity total score (Year 1: OR: 0.41, 95% CI: 0.22–0.73; Year 6: OR: 0.48, 95% CI: 0.29–0.80). ORs were significant for total, physical activity, and nutrition CPPs implemented over the prior one and six years.

Additionally, the odds of a child being satisfied with weight was 77% higher for a child in a community with the highest prior one-year physical activity CPP intensity score, compared to a child in a community with the lowest one-year score (OR 1.77, 95% CI 1.10–2.84) after adjusting for covariates. Though the estimates from the same model for total and nutrition CPP intensity scores were not significant, they also showed increased odds of child satisfaction with weight for those with the highest compared to the lowest CPP scores (total OR 1.71, 95% CI 1.00–2.91; nutrition OR 1.23, 95% CI 0.78–1.94). No statistically significant relationships were observed between CPP intensity scores and trying to lose weight, experiencing weight-based teasing, and skipping meals to lose weight.

Discussion

By examining potential unintended harms, this paper builds upon prior results reported from the HCS that more intense community efforts to address child obesity were related to lower child BMI [13]. Findings suggest that in communities more intensely engaged in efforts to improve child weight, weight satisfaction was higher (less dissatisfaction and more satisfaction). Consistent with our hypothesis based on the few prior obesity prevention trials that have evaluated potential unintended consequences [11], we did not detect any associations between community efforts and dieting behaviors (skipping meals to lose weight and trying to lose weight) or weight-based teasing.

While there is little debate regarding the importance of reducing the prevalence of obesity in U.S. children, it is equally important to take a holistic approach to ensure overall child health [4]. Dieting, body dissatisfaction and weight-based teasing are shared risk factors for disordered eating, depressive symptoms and risk of becoming overweight [7,8,30]. In contrast, higher body satisfaction, even among overweight adolescents, has been associated with improved long-term weight outcomes [31]. Therefore, to effectively reduce childhood obesity and avoid other harmful consequences, interventions should be implemented that consider these important shared risk and protective factors for physical and mental health.

Few studies have evaluated potential unintended consequences of attempting to change children’s diet and physical activity behavior [10,11]. To our knowledge, the present study is the first to examine potential harms of naturalistic community-based obesity prevention efforts implemented over multiple years by a diverse sample of U.S. communities. We believe we are also the first to find higher body satisfaction in relation to the intensity of such efforts. Our study differs from prior studies, however, in that we assessed overall community efforts in an observational study design rather than focusing on the change in outcomes as a result of a specific intervention.

Some of the potential protective relationships of physical activity CPPs may be due to the greater number of physical activity related CPPs (73%) compared to nutrition CPPs (42%) documented in the HCS. Physical activity also has been found to be associated with improved body image and self-esteem among children [32]. A useful line of inquiry for determining more effective interventions for improving dieting behaviors and weight satisfaction would be to compare interventions that focus on improving physical activity versus improving dietary behaviors.

As CCP intensity scores amalgamate the distinct characteristics related to type of behavioral intervention strategy, duration, and reach into a single measure, it is not clear if one of these may be a particular driving factor in relationships with outcomes. Based on prior experience with community measurement, this score was developed to estimate the 'dose' of interventions delivered in each community [17]. Investigation into the contributions of individual components relative to each other may be of value for guiding future design of community-based obesity prevention efforts.

Although we did not detect that community efforts to address child obesity were related to harms, the prevalence of dieting behaviors was relatively high: 45.7% of 12–15 year olds reported currently trying to lose weight. A similar percentage of high school students (47.1%) reported trying to lose weight in the national 2017 Youth Risk Behavior Surveillance survey [33], whereas this was reported by only 33% of 12–15 year olds from the 2005–2011 National Health and Nutrition Examination Survey (NHANES) [34]. Differences between studies may be due to secular increases in weight loss attempts as the rates of childhood obesity have increased [33]. Interestingly, in the NHANES study, a larger proportion of youth (33%) reported skipping meals sometimes or a lot to lose weight [34], compared to 21% of the HCS sample who reported skipping one or more meals per week. It is unclear to what extent this difference may be due to differences in survey questions.

In the HCS sample, 15% of children 12–15 years old reported experiencing weight-based teasing at least a few times per month in the past year, compared to 37% of males and 45% of females reporting *ever* being teased about their weight in a study of nearly 2000 adolescents from the Minneapolis-St. Paul metropolitan area in 1998–1999 [7]. The greater prevalence of teasing in the Minnesota study may be due to the use of different questions, a slightly older sample, and/or secular declines in teasing based on weight [35]. In the HCS sample of 4–15 year olds, 61% were satisfied with their weight while 21% were dissatisfied. In comparison, in the national Growing Up Today Study, body dissatisfaction using a slightly different question and response options ranged from 14.7% for 9–10 year olds to 31.9% for 15–16 year olds [36]. Body weight perception, as assessed in the NHANES by participant responses to the question 'how do you consider your weight' with response options being 'overweight or fat', 'too thin', and 'about the right weight', is another comparison [37]. In a NHANES sample of 12–19 year olds, approximately 25.9% of boys and 32.1% of girls responded as 'overweight or fat' or 'too thin' [38]. Additional studies are warranted to determine if there are trends in unhealthy (e.g., skipping meals) compared to healthy (e.g., eating less sweets) approaches to weight management and in dissatisfaction with weight among children.

HCS results should be interpreted with several cautionary limitations. As this study is observational and cross-sectional with assessments of dieting behaviors and body satisfaction at a single point in time, we cannot infer the direction of the relationship nor causality. None of the estimates for measures collected solely in 12–15 year old children (trying to lose weight, teased about weight, and skipping meals to lose weight) were significantly related to CPP intensity. As children in the 12–15 age range tend to be more susceptible to unhealthy dieting behaviors and weight dissatisfaction compared to younger children, one would expect it would be in this age group that we would detect relationships

with potential harms. Though this sub-sample is relatively large at 1303 children, it is approximately one-fourth of the full sample size for which the study was originally designed, reducing statistical power. Both the CPP and dieting/weight satisfaction measures were generated by self-report. Thus, bias may exist due to reporting and recall error. For example, children can be hesitant to admit to being teased about weight, and some findings have indicated reduced reporting by children if queried by a single definition-based measure as used in the HCS, instead of a behavior-based multi-response measure [7]. CPP characterization, mainly reliant on reporting by a small selection of community key informants, may not adequately reflect all CPPs and while information was captured on a broad range of nutrition and physical activity CPPs, some details (e.g., type of dietary fat addressed) were not included. Further, data were not collected on whether CPPs involved discussions about weight or weight stigma, or whether they focused on healthy lifestyle behaviors without directly addressing weight. Puhl et al. [39] reported that adolescents prefer more neutral terms such as ‘weight and ‘BMI’ when discussing body weight, than words like ‘fat’, ‘large’ or ‘obese’. Future studies should assess how community efforts discuss weight and whether such discussions have differential impacts on child outcomes. Finally, though a large and diverse national sample of children comprised the study population, results may not be generalizable to all populations of U.S. children. Although we did not observe any interactions by race/ethnicity, and sex, examining differences by subgroups is also of interest in future studies as dieting behaviors and body image have been found to differ by such characteristics [40].

Despite these limitations, the results of this study add to our understanding of the potential unintended effects that efforts to reduce childhood obesity may have. We find no evidence that community-based efforts to improve child nutrition or physical activity are associated with harms. More studies are needed to better understand the factors that contribute to unhealthy dieting and body dissatisfaction among children.

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Abbreviations:

CPP	community programs, policies, and environmental changes
HCS	Healthy Communities Study
NIH	National Institutes of Health
CDC	Centers for Disease Control and Prevention

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Table 1.

Calculating the Intensity Score for Community Programs and Policies[1].

Characteristic	Scoring Rubric	
Behavioral change strategy	High (1.0)	Modifying policies and systems
		Changing consequences
		Modifying access, opportunities, and barriers
	Medium (0.55)	Enhancing services and support
	Low (0.1)	Providing information and enhancing skills
Duration	High (1.0)	Ongoing throughout the year
	Medium (0.55)	Occurring more than once during the year
	Low (0.1)	One-time event
Reach	High (1.0)	21% or more of the population exposed
	Medium (0.55)	6-20% of the population exposed
	Low (0.1)	≤5% of the population exposed

[1]For each community program and policy, scores for the three characteristics were added together with a score of 1 indicative of the highest intensity [17].

Table 2.

Standardized Community Program and Policy (CPP) intensity scores for the past one year and past six years in the Healthy Communities Study Sample (n=130 communities)

CPP Goal	Standardized Intensity Score	
	Mean	SD
Past 1 year		
Total (n=8838 CPPs)	0.34	0.16
Physical activity (n=6463 CPPs)	0.35	0.18
Nutrition (n=3740 CPPs)	0.38	0.20
Past 6 years		
Total (n=9459 CPPs)	0.36	0.19
Physical activity (n=6912 CPPs)	0.35	0.19
Nutrition (n=4026 CPPs)	0.30	0.18

Table 3.

Child and Community Characteristics of the Healthy Communities Study Sample

Child-level characteristics (n=5138 children)	**Mean**	**SD**
Age (years)	9.3	2.7
Sex	**Percent**	
Female	50.9	
Race		
White only	70.3	
Black only	20.2	
Multiple	4.8	
Other	4.7	
Ethnicity		
Hispanic	44.8	
Annual household income		
Less than $20,000	27.0	
$20,000 – 35,000	24.3	
$35,000 – 50,000	12.6	
$50,000 – 75,000	10.7	
$75,000 – 100,000	7.8	
$100,000 or more	17.6	
Maximum parental education		
Less than high school	22.7	
High school diploma or equivalent	20.0	
Some college or associate degree	25.0	
Bachelor degree	15.4	
Graduate degree	16.9	
Maximum parental employment		
Full-time	72.9	
Part-time	10.1	
Unemployed	6.1	
Other	10.9	
Child BMI percentile for age and sex[1]		
<85th percentile	59.3	
≥85th and <95th percentile	15.9	
≥95th percentile	24.8	
Child dieting behaviors and weight satisfaction		
Child trying to lose weight (age 12 – 15 years only; n=1303 children)	45.7	
Child skipping meals to lose weight[2] (age 12 – 15 years only; n=1303 children)	20.6	
Child teased about weight[3] (age 12 – 15 years only; n=1303 children)	14.6	
Child satisfied with weight[4] (age 4 – 15 years; n=5138 children)	61.1	

Child-level characteristics (n=5138 children)	**Mean**	**SD**
Child dissatisfied with weight[5] (age 4 – 15 years; n=5138 children)	21.2	
Community-level characteristics (n=130 communities)	**Percent**	
U.S. Region		
Midwest	19.3	
Northeast	15.4	
South	41.6	
West	23.8	
Minority tract[6]		
African American	20.6	
Hispanic	39.8	
Urbanicity[7]		
Rural	22.6	
Suburban	39.6	
Urban	37.8	
Socio-demographics[8]	**Mean %**	**SD**
African American	19.7	23.4
Hispanic	34.6	29.6
Below poverty level	20.6	10.6
Unemployed	8.8	3.4

[1] Based on the Centers for Disease Control and Prevention growth charts

[2] Child skipping meals to lose weight defined as child skips 1 or more meals per week.

[3] Child teased about weight defined as teased at least a few times per month.

[4] Child satisfied with weight defined as a response of 1 or 2 on a scale of 1 to 5 with 1 being very satisfied and 5 being not at all satisfied.

[5] Child dissatisfied with weight defined as a response of 1 or 2 on a scale of 1 to 5 with 1 being very dissatisfied and 5 being not at all dissatisfied.

[6] Minority tracts defined as having at least 30% of the community population being African American or Latino.

[7] Urban defined as contiguous, built-up areas containing 50,000+ people based on U.S. Department Agriculture Rural-Urban Commuting area; suburban defined as areas in which 30-49% of the population commutes to Urban Core areas for work; rural defined as population less than 49,999 people and limited commute to Urban Core areas.

[8] Socio-demographics for community catchment areas calculated using estimates form the 2009-2013 5-year American Community Survey.

Table 4.

Odds of child dieting behaviors and weight satisfaction comparing the highest intensity community programs and policies (CPPs) to the lowest intensity CPPs for the past one and six years.[1]

	Past 1 year (n=8838 total CPPs, 6463 physical activity CPPs, 3740 nutrition CPPs)			Past 6 years (n=9459 total CPPs, 6912 physical activity CPPs, 4026 nutrition CPPs)		
	Odds Ratio	**LCL[2]**	**UCL[3]**	**Odds Ratio**	**LCL**	**UCL**
Child trying to lose weight (age 12 – 15 only, n=1303 children)						
Total CPPs	0.49	0.17	1.41	0.46	0.18	1.15
Physical activity CPPs	0.53	0.20	1.39	0.43	0.17	1.07
Nutrition CPPs	0.64	0.26	1.59	0.64	0.23	1.79
Child skipped meals to lose weight (age 12 – 15 only, n=1303 children)						
Total CPPs	0.52	0.18	1.51	0.57	0.22	1.46
Physical activity CPPs	0.48	0.18	1.26	0.48	0.19	1.25
Nutrition CPPs	0.70	0.28	1.76	0.68	0.24	1.93
Child teased about weight (age 12 – 15 only, n=1303 children)						
Total CPPs	1.03	0.31	3.44	0.83	0.29	2.43
Physical activity CPPs	1.48	0.50	4.42	1.10	0.38	3.22
Nutrition CPPs	0.52	0.19	1.47	0.43	0.13	1.41
Child satisfied with weight (n=5138 children)						
Total CPPs	1.71	1.00	2.91	1.42	0.89	2.25
Physical activity CPPs	**1.77**	**1.10**	**2.84**	**1.59**	**1.01**	**2.52**
Nutrition CPPs	1.23	0.78	1.94	1.09	0.65	1.81
Child dissatisfied with weight (n=5138 children)						
Total CPPs	**0.41**	**0.22**	**0.73**	**0.48**	**0.29**	**0.80**
Physical activity CPPs	**0.48**	**0.28**	**0.81**	**0.50**	**0.30**	**0.83**
Nutrition CPPs	**0.48**	**0.29**	**0.79**	**0.50**	**0.28**	**0.87**

Bold signifies statistical significance for 95% confidence interval using multi-level models. Confidence intervals were not adjusted for multiple comparisons. All CPP scores were standardized between 0 (lowest) and 1 (highest).

[1]Model adjusted for the following as well as clustering of participants within schools and communities:

- Child-level variables: race, ethnicity, family income, maximum parental education from both biological mother/father, seasonality of interview (based on sinusoidal curve over time), maximum employment status from both biological mother/father, child BMI category, child age (as polynomial with degrees as follows: 0 for child trying to lose weight, child teased about weight, child satisfied with weight; 1 for child skipped meals to lose weight, child unsatisfied with weight), child sex.
- Community-level variables (weighted combination of census tract information (as community may include >1 tract and/or parts of multiple tracts): U.S. region (Midwest, Northeast, South, West), minority classification (high African American, high Hispanic, or high other), urbanicity (urban, suburban, rural), percent catchment with unemployed adults.

[2]LCL refers to lower confidence level.

[3]UCL refers to upper confidence level.