



RESEARCH ARTICLE

Do Self- or Parental Perceptions of Weight Influence Children and Adolescents' Dieting and Family Eating Patterns?

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Abstract

Background: Accurate weight perceptions may promote weight control behaviors and encourage dietary changes in children and adolescents. Targeting children and adolescents who were trying to lose weight, this study aims to examine the association between self- and parental perceptions of children and adolescents' weight, accuracy of weight perceptions, individual dieting behaviors, and family eating patterns.

Methods: We examined data for all children and adolescents aged 8-15 who reported themselves as "trying to lose weight" (n=1,495) in the 2007-2012 data from the National Health and Nutrition Examination Survey. Latent class analysis (LCA) was applied to identify heterogeneous subgroups of children and adolescents with respect to their weight status, self- and parental weight perceptions, accuracy of perceptions, dieting patterns, and family eating patterns. Logistic regression was used to test the significance of identified latent classes to socio-demographic factors such as age, gender, race, and median household income.

Results: About 77% of participants were overweight or obese, while only 57.28% perceived themselves as "overweight or fat." Only 47.25% of parents perceived their children's weight accurately. The final LCA model yielded a 6-class solution. Our findings showed that overweight or obese children and adolescents whose weight status was accurately perceived by either themselves or their parents were more likely to be on a diet. However, family eating patterns were not necessarily related to weight perceptions. Also, relevance of identified latent subgroups was significantly associated with participants' socio-demographic factors.

Conclusions: The findings suggest that obesity intervention programs should work to improve the accuracy of self- and parental perception of children's weight status and furthermore tailor intervention protocols according to participants' distinct socio-demographic characteristics.

Introduction

In the United States, about one-fifth of children and adolescents aged 2-19 are obese [1-3]. Unhealthy diet, especially unnecessarily high energy intake, is one of the key factors driving the high prevalence of childhood obesity [4-6]. Accurate weight perception may promote children and adolescents' weight control behaviors and encourage dietary changes [7-9]. Weight perception can be categorized as self-perception or perceptions of others [10]. Self-perception of weight (hereafter self-perception) has a great effect on individuals' weight concerns and dieting behaviors [9,11-13]. While some children and adolescents perceive their weight status accurately, many others fail to recognize their weight problems [2,4-6,9]. Accurate weight perceptions among overweight children and adolescents seem to be important motivators of weight control activities, while incorrect perception in normal weight children may lead to unnecessary intentions to lose weight [9].

Children and adolescents also learn from the actions and experiences of others. The feedback they receive from observing the attitudes and activities of others could greatly impact their willingness either to change or maintain certain behavioral patterns [14-16]. Weight perception of others refers to how other people think of an individual's weight [10,17], including parental perceptions of their children's weight as

observed by the children (hereafter parental perception). Parents' concerns and comments regarding their children's weight and eating habits may significantly influence children and adolescents [18], since parents play an irreplaceable role in shaping children's dietary behaviors and encouraging changes in their children's lifestyle [19-21]. Surprisingly, a recent study found that 62.4% of parents incorrectly perceived their child's weight [20, 22]. Some studies suggest that parental misperception of children's weight leads to less concern about their child's weight [20, 22, 23]. However, findings have been inconsistent regarding the association between parental perception of children's weight and diet [10, 20].

Parental perceptions and behaviors interact with children and adolescents' perceptions and feeding practices [21, 24]. Parents influence their children's eating habits through creating home food environments, modeling food choices, and their own beliefs and food practices [21]. At the same time, it's well documented that children and adolescents influence their families' food-

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related decision making [25-27], since family food purchase is often considered a joint activity by children and parents [25, 26]. In recent years, easy access to unhealthy and energy-dense food is of great concern [28, 29], and family food choices have become particularly important to children and adolescents' health. Past research has found that children's weight status is negatively associated with the intake of fruits and vegetables [30]. Healthy eating—for example, intake of fruits and vegetables—is reportedly correlated more strongly with home eating behaviors [31, 32]. However, potential benefits of home eating for children and adolescents are highly related to parenting style, due to parents' nutrition knowledge and home food availability [33]. Out-of-home eating is usually related to greater intake of more energy-dense food, fewer healthy food choices, and ultimately a higher risk of being overweight or obese [34, 35]. The share of all food spending taken up by out-of-home eating (OHE) has increased steadily,⁹ rising dramatically from 25.9% in 1970 to 43.1% in 2012 [36, 37].

Furthermore, previous work has revealed that socio-demographic factors are greatly associated with both self- and parental perceptions of children and adolescents' weight as well as family and children's eating patterns [9,20]. For instance, boys are less likely to overestimate their weight, and overweight or obese boys are more likely to misperceive their weight compared to overweight or obese girls [9, 38]. African Americans and Asian Americans are less likely to perceive their weight accurately compared to Caucasians [9, 38]. A parent's perception of their child's weight status might be influenced by the child's sex or age as well as parental socioeconomic status [20]. For example, parents are more likely to incorrectly perceive the weight status of younger children [19, 20]. In addition, family socioeconomic status has a great effect on food purchasing and consumption. Food cost explains some contribution of socioeconomic status to diet quality. Generally unhealthy eating has been related with cheap, less nutritious, and energy-dense food, while better-quality diet has been associated with higher food cost [39]. Besides, lower socioeconomic status family usually live in disadvantaged neighborhoods with limited availability of healthy local food destinations [40].

Even though the effect of self- and parental perceptions on children's eating behaviors has been well documented [20, 41-43], little is known about the interplay between self-perception, parental perception, and the accuracy of those perceptions for children and adolescents who are willing to lose weight [13]. Furthermore, it remains unclear how socio-demographic factors are associated with the latent relevance between weight perceptions, children's dieting behaviors, and family eating patterns. The goal of this study is to identify distinct subgroups of children and adolescents with respect to self- and parental perception of children and adolescents' weight, accuracy of self- and parental perceptions, and dieting behaviors and family diet pattern among children and adolescents who were trying to lose weight. We hypothesize that: (1) overweight or obese children and adolescents who accurately perceive their weight status, or whose parents accurately perceive the children's weight, are more likely to be on a diet; (2) families of overweight or obese

children and adolescents who accurately perceive their weight, or whose parents accurately perceived the children's weight, have higher probability of adopting healthier eating patterns; (3) latent relevance of identified subgroups is associated with the group's socio-demographic factors.

Materials and Methods

Data

This is a cross-sectional study of data collected through the National Health and Nutrition Examination Survey (NHANES, 2007–2012). This national survey, conducted by the Center for Disease Control and Prevention (CDC), includes both in-person examination and questionnaires [13]. Weight and height were measured according to standardized procedures at a mobile examination center (MEC) [44]. The demographic questionnaire was completed by interviewing a parent at participants' homes. A computer-assisted questionnaire recording participants' "weight history" included questions about their weight perceptions and weight control behaviors. We examined the data of all children and adolescents aged 8-15 who reported themselves as "trying to lose weight" (n=1,495). The sample is comprised of 53.24% girls and 46.76% boys, 22.88% Caucasians and 77.12% minorities, and 54.85% children (aged 8-11) and 45.15% adolescents (aged 12-15). Among these participants, 46.82% came from low-income families (household income < \$35,000) and 53.18% came from mid- and high-income families (household income >= \$35,000) (Table 1).

Table 1: Sample statistics

(n = 1945)			
Socio-demographics	Age	8-11	54.85%
		12-15	45.15%
	Gender	Girl	53.24%
		Boy	46.76%
	Race	Caucasian	22.88%
		Minority	77.12%
	Household income	< 35 K	46.82%
		>= 35 K	53.18%
Weight	BMI percentile	Obese	53.85%
		Overweight	23.68%
		Normal	22.47%
Weight perception	Self-perception	Overweight & fat	57.28%
		Other	42.72%
	Parental perception	Overweight & fat	31.52%
		Other	68.48%
	Self-perception accuracy	Accurate	67.76%
		Inaccurate	32.24%
	Parental perception accuracy	Accurate	47.25%
		Inaccurate	52.75%
Family diet pattern	% S&G	Average	69.65%
	% eating out	Average	19.59%
	% other stores	Average	10.76%
Weight control	On a diet	Never	31.11%
		Sometimes	32.60%
		A lot	36.30%

Measures

Children and adolescents' weight status. Weight and height measurements were used to calculate body mass index (BMI) percentiles according to the sex and age-specific growth charts from the CDC. We then classified children into one of three weight categories: normal weight, 5th-84.99th percentile; overweight, 85th-94.99th percentile; and obese, ≥95th percentile. Overweight and obese were then collapsed into a single category.

Weight perception. Children and adolescents' weight statuses were assessed according to self-perception, self-perception accuracy, parental perception of child's weight status as interpreted by the child (hereafter parental perception), and parental perception accuracy. Self-perception was reflected by participants' responses to the fill-in-the-blank question, "Do you consider yourself now to be...", with provided answers of "fat or overweight," "too thin," or "about the right weight." We collapsed these three groups into two categories: "fat or overweight" and "others." Self-perception accuracy was determined by comparing self-perception of weight and actual weight status, and was considered accurate if these two were concordant or inaccurate if discordant. Following the concept of "weight perception of others" as defined in Introduction, parental perception was assessed by participants' response in agreement or disagreement with the sentence, "My mother or father wants me to lose weight." If yes, it was recorded that parents had concerns on their children's weight and considered them overweight or obese; if no, the response fell into the category of "others." Parental perception accuracy was identified by comparing parents' perceptions and their children's actual weight status, and considered accurate if these two were consistent or inaccurate if inconsistent.

Family eating pattern. Family eating pattern was assessed according to percentages of expenditure on food at supermarkets or grocery stores, at "other" food stores, and on out-of-home eating. Supermarkets and grocery stores provide more food choices and sell healthy, fresh, and nutritious food; while "other" stores such as convenience stores and specialized small food stores have fewer healthy food choices and mainly offer nonperishable or ready-to-eat foods [29]. Out-of-home eating has been considered to increase the intake of unhealthy energy-dense food [34, 35]. In this study, family food expenditure at supermarkets or grocery stores was determined by participants' responses to two questions: during the past 30 days, "how much money did you/your family spend at supermarkets or grocery stores?" and "about how much money was spent on nonfood items?". Family food expenditure was calculated by deducting money spent on nonfood items from the total purchase amount reported at these supermarkets or grocery stores. Food purchase at "other" stores was reflected by answers to the question, "During the past 30 days, about how much money did you/your family spend on food at stores other than grocery stores?". Expenditure on out-of-home eating was obtained by summing the answers to the questions, "How much money did you/your family spend on eating out?"

and "How much money did you/your family spend on food carried out or delivered?".

Dieting. Weight control behavior and dieting was reflected by participants' answers to the question, "In the past year, how often have you been on a diet to lose weight?" We collapsed the three response options, "never," "sometimes," or "a lot," into two categories: "never" and "sometimes or a lot."

Socio-demographic factors. Socio-demographic covariates include the participant's age, gender, race, and family income. Participants were categorized as children aged 8-11 (0) and adolescents aged 12-15 (1), boys (0) and girls (1), and Caucasian (0) and minority (1). Responses for family income was also used to create two categories, low-income (< \$35,000) vs. mid- to high-income (≥ \$35,000), coded as 0 and 1, respectively.

Statistical analysis

Latent class analysis (LCA), a person-centered statistical approach, is a mixture model that assumes a population could be divided into mutually exclusive and exhaustive latent classes based on categorical and cross-sectional observed indicators [45-47]. LCA assigns homogeneous individuals within a class, while participants are also heterogeneous among different classes [47, 48]. Compared to traditional variable-centered segmentation approaches, LCA performs better to yield subgroups of people because it permits statistical inference based on a likelihood model [47, 48]. LCA has been applied in obesity and nutrition research in recent years, for example, identifying latent subgroups of children and adolescents regarding parenting characteristics and children's BMI [49], children's eating and physical activity patterns and obesity risk [48], and family eating habits [47]. From these studies, LCA has been demonstrated an effective and convincing method to identify distinct subgroups with common characteristics.

To test hypotheses 1 and 2, LCA was applied using the M plus Version 7.0 software program to identify heterogeneous subgroups of children and adolescents who had intentions to lose weight, with respect to children and adolescents' weight status, weight perception and perception accuracies, dieting, family eating patterns. More specifically, 9 binary latent class indicators were created to reflect these four dimensions: 1) children and adolescents' BMI percentile, 2) self- and parental perceptions of children and adolescents' weight, and accuracies of self- and parental perceptions, 3) children and adolescents' dieting behaviour, and 4) percentages of expenditure on food at supermarkets or grocery stores, at "other" food stores, and on out-of-home eating.

To test hypothesis 3, such socio-demographic covariates as age, gender, race, and family income were used to examine associations between each latent class and these covariates. A logit link function was applied to model these associations and generate a series of logistic regression coefficients to describe how these covariates predict the latent variables [46, 50]. These coefficients were transformed into more understandable odds ratios while exponentiated [46].

Results

Sample description

Table 1 summarizes the sample statistics. All these children and adolescents had intentions to lose weight. Among them, 53.85% were obese, 23.68% were overweight, and 22.47% were normal weight, while 57.28% perceived themselves as overweight or obese and 42.72% considered themselves as being normal weight. Overall, 67.76% of participants perceived their own weight correctly. Only 47.25% of parents perceived their children's weight accurately, and only 31.52% had concerns about their children's weight. Regarding family eating patterns, on average 69.54% of family food expenditure occurred at super markets or grocery stores, 10.76% at "other" food stores, and 19.59% was spent on out-of-home eating, including eating at a dine-in place and ordering food for carry-out or delivery. In the past year, 36.3% of participants had frequently dieted to lose weight, 32.6% had done so sometime, and 31.11% had never been on a diet.

Latent classes

Several model-fit indices, including the likelihood ratio χ^2 test (LL), Akaike information criterion (AIC), and Bayesian information criterion (BIC) were evaluated to compare models using 1-6 clusters. Lower scores of AIC and BIC represent a better fit of the model [47, 51]. AIC and BIC decreased as the number of classes increased from 1 to 6, reflecting better model fit. Lo Mendell-Rubin likelihood ratio compares models with n-1 and n classes and rejects the null hypothesis that the former model outperforms the latter model if the p value is smaller than 0.05. It was determined that the optimal solution is the 6-class model, based on all three model fit indices in Table 2.

Table 3 summarizes class profiles with respect to 9 variables. Each latent class reflects a subgroup of children and adolescents characterized by a pattern of these 9 indicators. **Latent Class 1** represents 33.6% (n=503) of the total sample. Children and adolescents from Class 1 had high probability of being overweight or obese (p=1), and also accurately perceived their

Table 2: Model-fit indexes for latent class models

	Number of classes				
	2	3	4	5	6
DF	492	482	472	462	452
# of parameters	19	29	39	49	59
Loglikelihood	- 7730.692	- 7021.594	- 6732.520	- 6563.436	-6428.579
AIC	15499.384	14101.187	13543.039	13224.872	12975.158
BIC	15600.272	14255.174	13750.125	13485.056	13288.441
BIC*	15539.914	14163.049	13626.233	13329.397	13101.015
Lo-Mendell-Rubin testing the null hypothesis	1 vs. 2 Classes	2 vs. 3 Classes	3 vs. 4 Classes	4 vs. 5 Classes	5 vs. 6 Classes
LMR probability	<0.001	<0.001	<0.001	<0.001	<0.001

Note: AIC--Akaike Information Criterion, BIC--Bayesian Information Criterion, BIC*--Bayesian Information Criterion using sample size adjustment.

Table 3: Probabilities of meeting criteria for six distinct subgroups

Variables	Class1 (33.6%; n=503)	Class2 (11.2%; n=168)	Class 3 (17.3%; n=258)	Class4 (10.2%; n= 153)	Class 5 (10.9%; n=163)	Class 6 (16.7%; n=250)
<u>Family diet pattern</u>						
% S&G	0.523	0.000	0.000	1.000	0.423	1.000
% eating out	0.521	0.750	0.748	0.229	0.540	0.184
% other stores	0.457	0.768	0.740	0.235	0.521	0.212
<u>Weight perceptions</u>						
Self-perception	1.000	0.202	0.000	0.144	0.644	0.000
Parental perception	0.000	0.000	0.000	0.000	1.000	0.000
Self-perception accuracy	1.000	0.762	0.000	0.804	0.699	0.000
Parental perception accuracy	0.000	1.000	0.000	1.000	0.908	0.000
<u>Weight control</u>						
On a diet	0.581	0.369	0.457	0.366	0.650	0.456
BMI percentile	1.000	0.000	1.000	0.000	0.908	1.000

Note: Item-response probabilities > 0.5 to facilitate interpretation.

own weight problems ($p=1$). Their families were more likely to spend their food budget in grocery stores or supermarkets ($p=0.523$) as well as on eating out ($p=0.521$), and participants themselves were very likely to have been on a diet ($p=0.581$).

About 11.2% ($n=168$) of participants belong to **Latent Class 2**. Their response pattern is characterized by low probability of both being overweight or obese and having been on diet, but high probability of their family eating out ($p=0.75$) and buying food from "other" stores instead of grocery stores or supermarkets ($p=0.768$). Both parents ($p=1$) and children ($p=0.762$) were likely to perceive children and adolescents' weight accurately.

Latent Class 3 includes 17.3% ($n=258$) of participants. While participants in this class were very likely to be overweight or obese, neither the child's parents ($p=0$) nor the child ($p=0$) were likely to consider the child overweight or fat and therefore perceived participants' weight incorrectly ($p=0$). The participants' families had high probability of purchasing food in "other" stores ($p=0.740$) and spending on out-of-home eating ($p=0.748$). The participants were less likely to have been on a diet ($p=0.457$).

Latent Class 4 represents 10.2% ($n=153$) of the total sample. The participants were less likely to be overweight or obese ($p=0$), and the participant ($p=0.804$) as well as their parents ($p=1$) perceived the participants' weight status correctly. Their families had high probability of purchasing food at super markets and grocery stores ($p=1$). Participants were less likely to have been on a diet ($p=0.366$).

Latent Class 5 includes 10.9% ($n=163$) of participants. Children and adolescents in this class were more likely to be overweight or fat ($p=0.908$). Both children ($p=0.699$) and parents ($p=0.908$) perceived the participants' weight status correctly. While their families had high probability of eating out ($p=0.540$) and purchasing food at "other" food stores ($p=0.521$), participants ($p=0.650$) tended to have been on a diet with the intention to lose weight.

Latent Class 6 represents 16.7% ($n=250$) of participants. Children and adolescents in this class were more likely to be overweight or fat ($p=1$). Neither children ($p=0$) nor parents ($p=0$) considered the participants overweight or fat and therefore their perceptions tended to be inaccurate. Participants ($p=0.650$) were less likely to have been on a diet in order to lose weight, but their families had high probability of buying food at super markets or grocery stores ($p=1$).

Covariates predicting latent class membership

Table 4 presents the results of logistic regression coefficients for six latent classes with socio-demographic covariates. Aside from the models of Class 1 ($p=0.14$) and Class 4 ($p=0.37$), all four other models show these covariates are significant overall. Participants in Class 2 (odds ratio=1.61, $p < 0.01$), Class 3 (odds ratio =1.47, $p < 0.01$), and Class 5 (odds ratio =1.42, $p < 0.05$) were more likely to come from middle or high-income families, while those from Class 6 tended to live in low-income families (odds ratio =0.47, $p < 0.01$). Participants of Class 2 were more likely to be adolescent (odds ratio =1.38, $p < 0.05$) girls (odds ratio =1.65, $p < 0.01$), while participants in Class 3 were very likely to be children aged 8-11 (odds ratio=0.7, $p < 0.05$). Class 5 has more minority participants (odds ratio =1.62, $p < 0.05$) than Caucasian participants. Class 6 includes more children (odds ratio =0.67, $p < 0.01$) than adolescents Table 3.

Discussion

The results fully support the first hypothesis that "overweight or obese children and adolescents who accurately perceive their weight status, or whose parents accurately perceive the children's weight, are more likely to be on a diet" (Table 3). Among 6 latent classes, Classes 1, 3, 5, and 6, which account for 78.53% ($n=1174$) of the total sample, were characterized by high probability of overweight or obesity (Tables 3&4). Comparing these four groups, all participants in Class 1 were accurately perceived as overweight or fat by the participant, while the majorities in Class 5 were correctly considered overweight or obese by both the participants and their parents. Though participants in both classes tended to have dieted to lose weight, those who accurately recognized their weight problems and whose parents also accurately recognized them (Class 5, $p=0.650$) were more likely to diet than those whose parents had no concern about their child's weight (Class 1, $p=0.581$). In contrast, overweight or obese children and adolescents in Class 3 and Class 6 were less likely to have dieted to lose weight, since neither the participants ($p=0$) nor their parents ($p=0$) had concerns regarding the participants' weight. Part of our findings was in line with recent literature suggesting that children and adolescents' self-perceptions of weight and the accuracy of their perceptions are both strongly associated with their weight control behaviors (i.e. dieting) [9,10]. However, previous studies on adolescents have found that parental perception of children's weight and/or perception

Table 4: Logit estimates for predictors on latent class membership

Covariate	Class1 ($p=0.14$)	Class2** ($p<0.01$)	Class3* ($p<0.05$)	Class4 ($p=0.37$)	Class5* ($p<0.05$)	Class6** ($p<0.01$)
Gender	0.91	1.65**	0.86	1.23	1.37	0.67**
Race	0.88	0.98	0.99	0.76	1.62*	1.11
Age	1.29*	1.38*	0.70*	1.12	0.86	0.77
Income	0.91	1.61**	1.47**	0.89	1.42*	0.47**
Intercept	0.55**	0.06**	0.21**	0.13**	0.06**	0.36**

Note: * $p<0.05$; ** $p<0.01$.

accuracy were not necessarily related to adolescents' healthy weight management (i.e. dietary behaviors) [10, 20, 52]. One possible reason for the differences in our analysis is that our study includes a sample that is 54.85% children aged 8-11 and 45.15% adolescents aged 12-15, and parental influence likely loses significance as adolescents grow up and achieve greater independence [52].

Our analysis does not support the second hypothesis that "families of overweight or obese children and adolescents who accurately perceive their weight, or whose parents accurately perceived the children's weight, have higher probability of adopting healthier eating patterns" (Table 3). Four overweight or obese subgroups exhibit inconsistent, or even opposite latent relevance between weight perceptions and family eating patterns. In Class 3 and Class 6, neither children and adolescents nor their parents recognized participants as being overweight or fat. Families in Class 3 tended to eat more unhealthily than other classes as evidenced by their spending more on eating out ($p=0.748$) or their buying food at "other" food stores ($p=0.74$). But unexpectedly, families belonging to Class 6 were more likely to purchase food at supermarket and grocery stores ($p=1$) and less likely to eat out ($p=0.184$) or buy food at "other" food stores ($p=0.212$). In Class 1 and Class 5, though participants and/or their parents accurately perceived participants' weight problems, families still had high probability of eating out ($p=0.521$, 0.54). Families in Class 5 were also very likely to purchase food at "other" food stores ($p=0.521$). Family eating patterns and food purchases might be influenced by self- and parental perceptions of child weight as well as perception accuracies, but latent relevance varies among different socio-demographic population groups, given that family food purchase is also greatly affected by surrounding food retail environments and family social economic status [37, 53, 54].

Our findings generally support the third hypothesis (Tables 3&4&5) that "latent relevance of identified subgroups is associated with their socio-demographic factors." Participants of both Class 2 and Class 4 can be characterized by their low probability of being overweight or obese and their high probability of accurate self- and parental

perceptions of weight. However, these two classes showed opposite family eating patterns, with Class 2 tending to spend more on eating out and the purchase of food at "other" food stores, while Class 4 was more likely to buy food at supermarkets or grocery stores. Similarly, both Class 3 and Class 6 contain children and adolescents who were more likely to be overweight or fat, but were less likely to be perceived as overweight or fat by either themselves or their parents, and these classes showed opposite family dieting patterns as well. Class 3 spent more eating out or buying food at "other" food stores, while Class 6 tended to purchase food at supermarkets or grocery stores. Household income might be a major determinant of these inconsistent patterns of latent relevance between weight perceptions, weight status, and family eating patterns. About 64% of participants in Class 2, but only half of Class 4, came from middle- or high-income families; 63.69% of Class 3, but only 37.6% of Class 6, came from middle- or high-income families (Table 5). These results align with a recent study based on 2007-2008 NHANES data, which found that high-income families consumed more daily energy from away-from-home foods, while low-income families obtained less of their daily energy from out-of-home eating [55]. Children and adolescents' demographic factors also mattered (Tables 4 and 5). Excepting Class 4, each of the other 5 classes are significant to participants' age (Class 1, Class 2, and Class 3), gender (Class 2 and Class 6), or race (Class 5). Consistent with the literature [9,20], we also found that the weight status of minority children (Class 3) and boys (Class 3&6) was more likely to be misperceived by the participants and/or their parents compared to Caucasian (Class 5) adolescent (Class 2) girls.

Conclusion

In conclusion, focusing on children and adolescents aged 8-15 intending to lose weight, this research examined the latent relevance between self- and parental perceptions of weight, accuracy of self- and parental perceptions, dieting, and family eating patterns by analyzing the 2007-2012 NHANES data. This study contributes to the literature by identifying six heterogeneous subtypes of children and adolescents with consideration for their socio-demographic factors. Some

Table 5: Socio-demographic characteristics of six subgroups

	Class1	Class2	Class3	Class4	Class 5	Class 6
Age						
8-11	50.89%	46.43%	61.63%	52.29%	57.06%	61.60%
12-15	49.11%	53.57%	38.37%	47.71%	42.94%	38.40%
Gender						
Male	47.91%	35.71%	50.39%	41.83%	40.49%	55.20%
Female	52.09%	64.29%	49.61%	58.17%	59.51%	44.80%
Race						
White	24.25%	23.81%	23.26%	27.45%	16.56%	20.40%
Minority	75.75%	76.19%	76.74%	72.55%	83.44%	79.60%
MHIIncome						
< \$35000	47.91%	36.31%	39.53%	49.02%	39.88%	62.40%
>= \$35000	52.09%	63.69%	60.47%	50.98%	60.12%	37.60%

noteworthy findings can be highlighted. First, self- or parental perception of children and adolescents' weight and perception accuracy could encourage overweight or obese children and adolescents' individual dieting behaviors but were not able to fundamentally change family eating patterns because family eating habits and food purchases were also determined by their income level and surrounding food environments. Second, normal-weight children and adolescents (class 2 and class 4) were trying to lose weight although both parents and children themselves very likely perceived their weight accurately. Most of them were girls coming from middle or high-income families. Third, all 6 latent classes except the class 4 are significant to participants' socio-demographic covariates. The gender, age, and race differences in identified latent subgroups call attention to the need for customized weight control approaches according to children and adolescents' distinct characteristics. These findings also suggest that obesity intervention programs should seek to improve accuracy of self- and parental perceptions of children's weight status and promote appropriate family healthy dietary patterns considering their different income levels and background.

This study has a few limitations. First, family eating pattern was assessed according to percentage of food spending at different types of food stores, which cannot reveal certain information about family-specific dietary behaviors, including for example whether the choice of food at a restaurant was healthy or unhealthy. Second, this is a cross-sectional analysis. A longitudinal design might be better suited to determining causality between obesity and weight perceptions in future research.

Conflict of interest statement

The authors declare no conflict of interest.

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