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ORIGINAL ARTICLE

Use of the Revised Children's Diet Quality Index to assess preschooler's diet quality, its sociodemographic predictors, and its association with body weight status

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Abstract

Objective: To determine the level of overall diet quality, sociodemographic predictors of diet quality, and the association between diet quality and body weight status in a nationally representative sample of preschoolers.

Methods: Cross-sectional study using a sample of 2-5 years old with sociodemographic, dietary, and anthropometric data (n = 1,521) in the National Health and Examination Survey 1999-2002. Overall diet quality was determined using the Revised Children's Diet Quality Index. Sociodemographic predictors (age, sex, sociodemographic, ethnic group, household income, preschool attendance, federal food program participation) of diet quality were determined using multiple linear regression models in the total sample and stratified by household income for Food Stamp eligible (< 1.3 of the poverty income ratio) or Special Supplemental Program for Women, Infants, and Children eligible (poverty income ratio < 1.85). Association between diet quality and prevalence of childhood obesity was assessed with Pearson chi-square tests. Statistical significance was assumed at $p \leq 0.05$. All analysis was conducted using complex survey design routines.

Results: On average, preschooler consumed suboptimal levels of whole grains, fruits, vegetables, and dairy. Overall diet quality decreased with increasing age (beta-coefficient: -2.38, $p < 0.001$) but improved with increasing family income in the full sample (beta-coefficient: 1.22, $p < 0.001$) but not in the low-income subpopulations. Mexican American children had significantly better diet quality than non-Hispanic white children (beta-coefficient: 2.18, $p < 0.033$) especially in the low income group (beta-coefficient: 3.57, $p < 0.006$). Childhood obesity prevalence decreased significantly with increasing diet quality.

Conclusions: Preschooler's diet quality needs to be improved to support the prevention of childhood obesity early in life.

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Introduction

Childhood obesity rates have been increasing dramatically in the past decades in the USA while preschooler's intake of fruits and vegetables decreased.[1] The number of children at risk for overweight (85th-94th percentile on the body mass index-for-age growth charts) or overweight (≥ 95th percentile) has reached epidemic proportions.[2] In addition to the health problems associated with high body weight, overweight children might also be at increased risk to suffer from the metabolic syndrome.[3,4]

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To help prevent childhood obesity, it is of pivotal importance to understand the relationship between modifiable lifestyle factors, such as dietary intake patterns and the development of excessive body weight. Dietary intake levels of some food groups or nutrients have been found to be associated with overall diet quality or body weight status,[5,6] however, there is lack of data indicating a direct association between overall diet quality, measured with a composite diet quality assessment tool specifically designed for children, and body weight status in American preschoolers. In an effort to close this gap, the aims of this study were to determine the level of overall diet quality in American children and to ascertain the sociodemographic predictors of overall diet quality, as well as to examine the association between diet quality and body weight status.

Methods

Sample

The Centers for Disease Control and Prevention (CDC) conducts the National Health and Nutrition Examination Survey (NHANES, http://www.cdc.gov/nchs/nhanes.htm), an ongoing survey using a multistage, stratified area design to obtain a sample of respondents that is representative of the civilian non-institutionalized American population. Certain population groups were over-sampled (e.g. young children, adolescents 12-19 years, African Americans, Mexican Americans, and low-income persons).

Although the data are released in 2-year increments, they were designed to be merged to multi-year data sets.[7] The first 4-year data (NHANES 1999-2002) contains information on 21,004 individuals who provided interview data. Of these, 19,759 individuals also had medical examination data and the sample size for children 2-5 years old who provided sociodemographic, dietary, and body mass index (BMI) data, and who were not breastfeeding was 1,521. To allow the examination of the effect of federal food programs, such as the Food Stamp Program and the Special Supplemental Program for Women, Infants, and Children (WIC), multiple regression models were employed in two income-stratified subpopulations. Thus, linear regression models were developed for the total sample of preschoolers, the children who were income-eligible for the WIC program (poverty income ratio - PIR ≤ 1.85, n = 861) or the Food Stamp Program (PIR < 1.3, n = 676). All samples were nationally representative of the American preschool-age population.

Sociodemographic data

Sociodemographic information, such as age, sex, race, ethnicity, preschool participation, and total household income was reported by the adult completing the household interview during the NHANES survey. Age was used as continuous variable in this study.

Children's race is determined based on the interview responder's categorization as American Indian or Alaskan Native, Asian, black or African American, Native Hawaiian or Pacific Islander, white, or other. In addition, self-reported ethnic background is determined by whether the child is Mexican American, other Hispanic or Latino, both (Mexican and other Hispanic), or not Hispanic. In an effort to capture cultural differences of children living in the USA, the variables were employed to define four mutual exclusive ethnic groups: non-Hispanic white, non-Hispanic black, Mexican Americans, and other.

To estimate the relative income of the households with preschool-age children in the sample, the method suggested by the USA Census Bureau to calculate the PIR was employed.[8] The PIR is an indicator of the total household income in relation to the number of individuals living in the household. Based on annually updated threshold incomes, families' incomes are compared to the threshold. In 2006, for instance, a weighted average threshold for a family of four was US$ 20,614, thus families with a combined income above this value were considered as not living in poverty. [9] Total household income was used in this study to represent individuals eligible for the federal Food Stamp Program (PIR < 1.3), as well as for the WIC (PIR < 1.85), or children living in families with medium income (1.85-3.4 PIR) and children in high income families (3.5-5.0 PIR). The PIR variable was capped at 5.0, so that an investigation of very high-income families was not possible using this data set. Two dichotomous variables were created to categorize children as Food Stamp or WIC participants (compared to income-eligible non-participants). An interaction term (Food Stamp vs. WIC) was created to examine the relationship between participating in either or both of the programs.

Diet

NHANES dietary data was collected with one interviewer administered 24-hour recall. Respondents were asked to report dietary intake during the past 24 hours using a multiple-pass approach.[10] Caretakers reported the diets for children less than 6 years old. Intake information was disaggregated to provide dietary intake data for total energy (kcal per day), macro or micronutrients (g or mg per day), and MyPyramid[11] food groups (in cups or ounces per day).

Overall diet quality was assessed using the Revised Children's Diet Quality Index (RC-DQI),[12] an index based on national dietary intake recommendations, such as the Dietary Reference Intakes (DRI) for macronutrients and iron,[13,14] MyPyramid,[11] and position papers from the American Dietetic Association (ADA),[15] and the American Academy of Pediatrics (AAP).[16,17] The RC-DQI has a maximum of 90 points and consists of 13 components: added sugar, total fat, linoleic and linolenic fatty acids, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), total grains, whole grains, vegetables, fruits, 100% fruit juice, dairy, and iron intake, as well as a component representing a proxy for energy balance (time spent watching television interacted with total daily energy intake). A full description of the RC-DQI can be found elsewhere.12 In short, usual dietary intake information is collected from the child's caretaker and scores assigned for each of the 13 components. The calculation of the score is based on under- as well as overconsumption of intake. The formula to calculate the points scored for each component is based on underconsumption –point score = (actual intake/ideal intake) * maximum points – or overconsumption – point score = maximum component points - (actual intake/ideal intake) * 100%. For instance, for a 2-year-old boy the recommended intake of fruit is 1.5 cups per day. If the child ate only 0.5 cups of fruits, he scores 3 points out of the possible 10 component scores: 10 - (0.5/1.5) * 100. Conversions to the metric system from the units of intake in MyPyramid (ounces and cups) can be based on the assumption that 1 ounce is equivalent to 28.4 g (e.g. one slice of bread) and one cup is equivalent to 240 mL.

The proportion of children who met the dietary income recommendations of the components and scored maximum points for each component was calculated and results described for the total sample. Total RC-DQI score as continuous value from zero to 90 points was the dependent variable in all linear regression models, whereas total RC-DQI score was divided into quartiles to examine the association between diet quality and the prevalence of childhood obesity.

Anthropometric data

Measured height and weight as well as calculated BMI are available in the NHANES data set. Weight (kg) was obtained as the individual stood on a digital scale. Standing height (m) was measured with an electronic stadiometer in individuals who were at least 2 years old. CDC's BMI-for-age and sex-specific growth charts were used to create four distinct groups: underweight (less than 5th percentile), healthy weight (5th to 84th percentile), at risk for overweight (between the 85th and 94th percentile), and overweight (≥ 95th percentile). As expected, anthropometric data was not normally distributed, thus, the method by Cole et al. to construct a smoothed curve using the calculated power (L), mean (M), and coefficient of variation (S) to provided standards in terms of centiles was employed to determine children's normalized growth centile standards.[18] Binary dummy variables were created that equaled "1" when children were classified as at risk for overweight or overweight and "0" otherwise.

Statistical analysis

All analysis was conducted using complex sample survey routines (version 9.2; StataCorp LP, College Station, TX, USA[19]) to maintain the nationally representative character of the data. Descriptive statistics, such as means and standard errors (SE), proportions, were calculated. The interrelationships between participation in food assistance programs and income required the assessment of endogeneity, thus, endogeneity between the income and income-related variables (such as child's age, sex, age squared, ethnicity, sociodemographic, body weight status, and federal food program participation) were tested using the Hausman-Wu test.[20]

The status of overall diet quality was described by calculating the population's mean RC-DQI score and the percentage of children receiving full point score for each of the 13 RC-DQI components. Multiple linear regression models were designed to examine the sociodemographic predictors of overall diet quality in the total sample as well as in the two subsamples of children who were income-eligible for the WIC or the Food Stamp Program. Forward and backward deletion process was employed with a $p < 0.2$ and < 0.25 respectively, indicating significance for the models. Likelihood ratio tests were conducted to examine the importance of each added/removed term to the model. Results were reported for the final models as beta-coefficient, 95% confidence interval and level of statistical significance (p). Quartiles of total RC-DQI scores were created to assess the relationship between level of diet quality and the prevalence of children being at risk for overweight or overweight. Pearson's chi-square test was employed to determine the significant difference in proportion of children at risk for overweight or overweight between the quartiles of RC-DQI scores. Statistical significance was assumed at a $p < 0.05$. The Institutional Review Board (IRB) in the Office of Research Protection at Pennsylvania State University granted approval for the study based on the use of secondary data with no person identifiers.

Results

The descriptions of the samples can be found in Table 1. The proportion of non-Hispanic white children was highest in the total sample while more children in the low income samples were Mexican American or non-Hispanic black. Within the income-eligible subpopulations, approximately half of the children were enrolled in either program. One third of the preschoolers were either at risk for overweight or overweight.

The overall diet quality of the population was low, in that the population average total RC-DQI score was 59 points, ranging from 21-86 points of the total maximum of 90 points (Table 2). With the exceptions of the DHA and EPA, the total grain, or the iron component, less than half of the children met the intake recommendations of the RC-DQI components and achieved full points. Only 8% of the sample met the intake recommendation for whole grains.

Hausman-Wu test results showed that there was no endogeneity between the available sociodemographic variables and the children's household income variable. Thus, additional stratification by income-related covariates was not necessary. The regression models indicated that increasing age predicted lower overall diet quality (Table 3) while Mexican-American preschoolers had significantly better diet quality

Table 1 - Description of the population of American preschoolers in the National Health and Nutrition Examination Survey (NHANES 1999-2002) in percent

Characteristics	Total, n = 1,521
Ethnic group	
Non-Hispanic white	61.9
Non-Hispanic black	12.9
Mexican	13.5
Other	11.7
Food Stamp income-eligible	34.2
Food Stamp participants	53.0
WIC income-eligible	46.3
WIC participants (of eligible)	43.7
Household income	
< 1.3 PIR	34.2
1.3-1.84 PIR	12.0
1.85-3.4 PIR	21.7
> 3.5 PIR	32.1
Attends preschool	21.5
At risk for overweight (85-94th BMI percentile)	21.8
Overweight (≥ 95th BMI percentile)	11.2

BMI = body mass index; PIR = poverty income ratio; WIC = Special Supplemental Program for Women, Infants, and Children.

than non-Hispanic white children. No other ethnic group was significantly different from the referent group. Boys in the WIC income-eligible subsample had significantly better diet quality than girls (Tables 4 and 5) and Mexican-American children scored almost 4 points more on the total RC-DQI than their non-Hispanic white counterparts. Food Stamp Program participation was not a significant predictor of overall diet quality in either subsample whereas a beneficial, although not statistical significant effect of WIC participation was indicated. The interaction between WIC and Food Stamp participation was not statistically significant in either model.

The proportion of children at risk for overweight or overweight decreased significantly between the lowest and the highest RC-DQI total score quartile (Figure 1). Although this trend was not consistent in the second and third quartile, the decrease of the numbers of children at risk for overweight between the first, second, and forth quartile of RC-DQI score was statistically significant whereas the difference in the proportion of children who were overweight was only statistically lower between the first and the second, the first and the fourth, as well as the third and the fourth RC-DQI score quartile.

Discussion

Results of this study showed that preschooler's diet leaves much room for improvement. Particularly the consumption of whole grains, fruits, vegetables, and dairy were suboptimal.[21] A 1-year increase in children's age was associated with a loss of approximately two points in the diet quality index. This phenomenon is likely due to the increasing independence in food choice and dietary intake with increasing age. While most children are still in the parent-guided transition period to table foods at 2 years of age,[22] older children will have become independent eaters and choose their own foods for meals and snacks.

Table 2 - Proportion of American preschoolers with maximum Revised Children's Diet Quality Index (RC-DQI) component scores (in percent)

Component	Scoring Scheme (ideal values)	Maximum points	With maximum points (%)
Added sugar (%kcal)*	≤ 10% of energy	10	33
Total fat (%kcal)*	25-35% of energy	2.5	45
Linoleic acid (%kcal)*	≤ 5-10% of energy	2.5	43
Linolenic acid (%kcal)*	0.6-1.2% of energy	2.5	22
DHA + EPA (%kcal)*	≤ 10% of a-linolenic acid	2.5	93
Grains (ounces)*†	MyPyramid	5	72
Whole grains (ounces)*†	MyPyramid	5	8
Fruits (cups)*†	MyPyramid	10	45
Vegetables (cups)*†	MyPyramid	10	46
100% Fruit juice*	12 ounces	10	24
Dairy (cups)*†	MyPyramid	10	24
Iron (md/dL)‡	Dietary Reference Intake	10	71
Energy balance*§	Age- and gender-specific	10	17

DHA = docosahexaenoic acid; EPA = eicosapentaenoic acid.
* Continuous variables: for underconsumption point score = (actual intake/ideal intake) * maximum points and for overconsumption point score = maximum points - (actual intake/ideal intake) * 100%.
† MyPyramid age- and gender-specific intake recommendations:
Total grains: 3 ounces in 2-3 year olds, 4 ounces in 4-5 year-old girls, and 5 ounces in 4-5 year-old boys; 1 ounce = 28.4 g, for instance one slice of bread; Whole grains: 1/2 of the total grains.
Vegetables: 1 cup in 2-3 year olds, 2 cups in 4-5 year olds; 1 cup = 8 ounces = 240 mL.
Fruit: 1.5 cups in 2-3 year olds, 1.5 cups in 4-5 year-old girls, and 2 cups in 4-5 year-old boys; 1 cup = 8 ounces = 240 mL. Dairy: 2 cups per day in 2-5 year olds; 1 cup = 8 ounces = 240 mL.
‡ Iron: categorical variable based on age- and gender-specific Dietary Intake Reference values; less than estimated average requirement (EAR) (0 points), EAR-recommended dietary allowance (RDA) (5 points), or meets RDA (10 points).
§ Time spent watching TV and estimated energy requirement (EER) combined score.
(TV score + energy score)/2 based on individual scores as follows:
TV score: ≤ 2 hours of TV = 10 points, if more than 2 hours point loss based on 10 points - (time spent TV/2 hours) * 100%.
EER score = 0.9 * EER to 1.1 * EER = 10 points, if total energy intake not ±10% of EER: overconsumption of kcal 10 points - (actual intake/highest EER range point) * 100%, underconsumption 10 - (actual intake/lowest EER point) * 100%.

Increasing family income was predictive of better diet quality scores in the total population. The significance of family income on preschooler's diet quality was removed in the two low-income subpopulations. This finding indicates a threshold level in the relationship between family income and dietary intake. Family economic power has been found to predict the purchases of foods with high nutritional quality, such as whole grain starches (e.g. bread and pasta), fresh fish, fruits and vegetables.[23] However, it has been found that WIC or Food Stamp Program participation increase the diet quality of children.[24,25] Hence, federal food program participation appears to reflect change in behavior in that more resources are spent on the purchase of high-quality foods.

The large proportion of fruit and high-fiber vegetables, such as beans, that are traditionally consumed in the Mexican diet were likely the reason for the observed increased diet quality in Mexican-American children. This effect of ethnic background was particularly high in the WIC income-eligible subgroup. Hence, it appears that especially low-income children may benefit from adopting traditional Mexican diets. The importance of cultural background and family income on the foods provided in households with children has been established.[26,27] However, the emergence of Mexican American ethnicity as the strongest positive predictor of good diet quality indicates the urgent need to further explore the potential underlying factors for this beneficial effect.

Table 3 - Sociodemographic predictors of Revised Children's Diet Quality Index (RC-DQI) scores in American preschoolers aged 2-5 years

Sociodemographic characteristic	Beta coefficient	95% confidence interval	p
Total sample (n = 1,521)			
Age (years)	-2.38	-3.10 to -1.67	< 0.001
Ethnicity (referent non-Hispanic white)			
Non-Hispanic black	-1.23	-5.77 to 3.31	0.585
Mexican American	2.18	0.19 to 4.18	0.033
Non-Hispanic other	2.23	-2.04 to 6.50	0.295
Household income (poverty income ratio)	1.22	0.74 to 1.70	< 0.001
WIC* eligible (n = 861)			
Age (years)	-2.08	-3.06 to -1.10	< 0.001
Male (referent female)	1.87	0.09 to 3.65	0.039
Ethnicity (referent non-Hispanic white)			
Non-Hispanic black	-1.93	-5.93 to 2.06	0.331
Mexican American	3.57	1.08 to 6.05	0.006
Non-Hispanic other	3.93	-0.29 to 8.15	0.067
WIC participant (referent: non-participant)	2.03	-0.75 to 4.82	0.147
Food Stamp eligible (n = 676)			
Age (years)	-2.2	-3.10 to -1.33	< 0.001
Ethnicity (referent non-Hispanic White)			
Non-Hispanic black	-3.11	-7.39 to 1.16	0.147
Mexican American	2.75	-0.24 to 5.76	0.070
Non-Hispanic other	3.75	-0.48 to 7.99	0.080
Preschool attendance (referent: not in preschool)	2.13	-0.149 to 5.75	0.238
WIC participant (referent: non-participant)	2.71	-0.10 to 5.53	0.058

* WIC = Special Supplemental Program for Women, Infants, and Children.

Although this study was limited by the use of one single 24-hour recall to estimate usual intake, it is based on a large, nationally representative data set that was designed for nutrition and health surveillance in the population. Clinicians may choose to ask the caretakers of young children to report children's usual diet, rather than intakes of the previous day alone.

The results presented here contribute new evidence to the diet-childhood obesity relationship. Although this study focused on the difference between children with Hispanic and non-Hispanic background, results are applicable to other ethnic groups as well in various countries. While large proportions of children in South America might not be considered Mexican but non-Hispanic white, dietary intake patterns are likely more similar to the Mexican American population than to non-Hispanic white American children. Furthermore, non-Hispanic white American children have similar rates of childhood obesity as Latin American and Caribbean children.[28] However, while parts of the preschool population in South

Table 4 - Components and scoring scheme for the Revised Children's Diet Quality Index (RC-DQI): girls

C-DQI component	Score					Scoring scheme	Scoring Criteria
Age		2	3	4	5		
Added sugar*	10	≤ 10% total energy				Overconsumption	WHO
Fat*	2.5	30-40% 25-35% total energy				Overconsumption	AMDR
Linoleic acid (18_2)*	2.5	≤ 5-10% of total energy				Underconsumption	(ω -6 f.a.)
Linolenic acid (18_3)*	2.5	0.6-1.2% of total energy				Underconsumption	(ω -3 f.a.)
DHA and EPA*	2.5	≤ 10% of a-linolenic acid				Overconsumption	(more potent ω-3 f.a.)
Total grains*†	5	3	3	4	4	Underconsumption	food groups
Whole grains*†	5	1.5	1.5	2	2	Underconsumption	food groups
Fruit*†	10	1.5	1.5	1.5	1.5	Underconsumption	food groups
Vegetable*†	10	1	1	2	2	Underconsumption	food groups
Excess juice*	10	6	6	6	6	Overconsumption	AAP age-appropriate limit
Dairy*†	10	2	2	2	2	Underconsumption	food groups and AAP
Iron‡	10	≤ 3.0		≤ 4.1		Underconsumption	≤ EAR = 0 points
		3.1-6.9		4.2-9.9			EAR-RDA = 5 points
		≥ 7		≥ 10			≥ RDA = 10 points
TV/energy*§	10	EER: 1,072	EER: 1,080	EER: 1,133	EER: 1,189	Exceeding time	≤ 2 hours TV
						Overconsumption	Energy ± 10% of EER
Total points	90						

AAP = American Academy of Pediatrics; AMDR = acceptable macronutrient distribution ranges; DHA = docosahexaenoic acid; EAR = estimated average requirement; EER = estimated energy requirement; EPA = eicosapentaenoic acid; RDA = recommended dietary allowance; WHO = World Health Organization.
* Continuous score for overconsumption: maximum points - (actual intake/ideal intake) * 100%; underconsumption (actual intake/ideal intake) * maximum points.
† Dietary guidelines MyPyramid food group patterns by age-appropriate energy patterns.
‡ Categorical variable based on less than EAR (0 points), EAR-RDA (5 points), or meets RDA (10 points).
§ Combined score: (TV score + energy score) / 2.
TV score: ≤ 2 hours of TV = 10 points.
EER score = 0.9 * EER to 1.1 * EER = 10 points, otherwise for overconsumption 10 points - (actual intake/highest EER point) * 100%, for underconsumption 10 - (actual intake/lowest EER point) * 100%.

America are at high risk for childhood obesity, others are likely to develop medical manifestations of malnutrition, such as stunting.

While several foods and nutrients have been found to be associated with chronic disease risk and dietary intake recommendations are based on these diet-disease relationships,[29,30] the direct association between lower diet quality and increased risk childhood obesity was demonstrated in this study. Results emphasized the need to improve overall diet quality, for instance by increasing whole grain, fruit, and vegetable intake. Certain ethnic groups are likely to have much better diet quality than others, especially in the low-income population. Hence, low-income children should be encouraged to consume foods common in the traditional Mexican diet, such as high proportions of fruits and vegetables to increase overall diet quality and decrease the risk for childhood obesity in preschoolers.

Table 5 - Components and scoring scheme for the Revised Children's Diet Quality Index (RC-DQI): boys

C-DQI component	Score					Scoring scheme	Scoring Criteria
Age		2	3	4	5		
Added sugar*	10	≤ 10% total energy				Overconsumption	WHO
Fat*	2.5	30-40%		25-35% total energy		Overconsumption	AMDR
Linoleic acid (18_2)*	2.5	≤ 5-10% of total energy				Underconsumption	(ω -6 f.a.)
Linolenic acid (18_3)*	2.5	0.6-1.2% of total energy				Underconsumption	(ω -3 f.a.)
DHA and EPA*	2.5	≤ 10% of a-linolenic acid				Overconsumption	(more potent ω-3 f.a.)
Total grains*†	5	3	3	5	5	Underconsumption	food groups
Whole grains*†	5	1	1.5	2.5	2.5	Underconsumption	food groups
Fruit*†	10	1.5	1.5	2	2	Underconsumption	food groups
Vegetable*†	10	1	1	2	2	Underconsumption	food groups
Excess juice*	10	6	6	6	6	Overconsumption	AAP age-appropriate limit
Dairy*†	10	2	2	2	2	Underconsumption	food groups and AAP
Iron‡	10	≤ 3.0		≤ 4.1		Underconsumption	≤ EAR = 0 points
		3.1-6.9		4.2-9.9			EAR-RDA = 5 points
		≥ 7		≥ 10			≥ RDA = 10 points
TV/energy*§	10	EER: 1,120	EER: 1,162	EER: 1,215	EER: 1,275	Exceeding time	≤ 2 hours TV
						Overconsumption	Energy ±10% of EER
Total points	90						

AAP = American Academy of Pediatrics; AMDR = acceptable macronutrient distribution ranges; DHA = docosahexaenoic acid; EAR = estimated average requirement; EER = estimated energy requirement; EPA = eicosapentaenoic acid; RDA = recommended dietary allowance; WHO = World Health Organization.
* Continuous score for overconsumption: maximum points - (actual intake/ideal intake) * 100%; underconsumption (actual intake/ideal intake) * maximum points.
† Dietary guidelines MyPyramid food group patterns by age-appropriate energy patterns.
‡ Categorical variable based on less than EAR (0 points), EAR-RDA (5 points), or meets RDA (10 points).
§Combined score: (TV score + energy score) / 2.
TV score: ≤ 2 hours of TV = 10 points.
EER score = 0.9 * EER to 1.1 * EER = 10 points, otherwise for overconsumption 10 points - (actual intake/highest EER point) * 100%, for underconsumption 10 - (actual intake/lowest EER point) * 100%.

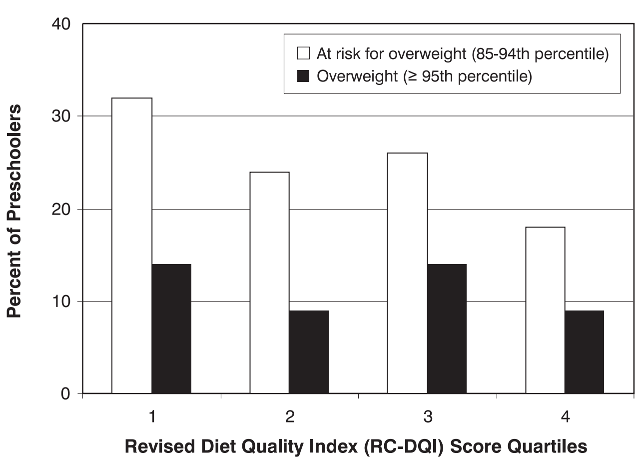

Figure 1 - The proportion of preschoolers at risk for overweight or overweight with increasing Revised Children's Diet Quality Index (RC-DQI) total score quartiles in a nationally representative sample of American children 2-5 years old (n = 1,521)

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