

Extreme Weight Loss Behaviors among Multi-ethnic Adolescents of Florida

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Citation

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Abstract

Childhood overweight and obesity across the United States (US) have increased with one-third of Florida's youth are either overweight or obese. While public health (PH) efforts must continue to address prevention, understanding the behavioral impact of overweight/obesity among adolescents is imperative. Using the Youth Risk Behavior Survey (YRBS), the prevalence and the correlates of extreme weight loss behavior/practice among multi-ethnic adolescents of Florida were examined cross-sectionally. A representative sample from 75 public High School students in Grades 9 through 12 in 2005 (n=4,564) were included. Analysis accounted for the sampling design and non-response effects. Extreme weight loss behavior or extreme dieter (outcome) was defined as those who used at least one of the three unhealthy methods to lose weight. Prevalence of extreme weight loss behaviors included were (1) fasting for 24 hours or more (11.7%); (2) use of diet pills/powder/liquid without doctor's advice (6.02%); and (3) use laxatives or purging (5.05%). About 15.1% (n=599) were using at least one of the three methods to lose weight. About 52.5% of extreme dieters were whites, with 25.8% blacks, 19.7% Hispanics, and 2.0% others. Compared to the boys (referent group), girls were 15 times (adjusted OR: 15.4; 95% CI: 9.3 – 25.5) likely to be extreme dieters. Over 52% of extreme dieters were in healthy weight as defined by age-sex-specific BMI percentile. Culturally sensitive and comprehensive health education programs addressing several health risk behaviors could be beneficial for adolescents.

INTRODUCTION

The problem of overweight and obesity are an increasingly prevalent condition among children and adolescents of the United States (US). This condition has increased three-fold among youth in the last four decades.¹ The National Health and Nutrition Examination Survey (NHANES) data indicated that 16% of school-age children were classified as obese in 2005-2006.² About one-third of Florida's youth are either overweight or obese in a recent report.³

As obesity epidemic is recognized as a chronic public health problem in the US, weight loss practice has been generally accepted as a health care principle.⁴ Since the late 1960s, a strong cultural importance on weight loss appeared in the country which created endless anxieties about weight, diet and exercise.⁴ The weight loss or control behaviors remain a common practice especially among adolescents regardless of their weight status.^{4,6} Weight loss practices range from healthy behaviors like moderate food intake and exercise to risky or extreme behaviors such as fasting, purging, and using laxatives or diet pills.^{4,7} In adolescents, excessive weight loss/control behaviors can result in adverse consequences during their normal growth and maturation.^{5,8}

Previous studies showed that approximately 66% and 25% of adolescent girls and boys, respectively, were actively controlling their weight.^{5,6}

Participation in weight loss practice among adolescents has increased.⁹ With increasing trends in overweight and obesity among population of all ages, it seems weight control or loss practices should be encouraged since overweight among adolescence is related to many chronic diseases later in life.¹⁰⁻¹² Although healthy weight loss behaviors have increased in practice, unhealthy weight control practices and clinical eating disorders, are becoming significant problems for adolescents.¹³

The association between gender and race with weight loss behavior and related disorders have been previously documented.^{5,14,15} Unhealthy weight loss practices are greater among females than among males.^{5,7,14,16} A lower occurrence of weight loss practices has been described among African-Americans than other race/ethnic groups.¹⁴ Overweight with both healthy and unhealthy weight loss practice has been documented in adolescents.^{7,17,18} Previous studies have reported that a high percentage of adolescents that perceived

themselves as overweight and their dissatisfaction with their body weight were actively engaging in a variety of healthy or unhealthy weight loss practices.^{5,7,16-19}

Weight loss behavior is often viewed as a single behavior but it represents a wide range of behaviors.^{6,7,16} While restricting fat intake, increasing fruits and vegetable consumption and increasing physical activity as weight control measures may present as health promoting behaviors, extreme measures such as fasting, self-induced vomiting, using diet pills and laxatives are considered health risk behaviors. Thus, potential negative impacts of weight loss behaviors on other associated such as cigarette and substance use should be explored further. Most extreme weight loss studies focused on differences in black and white adolescents previously; and comparative study including Hispanic adolescents is scant.

Therefore, this study examined weight loss and related risk behaviors among multi-ethnic adolescents of Florida. The aim of this study was three fold: first, to assess the prevalence of unhealthy or extreme weight loss practice among Florida adolescents; second, to evaluate the characteristic differences between three weight-loss practice groups (none vs. healthy vs. unhealthy weight loss practice groups) among Florida adolescents; and third, to evaluate the correlates of unhealthy or extreme weight loss practice among Florida adolescents. The definitions of weight loss practice or behavior groups used in this study appear under "Methods" section

METHODS

The Youth Risk Behavior Survey (YRBS) is a school-based anonymous survey of risk behaviors among high school students (grades 9-12). It has been conducted nationally and by more than 50 states, territories, and large cities in odd-numbered years since 1991 in the US²⁰ The study utilized the survey data collected by the Florida Departments of Education and Health from randomly selected high schools in Florida in 2005. The school-based survey used a two-stage cluster (schools and classes were the clusters) sampling design to produce representative samples of students in grades 9 through 12 in Florida. All students in randomly selected classes of randomly selected high schools were eligible to participate²³ For the national, state, territory, and local YRBS samples, schools are selected with probability proportional to the size of student enrollment in grades 9-12 and then required classes of students (e.g., English classes) are randomly selected to participate. Within selected classes,

all students are eligible to participate.²⁰ Detailed data collection and methodology appear elsewhere.²⁰⁻²²

The questionnaire used in the study was developed by the Center for Disease Control and Prevention (CDC) and it was found to be a reliable instrument (Kappa = 61% - 100%). Detailed psychometric properties of it have been published elsewhere.²⁰ Although all students in selected classrooms of high schools were eligible to participate, non-responses occurred. Hence, data analyses used sampling weights which took into account of the complex survey design and non-response rates. In 2005, 4,564 students in 75 public high schools participated and overall response rate was 66%. The response rate in 2005 was considered high enough for the survey to be representative of all Florida public high school students.²³

The YRBS survey were anonymous and only the de-identified data set was used. The Institutional Review Board at Florida International University approved the study. Secondary data were managed and analyzed using the version 8 SAS® software.

To allow for the sampling design and non-response effects, weighted relative frequencies (prevalence) of weight loss behaviors were calculated. Chi-square (χ^2) tests were performed to assess statistical significance of differences between groups. Categorization of the variables was guided by evidence from previous literature and the available sample size in the data. Groups were formed using the following variables: age group (young or ≤ 15 , old or > 15 years), gender (female, male), race/ethnicity (White, African American, Hispanic, others), grade levels (9 through 12), school performance defined by letter grade (mostly As, mostly Bs, Cs or worse grade), perceived body weight (underweight, right weight, overweight), and general health (excellent/very good, good, fair/poor). Weight status based on the BMI percentile adjusted for age, and sex (BMIPCT) was categorized using the CDC criteria: BMIPCT $< 5^{\text{th}}$ percentile (or underweight); $5^{\text{th}} \leq \text{BMIPCT} < 85^{\text{th}}$ percentile (or healthy weight); $85^{\text{th}} \leq \text{BMIPCT} < 95^{\text{th}}$ percentile or at risk for overweight; and BMIPCT $\geq 95^{\text{th}}$ percentile (or overweight).²⁴ In addition, three mutually exclusive groups of outcome (weight loss behaviors) were created using several questions relating to weight loss practices. Details of the 2005 YRBS survey questions that guided the analyses appeared elsewhere.²³ Three weight loss practice or behavior groups were non-dieters, moderate dieters, and extreme dieters. The groups were defined based on the rationale of

whether reasonable approach to weight loss was used or not. For example, healthy weight loss practice includes physical activity and/or calorie restriction at recommended levels. Unhealthy weight loss practice includes extreme methods to lose weight such as fasting, self-induced vomiting, using diet pills or laxatives. These unhealthy weight loss behaviors in adolescents have been shown to increase risk for both eating disorders and obesity.^{13,16,38,39}

Non-dieters were those who were not doing anything about their weight (not gain or lose weight); moderate dieters were those who used at least one healthy weight loss approach (physical activity, lowered calorie consumption) and not used any extreme methods to lose weight; and extreme dieters were those who used at least one unhealthy method to lose weight, (fasting, self-induced vomiting, use of diet pills or laxatives).

The framework that has guided the analyses was based on the facts of (1) *interrelatedness* of risk behaviors and problem proneness behaviors among adolescents and (2) health promoting and risk behaviors associated with weight loss practice. Previous studies indicate that many of the risk-taking behaviors of adolescents are interrelated. Example, cigarette use and initiation for weight loss may lead to initiation of other substances. Hence, we included cigarette smoking alcohol, drug use, sexual risk, and violent behaviors as potential covariates.³⁰⁻³⁵ Health promoting and risk behaviors were also included as covariates based on the literature.^{27,28} The definitions of these variables were based on the standard CDC criteria provided in the YRBS questionnaire. Other health promoting behaviors included physical activity (aerobic and/or leisure activity) level in past 7 days and consumption of four or more servings of fruits and vegetables in past 7 days. Unhealthy risk behaviors included consumption of cookies/candies/sodas in past 7 days and sedentary behavior on average school day (defined by number of hours of TV watching and/or video/computer game use on average day). Other related risk behaviors among adolescents were included. They were use of substances (tobacco/cigarette, alcohol, any illicit drug use), sexual risks (no condom use, injection drug use, multiple sex partners, sex under the influence of substances), delinquent behaviors (violence, runaway), mental health behaviors (suicidal attempt or actual suicide, depression), and history of physical or sexual abuse. Measures of association between several independent factors mentioned above and extreme weight loss behaviors were estimated based on appropriate logistic regression models.²⁵ Logistic regression models were

fitted to assess probability of unhealthy (extreme) weight loss behavior (yes=1; no=0). We used the SAS procedure "proc surveylogistic" using the appropriate cluster and weight statements to account for design effects and weights. The multivariable logistic models adjusted for non-response, complex sampling design (two-staged cluster) used to collect survey data, and potential confounding variables discussed above.

In logistic modeling process, several variables were combined as one variable. There were very few users of individual illicit drug. Therefore, instead of including the use (yes vs. no) of individual illicit drug separately, use of at least one illicit drug (yes vs. no) was created and included in the logistic models. Several models were fitted and three final models were selected and presented: (1) effects of demographic and physical (e.g., BMI percentile) variables alone; (2) effects of health behaviors (e.g., health promoting and risk) alone; and (3) effects of both health behaviors, demographic and physical variables together. Correlates of extreme weight loss behaviors were evaluated and adjusted odds ratios and their corresponding 95% confidence intervals were presented.

RESULTS

Among 4,564 high school students surveyed in 2005, 43.3% of them were trying to lose weight (Table 1). Prevalence of three unhealthy or extreme weight loss behaviors included in the survey were fasting for 24 hours or more (11.7%), use of diet pills/powder/liquid without doctor's advice (6.0%), and use of laxatives and/or purging (5.1%). Extreme dieter group consisted of those who used at least one of the extreme methods described above. Moderate dieter group included those who practiced recommended physical activity level or consumed diet low in calories, fat, or both. Non-dieter group consisted of those who were not doing anything to lose weight. There were 40.1% non-dieters, 44.8% moderate dieters, and 15.1% extreme dieters (**Table 1**).

Table 1

Prevalence of Weight Loss Behavior among Florida High School Students in 2005 (n = 4,564)

Variables	Missing	n	% *	95% Confidence Interval
Current weight control measures	98			
Lose weight		2002	43.27	41.54 - 45.00
Gain weight		797	18.95	17.25 - 20.66
Stay the same weight		910	20.51	19.01 - 22.01
Not doing anything about weight		757	17.27	15.69 - 18.84
Unhealthy weight loss/control practices				
Fasting ≥ 24 hours	114			
Yes		522	11.71	10.14 - 13.28
No		3928	88.29	86.72 - 89.86
Take diet pills/powders/liquids without Doctor's advice	117			
Yes		253	6.02	4.99 - 7.05
No		4194	93.98	92.95 - 95.61
Take laxatives or vomit	117			
Yes		223	5.05	4.39 - 5.70
No		4224	94.95	94.30 - 95.61
Weight loss/control groups	531			
Non-dieters or no weight loss practice		1554	40.14	38.44 - 41.83
Moderate dieters or at least one healthy weight loss practice		1880	44.76	42.46 - 47.06
Extreme dieters or at least one unhealthy weight loss practice		599	15.1	13.41 - 16.80

* weighted %

There were more males among non-dieters and more females among moderate and extreme dieters (Table 2). Race/ethnic distribution of three weight loss groups differed significantly ($p < .01$) with over 50% being whites in each group. About 52.5% (Whites), 25.8% (African Americans), 19.7% (Hispanics) and 2.0% (others) were in extreme weight loss group. Frequencies of perceived body weight as the right weight was highest among non-dieters (64.6%), followed by moderate dieters (54.5%), and extreme dieters (43.4%). Based on the body mass index (BMI) percentile for age and sex, about 73.7%, 55.5%, and 52.4% of non-dieters, moderate, and extreme dieters, respectively, were at healthy weight. About 3.2%, 14.2%, and 14.9% of non-dieters, moderate, and extreme dieters, respectively, were overweight.

Table 2

Characteristics of Florida High School Students by Weight Loss Behavior

	Non-dieters or (No Weight Loss) n = 1554		Moderate dieters or (Healthy Weight Loss) n = 1880		Extreme dieters or (Extreme Weight Loss) n = 599		Missing	p [†]
	n	%	n	%	n	%		
Age group							547	0.091
Young (≤ 15 years)	573	35.34	795	39.87	217	36.64		
Old (> 15 years)	976	64.66	1078	60.13	378	63.36		
Gender							561	<0.0001
Female	541	31.12	1137	57.53	428	68.49		
Male	1002	68.88	730	42.47	165	31.51		
Race/Ethnicity							758	<0.0001
Whites	686	51.61	888	55.85	282	52.54		
African-Americans	353	26.18	307	18.64	123	25.77		
Hispanics	356	20.16	497	23.46	131	19.66		
Others	72	2.05	87	2.05	24	2.03		
Grade Level							585	0.943
9th	475	31.27	606	32.35	185	32.06		
10th	462	25.43	556	26.08	172	27.12		
11th	329	22.57	404	22.73	130	21.27		
12th	269	20.72	290	18.84	101	19.56		
School Performance							2618	0.0001
Mostly As	227	30.42	335	35.68	64	22.63		
Mostly Bs	315	42.36	357	39.01	123	41.99		
Grade C or worse	202	27.22	219	25.31	104	35.38		
Perceived body weight							2496	<0.0001
Very/slightly underweight	222	26.99	37	4.03	31	8.91		
About right weight	505	64.61	531	54.49	134	43.44		
Very/slightly overweight	69	8.4	395	41.48	144	47.64		
General health							610	<0.0001
Excellent/Very Good	1096	71.54	1212	65.91	314	52.97		
Good	350	23.63	534	28.99	205	35.89		
Fair/Poor	82	4.83	99	5.1	62	11.14		
Body Mass Index (Percentile)							531	<0.0001
Underweight: < 5th	275	16.39	232	12.45	95	17.14		
Healthy weight: 5th to < 85th	1129	73.68	1059	55.52	326	52.35		
At risk for overweight: 85th to < 95th	100	6.7	329	17.84	92	15.58		
Overweight: ≥ 95th	50	3.23	260	14.2	86	14.93		

% = weighted %

[†] p-value based on Rao-Scott Chi-Square statistics

Table 2 Continued

	Non-dieters or (No Weight Loss) n = 1559		Moderate dieters or (Healthy Weight Loss) n = 1659		Extreme dieters or (Extreme Weight Loss) n = 508		p ^{††}
	Mean	SE	Mean	SE	Mean	SE	
Height (meters or m)	1.723	0.003	1.688	0.003	1.675	0.005	<0.0001
Weight (kilograms or kg)	63.335	0.425	69.316	0.572	69.278	1.071	<0.0001
Body Mass Index (kg/m²)	21.244	0.111	24.129	0.16	24.526	0.304	<0.0001
Body Mass Index (Percentile)	47.723	1.006	69.545	0.731	70.127	1.317	<0.0001

SE = standard error

^{††} p-value based on Fisher F statistics

The odds of unhealthy or extreme weight loss behaviors among Florida adolescents were evaluated by considering the effects of demographic and physical measures alone (Table 3a); health promoting and health risk variables alone (Table 3b); and health promoting and risk variables as well as demographic and physical measures (Table 3c). Among the demographic and physical measures (Table 3a), gender, race/ethnicity, school performance, perceived body weight, and actual weight by BMI percentile were significant correlates of extreme weight loss behavior. However, age and general health status were not significantly related to extreme weight loss behavior. Compared to healthy-weight (referent group) adolescents, those at risk for overweight and overweight adolescents were 2 and 3 times, respectively, likely to exhibit extreme weight loss behavior significantly. Those who received mostly B's and C's or worse grades were about 2 to 3 times likely to practice

extreme weight loss behavior compared with those who received mostly A's in school (Table 3a).

Table 3a

Demographic and Physical Correlates of Extreme Weight Loss Behavior

Risk factors	Adjusted OR	95% CI		p
Age group				0.3002
Old (> 15 years)	0.858	0.595	1.237	0.4127
Young (≤ 15 years)	1			
Gender				< 0.0001
Female	11.06	7.49	16.331	< 0.0001
Male	1			
Race/Ethnicity				0.0095
Other	2.421	0.741	7.91	0.4349
African-American	1.824	1.141	2.915	0.0299
Hispanic	2.436	1.108	5.355	0.207
White	1			
School Performance				< 0.0001
Grade C or worse	3.088	2.072	4.603	< 0.0001
Mostly Bs	1.927	1.288	2.884	0.0014
Mostly As	1			
Perceived body weight				< 0.0001
Very/slightly underweight	0.38	0.226	0.639	0.0003
Very/slightly overweight	6.523	4.679	9.093	< 0.0001
About right weight	1			
General health				0.0059
Fair/Poor	0.874	0.431	1.775	0.71
Good	0.968	0.647	1.449	0.8745
Excellent/Very Good	1			
Body Mass Index (Percentile)				< 0.0001
Underweight: < 5th	0.767	0.439	1.342	0.3529
At risk for overweight: 85th to < 95th	2.101	1.241	3.556	0.0057
Overweight: ≥ 95th	3.29	1.824	5.935	< 0.0001
Healthy weight: 5th to < 85th	1			

CI= confidence interval
All odds ratios (ORs) were mutually adjusted for the other variables in the table.

Only the significant health promoting and risk factors were retained in the model and presented in table 3b. Those who consumed snacks or sodas in past 7 days were protective of extreme weight loss practice compared with the referent group that did not consume snacks or sodas. Drinkers (binge drinkers) and illicit drug users were more likely to exhibit extreme weight loss practice compared to their referent counterparts (non-drinkers and nonusers). Cigarette smokers and delinquents were less likely to exhibit extreme weight loss behavior compared with their non-smoker or non-delinquent peers. Those who had suicidal (attempted or actual) past were 2.3 (95% CI: 1.6 -3.4) times likely to be extreme dieters compared with those who did not have suicidal history Likewise, a history of depression in past 12 months was a risk (OR=2.3, 95% CI=1.6 - 3.2) factor for extreme weight loss behavior (Table 3b).

Table 3b

Health Promoting and Risk Correlates of Extreme Weight Loss Behavior

Risk factors	Adjusted OR	95% CI		p
Aerobic & leisure physical activity past 7 days				0.0193
No	1.063	0.799	1.414	0.6754
Yes	1			
Snacks or Sodas Past 7 days				< 0.0001
Yes	0.494	0.349	0.701	< 0.0001
No	1			
Alcohol use for past 30 days: Binge drinking				0.0356
Yes	1.876	1.149	3.065	0.0119
No	1			
Illicit drug use past 30 days: At least one of 7 illicit drugs				0.0359
Yes	2.27	1.203	4.284	0.0114
No	1			
Age of initiation of marijuana				0.0211
≥ 15 years	0.578	0.276	1.214	0.1477
< 15 years	0.342	0.148	0.793	0.0124
Never tried	1			
Cigarette Smoking past 30 days				0.0016
Yes	0.468	0.307	0.714	0.0004
No	1			
Suicide in past 12 months: Attempted or actual suicide				< 0.0001
Yes	2.345	1.624	3.387	< 0.0001
No	1			
Depression in past 12 months				< 0.0001
Yes	2.292	1.626	3.23	< 0.0001
No	1			
Delinquent behavior past 12 months: At least one delinquent behavior				< 0.0001
Yes	0.719	0.503	1.029	0.0711
No	1			

CI= confidence interval
All odds ratios (ORs) were mutually adjusted for the other variables in the table.

When effects of health promotion/risk behaviors, demographic and physical variables were simultaneously adjusted for each other (Table 3c), African Americans, cigarette smokers, and underweight (perceived or actual) adolescents were protective (OR < 1) of extreme dieting compared with their corresponding referent groups. Those who were delinquent, used alcohol or illicit drugs, and had history of suicide and depression were significant risk factors of extreme dieting. School performance as defined by letter grade remained significant with higher risks among adolescents with worse grades (Bs, Cs, or worse grades) compared with better grade (mostly A's) counterparts. Not surprisingly, those who perceived themselves as overweight (OR=7.7, 95% CI=5.4 - 11.0) or were actually overweight (defined by BMI percentiles) (OR=2.8, 95% CI=1.1 - 6.8) were significantly more likely to be extreme dieters than their normal weight peers (Table 3c).

Table 3c

Demographic, Physical, Health Promoting and Risk Correlates of Extreme Weight Loss Behavior

Risk factors	Adjusted OR	95% CI		p
		Lower	Upper	
Aerobic & leisure physical activity past 7 days				<0.0001
No	0.523	0.374	0.73	0.0001
Yes	1			
Snacks or Sodas Past 7 days				0.0516
Yes	0.683	0.463	1.009	0.0556
No	1			
Alcohol use for past 30 days: binge drinking				0.0712
Yes	1.831	1.074	3.121	0.0262
No	1			
Illicit drug use past 30 days: At least one of 7 illicit drugs				0.0217
Yes	2.635	1.304	5.327	0.007
No	1			
Age of initiation of marijuana				0.0262
≥ 15 years	0.464	0.216	0.996	0.0488
< 15 years	0.277	0.116	0.663	0.004
Never tried	1			
Cigarette Smoking past 30 days				0.0045
Yes	0.442	0.271	0.721	0.0011
No	1			
Suicide in past 12 months: Attempted or actual suicide				0.0569
Yes	1.706	1.101	2.645	0.0149
No	1			
Depression in past 12 months				0.0002
Yes	1.782	1.125	2.825	0.0139
No	1			
Delinquent behavior past 12 months: At least one delinquent behavior				0.017
Yes	1.233	0.83	1.83	0.2996
No	1			
Gender				<0.0001
Females	15.386	9.297	25.462	<0.0001
Males	1			
School Performance				0.002
Grade C or worse	2.144	1.421	3.234	0.0003
Mostly Bs	1.734	1.121	2.684	0.0134
Mostly As	1			
Perceived body weight				<0.0001
Very slightly underweight	0.264	0.161	0.433	<0.0001
Very slightly overweight	7.67	5.37	10.956	<0.0001
About right weight	1			
Body Mass Index (Percentile)				<0.0001
Underweight: <5th	0.824	0.439	1.546	0.5462
At risk for overweight: 5th to <95th	1.884	1.011	3.508	0.046
Overweight: ≥ 95th	2.753	1.312	6.813	0.0285
Healthy weight: 5th to < 85th	1			
Race/Ethnicity				0.0046
Other	1.442	0.474	4.386	0.5193
African-American	0.880	0.532	1.475	0.6414
Hispanic	1.714	0.992	2.964	0.0536
White	1			

CI= confidence interval
All odds ratios (ORs) were mutually adjusted for the other variables in the table.

DISCUSSION

To the authors' knowledge, this is the first report that has evaluated the correlates of extreme weight loss behavior among Florida adolescents, using multivariable models adjusting for non-response and complex sampling design used to collect survey data. Extreme weight loss behavior among Florida high school students were found to be common (>15%). Although prevalent varied, consistent findings were found in other large studies across the US.^{15,17,26-28} In this study, more females were using either moderate/healthy or extreme/unhealthy methods to lose weight than males. Race/ethnic distributions also varied by weight loss practice (moderate or extreme weight loss). Such differences by gender and race/ethnicity were similarly found among non-Floridian adolescents.²⁷⁻²⁹ Based on the age-sex-specific BMI percentile for the U.S. adolescents, more than 50% of extreme dieters in the current study were found to be at healthy weight (5th – 85th percentile). Alarming about 17% of underweight (< 5th percentile) were using extreme methods to lose weight. These

results called for urgent public health intervention. And the emphasis of public health effort should not only concentrate on obesity prevention but also on prevention of unhealthy weight loss practice among Florida adolescents.

Most previous studies evaluated the association of extreme weight loss behavior to other health-risk behaviors, but the actual weight status of extreme dieters had not been reported. Hence, consistency of the association between actual weight-status and extreme weight loss behavior cannot be evaluated. The studies that evaluated the weight loss behavior and other health-risk behaviors primarily focused on a few risk factors such as initiation of cigarette use,^{14,30} diet, physical activity, and/or cigarette use.^{6,31} Very few studies^{8,27-28} examined the association of multiple health-risk behaviors with extreme weight loss behavior as in this study. Current study examined multiple health-risk behaviors based on the theory of problem-proneness behavior among adolescents. Adolescence is a high-risk stage of life for health and many of the risk-taking behaviors of adolescents are interrelated (e.g., cigarette use to lose weight, cigarette use as a stepping stone is linked to alcohol, and drug use which can lead to initiation of sex at early age, delinquent behaviors, poor academic performance etc).³²⁻³⁵

Extreme weight loss behavior was associated with both alcohol and cigarette use in this study as observed in the studies among Minnesota⁸ and South Carolina²⁸ adolescents. Consistent with current study, history of suicide²⁸ was linked to extreme dieting. Neumark-Sztainer, et al.,²⁷ indicated that unhealthy weight loss and suicidal involvement co-existed and labeled them as “quietly disturbed” behaviors among adolescents. Our study did not find specific association between the sexual risk behaviors and extreme dieting but co-existence of sexual risk and unhealthy weight loss behaviors along with suicidal ideation, delinquent, and substance use behaviors was found in another adolescents' study.²⁷

Prevention interventions should take into account the tendency for health risk behaviors to co-exist among adolescents. Prevention programs in Florida should be tailored to fit the gender-ethnic-specific groups. In addition, weight loss strategies used should be considered. Those engaging in healthy nutrition and exercise program versus those using purgatives or fasting to lose weight can have different implications for both physical and mental health.

The results of this report may be generalized to Florida adolescents because those surveyed included a representative

sample of high school students in the state of Florida. However, the study has some limitations.

LIMITATIONS

First, the temporal relationship between several of these correlates and extreme weight loss behavior outcome could not be determined because the data were collected cross-sectionally. Second, the CDC's YRBS instrument does not specifically define "extreme" weight loss behavior. Extreme weight loss in this study was defined by available information from the questionnaire and it did not include method such as extreme or excess/vigorous exercise to lose weight. Hence, the number of extreme dieters may be a biased estimate.

Third, the YRBS collected information from self-report which may be subject to recall bias and a social-desirability trait among participants. However, self-reported data may be the most effective and reliable way of obtaining sensitive information from adolescents. Fourth, the data collected may be applicable to adolescents in Florida schools but may not be representative of all adolescents in this age group.^{22,36} Adolescents who are school dropouts or who are not attending school regularly may conceivably be more likely to exhibit risk behaviors, compared with those attending school. Thus, those excluded from the survey (e.g., dropouts) may possibly have impacted the results. Further, Fry³⁷ indicated that school drop outs may differ by race/ethnic groups. Finally, Hispanic or Latino students²¹ may be representative of Hispanics in Florida in this study, but they may be different from Hispanic populations in other parts of the nation (e.g., Puerto Ricans in New York versus Mexican Americans in Texas).

CONCLUSIONS

Extreme weight loss practice among Florida adolescents is about 15%. Over half (52.5%) of extreme dieters are whites. About 25.8% of blacks, and 19.7% of Hispanics use extreme weight loss practice as well. Compared to the boys, girls are 15 times (adjusted OR: 15.4; 95% CI: 9.3 – 25.5) likely to be extreme dieters. Due to gender and race/ethnic differences in weight loss behaviors, culturally-appropriate and sensitive health education and promotion programs may be beneficial for Florida adolescents.

Weight status is associated with weight loss behavior in Florida adolescents. Over 52% of extreme dieters are in healthy weight as defined by age-sex-specific BMI percentile.

While overweight or at risk for overweight adolescents' attempt to lose weight is understandable, their extreme weight loss approach is also a concern.

A complex constellation of health risk factors is associated with extreme weight loss behavior in adolescents, thus, targeted health education may be challenging in this age group. However, evidence of inter-relatedness of risk behaviors among adolescents is too strong not to rise above this challenge. Comprehensive school health programs in Florida schools is warranted.

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