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Healthy and unhealthy weight-control behaviors among Minnesota youth

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Minnesota Department of **Human Services**
Performance Measurement and Quality Improvement Division

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By

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This is the third and last in a series of reports on issues related to overweight/obesity among Minnesota youth.

Copies of this report and the other reports, including the reports on adult obesity, can be printed from www.dhs.state.mn.us/healthcare/studies

Background

In the first two reports on youth obesity, we learned that more than one in five (22.1%) Minnesota students in grades 9 and 12 were either overweight or obese and almost one in four (23.9%) viewed themselves as overweight regardless of their actual body weight. The comparable estimates for nationwide youth[1] are 28.8% and 29.3%, respectively. Although the overall overweight/obesity rate is lower among Minnesota youth than nationwide youth, it is far from the 5% goal set in the federal government's *Healthy People 2010*.[2]

To control the epidemic level of overweight and obesity among children and adolescents, weight management through healthy eating habits and a more active lifestyle is critical. However, barriers to a more active and healthier lifestyle, the stigma of obesity, and the desire for a "quick fix" of the problem may lead children and adolescents to a path of unhealthy weight-control practices, such as fasting, purging, smoking and using drugs.

Studies suggest that substantial proportions of adolescents are engaged in excessive weight-control behaviors.[3,4] Paradoxically, instead of "fixing" the obesity problem, the unhealthy weight-control behaviors may increase the problem of overweight and obesity. In fact, the use of maladaptive compensatory behaviors, such as vomiting, laxative abuse, and dietary restraint, were found to be associated with an increased risk for obesity onset.[5] Research has demonstrated that dieting behaviors vary across socio-demographic characteristics such as gender, age, socioeconomic status and race/ethnicity.[2,6] In addition, dieting is found to be associated with perceived rather than actual overweight, especially among girls. [4,7]

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[1] Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance – United States, 2007. *Surveillance Summaries* June, 2008. *MMWR* 57 (SS-4). Available online at www.cdc.gov/HealthyYouth/yrbs/pdf/yrbss07_mmwr.pdf

[2] U.S. Department of Health and Human Services. *Healthy People 2010*. 2nd edition. 2 volumes. Washington, DC: U.S. Department of Health and Human Services, 2000. Available online at www.healthypeople.gov/Document/tableofcontents.htm#Volume2

A compilation of the 21 critical health objectives for adolescents and young adults are available online at www.cdc.gov/HealthyYouth/AdolescentHealth/NationalInitiative/pdf/21objectives.pdf.

[3] Croll J, Neumark-Sztainer D, Story M, Ireland M. Prevalence and risk and protective factors related to disordered eating behaviors among adolescents: Relationship to gender and ethnicity. *Journal of Adolescent Health* 2002; 31:166-175.

[4] Lynch WC, Heil DP, Wagner E, Havens MD. Ethnic differences in BMI, weight concerns, and eating behaviors: Comparison of Native American, White, and Hispanic adolescents. *Body Image.* 2007; 4:179-190.

[5] Stice E, Presnell K, Shaw H, Rohde P. Psychological and behavioral risk factors for obesity onset in adolescent girls: a prospective study. *J Consulting and Clinical Psychology*. 2005; 73(2):195-202.

[6] Strauss RS. Self-reported weight status and dieting in a cross-sectional sample of young adolescents: National Health and Nutrition Examination Survey III. *Arch Pediatr Adolesc Med.* 1999;153:741-747.

[7] Smolak L. Body image in children and adolescents: Where do we go from here? *Body Image* 2004; 1:15-28.

Minnesota youth

This report, the last of a series on obesity among Minnesota youth, examines their weight-control behaviors in relation to various socio-demographic variables as well as body mass index (BMI)-based body weight and weight perception. First, the overall weight-control behaviors will be examined, then they will be divided into two groups – healthy vs. unhealthy weight-control behaviors – and each will be examined separately.

Data are from the Minnesota Student Survey (MSS) conducted in spring 2007. MSS is administered statewide every three years to public school students in grades 6, 9, and 12. All public school districts are invited to participate and student participation is voluntary. In 2007, 309 of the 338 public school districts (91%) participated with an overall student participation of 72%.[8] Students in grade 6 were not asked about weight-control behaviors or about their height and weight. This report is based on the data from 50,713 9th graders and 36,755 12th graders.

The table below shows the characteristics of participating students. Gender is evenly divided in both grades. Overall, about one in five students (20%) are members of a minority population or of mixed racial/ethnic background. The proportion of minority students is higher in grade 9 than in grade 12. About 23.5% of 9th graders and 17.1% of 12th graders reported receiving a free or reduced-price lunch at school, which was used as a proxy measure for low-income status.

Characteristics of survey participants

		Grade 9 %	Grade 12 %	Total %
Gender	Female	50.7	50.4	50.6
Race/Ethnicity	White	77.3	83.8	80.0
	American Indian	1.4	.8	1.1
	Black	5.2	3.7	4.6
	Hispanic	3.8	2.6	3.3
	Asian or Pacific Islander	5.3	4.7	5.0
	Mixed	7.1	4.4	5.9
Household Income	Currently get a free or reduced-price lunch at school	23.5	17.1	20.8
Metro residence	Metro	58.5	56.8%	57.8%
BMI-based Weight Status	Underweight	2.1	2.8	2.4
	Healthy weight	75.4	75.6	75.5
	Overweight	13.4	12.4	13.0
	Obese	9.1	9.2	9.1
Weight Perception	Underweight	9.3	8.6	9.0
	About the right weight	67.8	66.2	67.1
	Overweight	22.9	25.2	23.9

[8] More detailed information about MSS is available online at www.dhs.state.mn.us/MSS

Using the self-reported height and weight information, a BMI score was computed for each student using the standard formula of weight/height^2 (kg/m^2). Based on Centers for Disease Control growth charts,[9] students with a BMI at or above the 95th percentile for children of the same age and sex were categorized as "obese," and those with a BMI score at or above the 85th percentile but below the 95th percentile were categorized as "overweight." [10] Students whose BMI scores were below the 5th percentile were categorized as "underweight." About 9.1% of Minnesota students in grades 9 and 12 were obese, with an additional 13% being overweight.[11] About three-quarters of them (75.5%) had a healthy weight and 2.4% were underweight.

Weight perception was measured by asking, "At the present time, do you think you are underweight, about the right weight, or overweight?" Just over two-thirds of students in grades 9 and 12 (67.1%) thought they were about the right weight, 23.9% thought they were overweight, and 9.0% thought they were underweight.[12]

Weight-control behaviors were more prevalent among females, heavier students, and among those who considered themselves overweight regardless of their actual body weight. Among females, black students had a significantly lower prevalence of weight-control behaviors than the others. Among males, minorities (except blacks) had a higher prevalence of weight-control behaviors than whites.

Weight-control behavior was measured by asking if they had done any of the following to lose or control their weight during the past 12 months: exercising; eating healthier; fasting or skipping meals; smoking cigarettes; using diet pills, speed or other drugs; vomiting on purpose after eating; or using laxatives. Overall, about 63.6% of students (80.4% of overweight or obese students) reported doing at least one of these weight-control behaviors. Of those students who had tried to lose or control their weight, only about 28.1% were overweight or obese, while a majority of them had a healthy weight (70.6%) or were underweight (1.3%).

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[9] Kuczmarski RJ, Ogden CL, Guo SS, Grummer-Strawn LM, Flegal KM, Mei Z, et al. 2000 CDC growth charts for the United States: methods and development. Vital Health Stat 11 2002; 246:1–190.

[10] In 2007, an Expert Committee, comprised of representatives from 15 professional organizations, including American Medical Association, recommended using "overweight" and "obesity", in place of the previous categories "at risk of overweight" and "overweight" respectively (Barlow S & the Expert Committee. Expert Committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: Summary report. Pediatrics. 2007; 120:s164-s192).

[11] Park E. Overweight youth in Minnesota, their eating habits and the level of physical activity: Data from 2007 Minnesota Student Survey. Available online at www.dhs.state.mn.us/healthcare/studies.

[12] Park E. Feeling overweight vs. being overweight: Accuracy of weight perception among Minnesota youth. Available online at www.dhs.state.mn.us/healthcare/studies.

The table below shows the prevalence of weight-control behaviors by major socio-demographic variables as well as body weight status and weight perception. Female students were more likely than males to report weight-control behaviors. More than three-quarters (76.6%) of female students and about half (49.9%) of male students had tried to lose or control their weight (adjusted odds ratio[13] for female=3.215, p<.001). Among male students, 12th graders were less likely than 9th graders to report weight-control behaviors (adjusted odds ratio=.843, p<.001), while no significant difference was found among female students.

Household income, measured by whether one gets a free or reduced-price lunch at school, shows an interesting interaction with gender in predicting weight-control behaviors. Male students from low-income households were more likely than their more affluent counterparts to have engaged in weight-control behaviors during the past year (55.1% vs. 48.6%; adjusted odds ratio=1.112, p=.001). Female students from low-income households, however, were less likely than their more affluent counterparts to have engaged in weight-control behaviors (74.7% vs. 77.1%; adjusted odds ratio=.812, p<.001). Multivariate analysis found residence in the metro area had no significant effect on overall weight-control behaviors.

Prevalence of weight-control behaviors by major variables

		Male %	Female %	Total %
Grade	9th	51.6	76.5	64.4
	12th	47.6	76.6	62.4
Race/Ethnicity	White	48.1	77.3	63.2
	American Indian	58.6	78.7	68.1
	Black	50.7	62.6	56.5
	Hispanic	60.0	78.1	69.0
	Asian/Pacific Islander	59.3	75.8	68.0
	Mixed	57.3	77.0	68.1
Household Income	Low	55.1	74.7	65.5
	High	48.6	77.1	63.1
Residence	Non-metro	49.9	78.0	64.1
	Metro [a]	49.9	75.6	63.2
BMI-based Weight Status	Underweight	28.1	41.9	34.9
	Healthy weight	41.3	74.1	59.2
	Overweight/Obese	73.1	91.0	80.4
Weight Perception	Underweight	29.7	43.6	34.0
	About the right weight	45.1	70.6	57.6
	Overweight	83.7	94.6	90.8

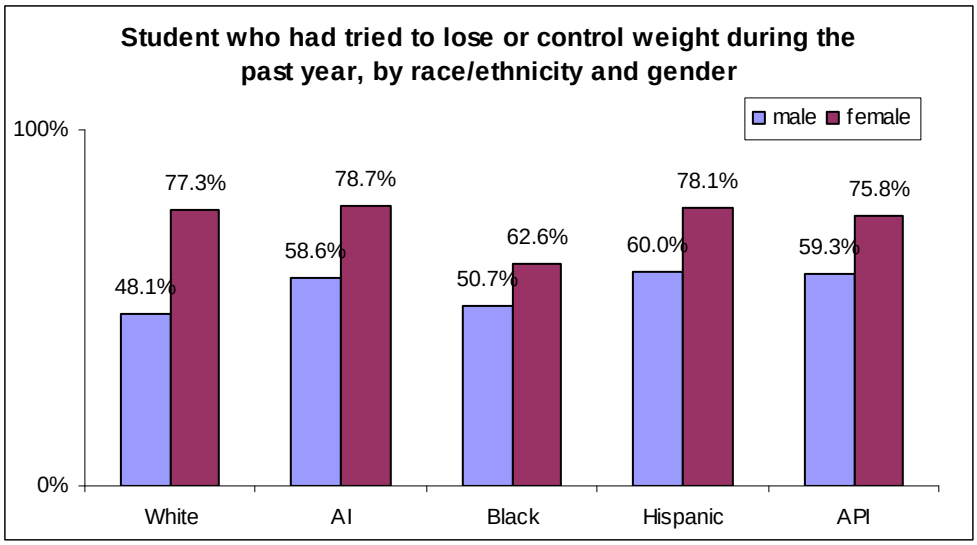
[a] Metro was defined as the 7 metro counties (Hennepin, Ramsey, Anoka, Carver, Scott, Dakota, Washington), as well as Stearns and St. Louis counties.

[13] Adjusted odds ratios reported throughout the report are from multivariate regression analyses controlling for all the other factors discussed. Full results of regression analyses are reported in the Appendix.

Compared to students with a healthy weight, overweight or obese students were more likely to report weight-control behaviors (80.4% vs. 59.2%; adjusted odds ratio=1.888, p<.001), while underweight students were less likely to report them (34.9% vs. 59.2%; adjusted odds ratio=.508, p<.001). The results were similar when the analysis was conducted for each gender separately. In addition, the prevalence of weight-control behaviors was consistently higher among female students than their male counterparts, regardless of their body weight status. For example, just under three-quarters of female students with a healthy weight (74.1%), compared to 41.3% of their male counterparts, reported weight-control behaviors. The prevalence was 91.0% of females vs. 73.1% of males among those who were overweight or obese, and 41.9% of females vs. 28.1% of males among those who were underweight.

A similar pattern was found for weight perception. For both genders, compared to those who thought they were about the right weight, students who considered themselves to be overweight were more likely to report weight-control behaviors (adjusted odds ratio=5.270, p<.001), and those who considered themselves to be underweight were less likely to report weight-control behaviors (adjusted odds ratio=.563, p<.001). In addition, the prevalence was higher among females than males regardless of their weight perception. Among those who considered themselves to be overweight, 94.6% of females and 83.7% of males had tried to lose or control their weight. Even among those who thought they were about the right weight, 70.6% of females vs. 45.1% of males reported weight-control behaviors. A significant proportion of students who thought that they were underweight (43.6% of females and 29.7% of males) also reported weight-control behaviors during the past year.

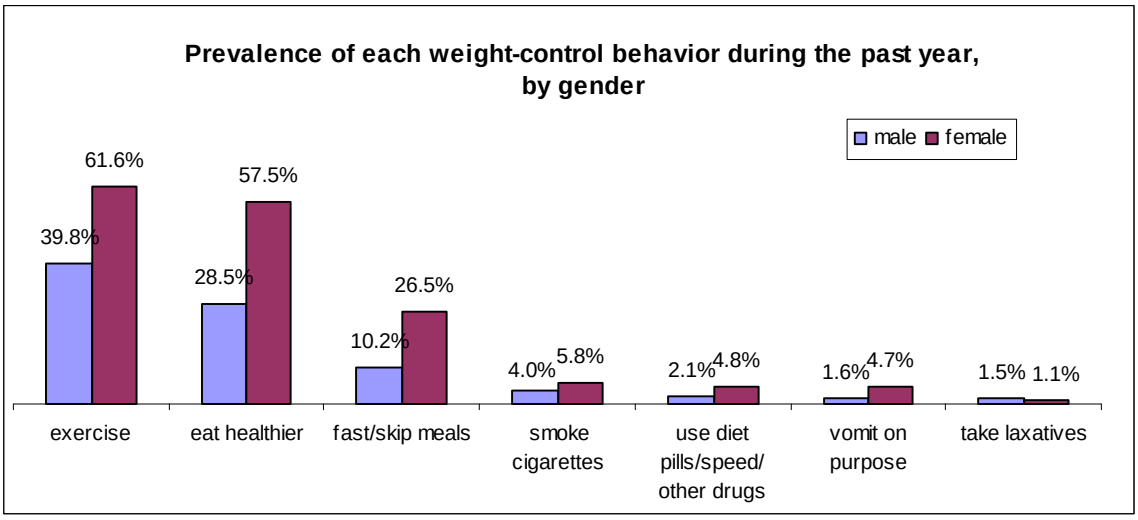
The chart below presents the distribution of prevalence of weight-control behaviors across racial/ethnic subgroups. Across all racial/ethnic subgroups, female students were more likely than their male counterparts to report weight-control behaviors. Among females, there is not much difference in the overall prevalence of weight-control behaviors across racial/ethnic subgroups with an exception of black students who showed the lowest prevalence with 62.6%. When only the students who were overweight or obese were compared, black females had the lowest prevalence of weight-control behaviors (83%) while their white counterparts had the highest prevalence (92.5%). The multivariate analysis found that even when other factors were controlled, black females were significantly less likely to report weight-control behaviors, compared to white females as well as other minority subgroups (adjusted odds ratio for black=.512 with 95% CI = .450 ~ .582).



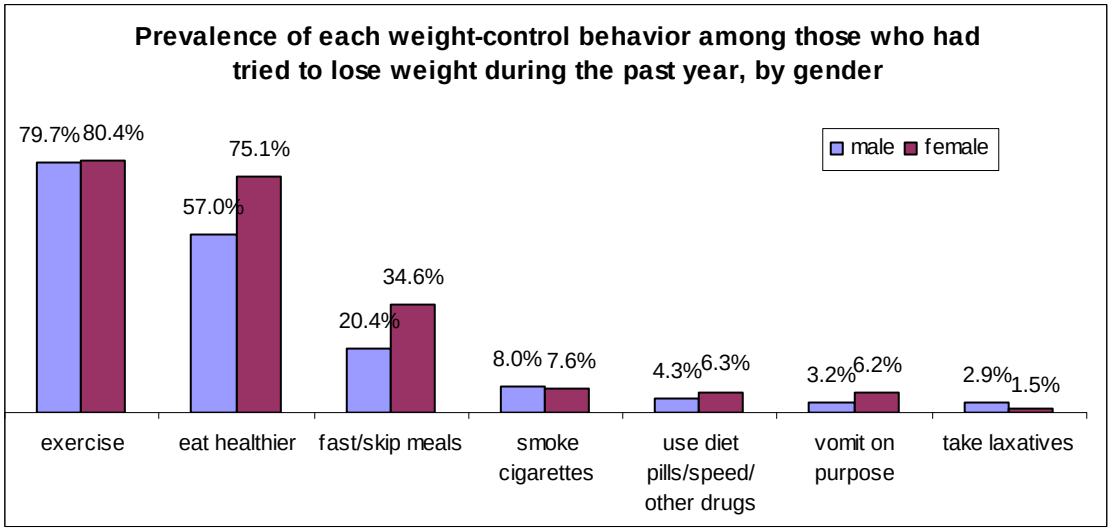
Among male students, on the other hand, whites had the lowest prevalence of weight-control behaviors (48.1%), and even when other factors were controlled in multivariate analysis, all the minority subgroups, except blacks, were significantly more likely to report weight-control behaviors (adjusted odds ratios are 1.270, $p<.05$ for American Indians (AI); 1.363, $p<.001$ for Hispanics; 1.433, $p<.001$ for Asian Pacific Islanders (API); 1.084, $p=.172$ for blacks).

Exercising and eating healthier were the most reported weight-control behaviors, followed by fasting/skipping meals and smoking cigarettes. Females, compared to males, were twice as likely to report eating healthier, fasting or skipping meals and using drugs to lose or control weight, and about three times more likely to report vomiting on purpose after eating.

Of the various weight-control behaviors asked in the survey, exercising and eating healthier were the top two most reported behaviors, followed by fasting/skipping meals and smoking cigarettes. Reflecting the fact that more females than males tried to lose or control weight (76.6% vs. 49.9%), the prevalence of each behavior, except taking laxatives, was higher among female students than males. Compared to males, female students were twice as likely to report eating healthier (57.5% vs. 28.5%), fasting or skipping meals (26.5% vs. 10.2%) and using diet pills, speed or other drugs (4.8% vs. 2.1%); about three times more likely to report vomiting on purpose after eating (4.7% vs. 1.6%).



When only those who reported a weight-control behavior during the past year were examined, females were more likely than males to report eating healthier (75.1% vs. 57.0%), fasting or skipping meals (34.6% vs. 20.4%), using diet pills, speed or other drugs (6.3% vs. 4.3%), and vomiting on purpose after eating (6.2% vs. 3.2%). There was not much gender difference in exercising (80.4% of females and 79.7% of males) or smoking cigarettes (7.6% of females and 8.0% of males).



For the rest of the report, weight-control behaviors are divided into two groups: healthy (exercise or eat healthier) and unhealthy (fasting/skipping meals, smoking, using diet pills/speed/other drugs, vomiting on purpose, taking laxatives) Each is examined in relation to various socio-demographic variables as well as BMI-based body weight status and weight perception.

Almost three in five students reported healthy weight-control behaviors during the past year. These behaviors were more prevalent among females, heavier students, and those who considered themselves overweight regardless of their actual weight. Black students, both genders, had the lowest prevalence of healthy weight-control behaviors. Minority females and females from low-income households were less likely than their counterparts to report healthy weight-control behaviors.

Overall, 58.9% of Minnesota students (73.9% of overweight or obese students) reported healthy weight-control behaviors, such as exercising and eating healthier, during the 12 months before survey. A vast majority (71.1%) of those reporting such healthy weight-control behaviors had a healthy weight, while only 27.6% were overweight or obese.

The table below shows the prevalence of healthy weight-control behaviors by major variables. Overall, females were more likely than males to report healthy weight-control behaviors (71.5% vs. 45.6%; adjusted odds ratio=2.862, p<.001). Across all subgroups, females consistently showed a higher prevalence of healthy behaviors than males.

Prevalence of healthy weight-control behaviors by major variables

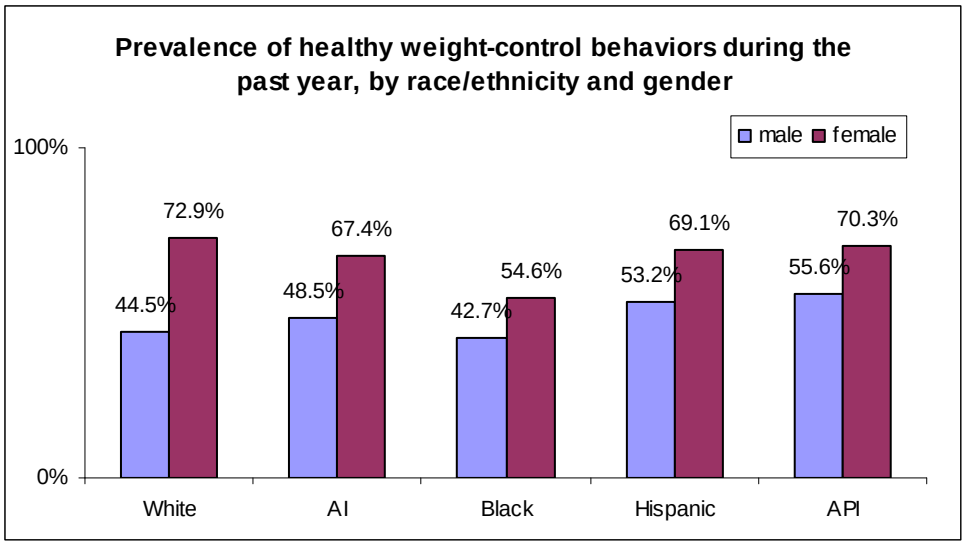
		Male %	Female %	Total %
Grade	9th	47.7	71.3	59.8
	12th	42.7	71.8	57.6
Race/Ethnicity	White	44.5	72.9	59.1
	American Indian	48.5	67.4	57.5
	Black	42.7	54.6	48.5
	Hispanic	53.2	69.1	61.1
	Asian/Pacific Islander	55.6	70.3	63.4
	Mixed	51.2	70.7	61.9
Household Income	Low	48.9	66.7	58.4
	High	44.8	72.8	59.0
Residence	Non-metro	45.1	72.3	58.9
	Metro [a]	45.9	70.9	58.8
BMI-based Weight Status	Underweight	23.8	38.1	30.8
	Healthy weight	38.7	69.8	55.6
	Overweight/Obese	66.9	84.1	73.9
Weight Perception	Underweight	24.8	37.7	28.8
	About the right weight	42.2	67.4	54.5
	Overweight	74.3	86.0	81.9

[a] Metro was defined as the 7 metro counties (Hennepin, Ramsey, Anoka, Carver, Scott, Dakota, Washington), as well as Stearns and St. Louis counties.

Among male students, 12th graders were less likely than 9th graders to report healthy weight-control behaviors (42.7% vs. 47.7%; adjusted odds ratio=.801, p<.001), while there was no significant difference among females. Female students from low-income households were less likely than their more affluent counterparts to report healthy weight-control behaviors (66.7% vs. 72.8%; adjusted odds ratio=.727, p<.001). While male students from low-income households were more likely than their counterparts to report healthy weight-control behaviors, the difference was not significant when other factors were considered in the analysis (48.9% vs. 44.8%; adjusted odds ratio=1.045, p=.158). In addition, multivariate analyses found that when other factors were controlled, male students in non-metro areas were less likely than their counterparts in the metro area to report healthy weight-control behaviors (adjusted odds ratio=.952, p<.05).

The prevalence of healthy weight-control behaviors increased across the categories of body weight status from 'underweight' through 'healthy weight' to 'overweight/obese' (30.8%, 55.6% and 73.9%). Similarly, the prevalence of healthy behaviors increased across the categories of weight perception from 'underweight' through 'about the right weight' to 'overweight' (28.8%, 54.5% and 81.9%). Multivariate logistic regression analyses showed that both BMI-based body weight status and weight perception had a similar relationship with healthy behaviors. That is, compared to their healthy weight counterparts, overweight or obese students were more likely to report healthy weight-control behaviors while underweight students were less likely to report them (adjusted odds ratio=1.741, p<.001 for overweight/obese students;.502, p<.001 for underweight students). In addition, compared to students who considered themselves to be about the right weight, those who considered themselves as overweight were more likely to report healthy weight-control behaviors (adjusted odds ratio=2.911, p<.001), while those who considered themselves to be underweight were less likely to report them (adjusted odds ratio=.426, p<.001). Similar patterns appeared when the analysis was conducted for each gender separately (see Appendix for detailed results).

The chart below presents the distribution of prevalence of healthy weight-control behaviors across racial/ethnic subgroups for each gender. Among females, more than seven in 10 white students (72.9%) reported having tried to lose or control weight by either eating healthier or exercising during the past year. The prevalence of such healthy weight-control behaviors was lower among minority females with black females having the lowest prevalence of 54.6%. Even when other factors were considered, minority female students were less likely than their white counterparts to report healthy weight-control behaviors, with an exception of APIs (adjusted odds ratio=.668, p<.01 for AI; .512, p<.001 for black; .851, p<.05 for Hispanic).



Among male students, 44.5% of whites reported healthy weight-control behaviors, and the prevalence was higher among their minority counterparts except blacks who had the lowest prevalence of 42.7%. When other factors were controlled in multivariate analysis, Hispanic and Asian/Pacific Islander males were significantly more likely to report healthy weight-control behaviors than white or black males (adjusted odds ratio compared to white=1.244, $p<.01$ for Hispanic; 1.445, $p<.001$ for API). When only the overweight or obese students were examined, black males were significantly less likely than their white counterparts to report healthy behaviors (the prevalence was 66.8% among whites and 59.1% among blacks; an adjusted odds ratio for black = .791, $p<.05$).

About one in five students reported unhealthy weight-control behaviors during the past year, and a majority of them were not overweight or obese. Unhealthy weight-control behaviors were more prevalent among females, 12th graders, students from low-income households, and students in non-metro areas than their respective counterparts. Compared to white females, American Indian females were more likely to report unhealthy weight-control behaviors while black females were less likely to report them.
Weight perception was a more consistent factor than BMI-based weight status in predicting weight-control behaviors.

This section examines unhealthy weight-control behaviors, such as fasting/skipping meals, smoking, using diet pills/speed/other drugs, vomiting on purpose, and taking laxatives. Overall, 22.2% of Minnesota students (30.5% of overweight or obese students) reported unhealthy weight-control behaviors. A majority (67.4%) of those who reported

unhealthy weight-control behaviors had a healthy weight, while 31.1% were overweight or obese.

The table below shows the prevalence of unhealthy weight-control behaviors by major variables. As in the case of healthy behaviors, female students were more likely than male students to report unhealthy weight-control behaviors (29.9% vs. 14.0%; adjusted odds ratio=2.386, p<.001), and this was consistent across all the categories of major variables listed in the table.

The prevalence of unhealthy weight-control behaviors was higher among 12th graders than 9th graders for both genders (adjusted odds ratio=1.390, p<.001 for males; 1.132, p<.001 for females). Students from low-income households, both genders, were more likely than their more affluent counterparts to report unhealthy weight-control behaviors (adjusted odds ratio=1.241, p<.001 for males; 1.207, p<.001 for females). In addition, students in non-metro areas were more likely than those in the metro area to report unhealthy behaviors (adjusted odds ratio=1.273, p<.001 for males; 1.149, p<.001 for females).

Prevalence of unhealthy weight-control behaviors by major variables

		Male %	Female %	Total %
Grade	9th	12.5	28.7	20.8
	12th	16.0	31.6	24.0
Race/Ethnicity	White	12.9	28.9	21.2
	American Indian	19.5	41.2	29.8
	Black	14.2	25.7	19.8
	Hispanic	16.7	34.7	25.6
	Asian/Pacific Islander	15.4	33.3	24.8
	Mixed	20.5	37.9	30.1
Household Income	Low	17.1	34.8	26.6
	High	13.1	28.7	21.0
Residence	Non-metro	15.6	32.2	24.0
	Metro [a]	12.8	28.3	20.8
BMI-based Weight Status	Underweight	9.4	17.8	13.5
	Healthy weight	9.9	27.3	19.4
	Overweight/Obese	22.8	41.9	30.5
Weight Perception	Underweight	9.7	17.1	12.0
	About the right weight	9.8	20.3	15.0
	Overweight	33.5	52.4	45.7

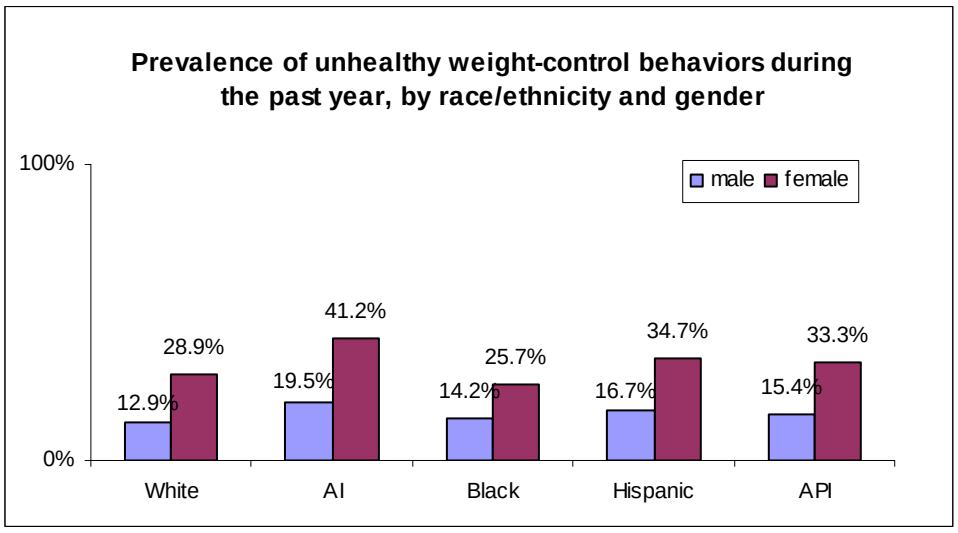
[a] Metro was defined as the 7 metro counties (Hennepin, Ramsey, Anoka, Carver, Scott, Dakota, Washington), as well as Stearns and St. Louis counties.

While the prevalence of unhealthy weight-control behaviors increased across the categories of body weight status from ‘underweight’ through ‘healthy weight’ to

'overweight/obese' (13.5%, 19.4% and 30.5%), multivariate analyses showed an interesting interaction between gender and body weight status in relation to unhealthy weight-control behaviors. That is, overweight/obese male students were more likely than their healthy-weight counterparts to report unhealthy weight-control behaviors, while overweight/obese female students were less likely than their healthy-weight counterparts to report them (adjusted odds ratio=1.323, p<.001 for males; .794, p<.001 for females). Underweight students were less likely than those with a healthy weight to report unhealthy weight-control behaviors, but the odds ratio was significant only among females (adjusted odds ratios are .961, p=.744 for males; .780, p<.05 for females).

On the other hand, weight perception was found to be a more consistent factor in predicting both healthy and unhealthy weight-control behaviors. As in the case of healthy weight-control behaviors, the prevalence of unhealthy behaviors increased across the categories of weight perception from 'underweight' through 'about the right weight' to 'overweight' (12.0%, 15.0% and 45.7%), and the multivariate analyses showed that, compared to students who considered themselves to be about the right weight, those who considered themselves as overweight were more likely to report unhealthy behaviors (adjusted odds ratio=4.364, p<.001), and those who considered themselves underweight were less likely to report them (adjusted odds ratio=.800, p<.001). A similar pattern appeared in the analysis of each gender (see Appendix for detailed results).

The following chart shows the prevalence of unhealthy weight-control behaviors across race/ethnicity for each gender. Nearly three in 10 white females (28.9%) reported unhealthy behaviors during the past year. Compared to white females, black females had a lower prevalence while other minority females had a higher prevalence. When other factors were controlled in a multivariate logistic analysis, American Indian females were significantly more likely than white females to report unhealthy behaviors (41.2% vs. 28.9%; adjusted odds ratio=1.299, p<.05), and black females were significantly less likely to report them (25.7% vs. 28.9%; adjusted odds ratio=.856, p<.05).



Among males, 12.9% of white students reported unhealthy weight-control behaviors during the past year. The prevalence was higher among minority male students than among white males, but the difference was not significant when other factors were controlled in multivariate analysis (adjusted odds ratios are 1.230, p=.145 for AI; 1.145, p=.115 for black; 1.141, p=.140 for Hispanic; 1.097, p=.226 for API).

Summary of findings

In summary, this report showed that a majority of students tried to lose or control weight and their weight-control behaviors varied across socio-demographic factors. While healthy weight-control behaviors were more prevalent than unhealthy behaviors, some worrisome patterns were found. In addition, the analyses showed that feeling overweight might be a more consistent predictor than being overweight for weight-control behaviors.

- More than three-quarters of female students and about half of male students had tried to lose or control their weight during the 12 months before the survey and a majority of those students had a healthy weight;
- While healthy weight-control behaviors were more prevalent than unhealthy weight-control behaviors, more than one in five students reported unhealthy behaviors;
- Female students were more likely than males to report healthy as well as unhealthy weight-control behaviors;
- High school seniors, compared to 9th graders, were more likely to report unhealthy weight-control behaviors and less likely to report healthy weight-control behaviors.
- Compared to their more affluent counterparts, both male and female students from low-income households were more likely to report unhealthy weight-control behaviors, and female students from low-income households were less likely to report healthy weight-control behaviors;
- Compared to those in the metro area, both male and female students in non-metro areas were more likely to report unhealthy weight-control behaviors while male students in non-metro areas were less likely to report healthy weight-control behaviors;
- Compared to white females, American Indian females were more likely to report unhealthy weight-control behaviors and less likely to report healthy weight-control behaviors, while black females were less likely to report both healthy and unhealthy weight-control behaviors;
- Compared to white counterparts, Hispanic females were less likely to report healthy weight-control behaviors while Hispanic males were more likely to report them;
- Compared to students who thought they were about the right weight, those who considered themselves as overweight were more likely to report both healthy and unhealthy weight-control behaviors, while those who considered themselves as underweight were less likely to report them.

- Overweight or obese students were more likely than their healthy-weight counterparts to report healthy weight-control behaviors. However, unhealthy weight-control behaviors were more prevalent among healthy-weight females than their overweight or obese counterparts.

This concludes the series of reports on obesity among Minnesota youth. The three reports examined:

- the prevalence of overweight and obese youth in Minnesota,
- the accuracy of weight perception they have about themselves, and
- their healthy and unhealthy weight-control behaviors.

These reports illuminated some of the challenges we face with obesity among Minnesota youth. The problem of childhood obesity becomes even more challenging by the fact that obesity, negative body image and unhealthy weight-control behaviors may perpetuate each other. That is, overweight and obesity among adolescents can increase dissatisfaction level with their body weight, which may increase the likelihood of engaging in unhealthy weight-control behaviors as well as the risk of eating disorders, which, in turn, may result in further weight gain.[14]

Being overweight at a young age appears to be far more destructive to the overall health and well-being than gaining some weight later in life. Health-related behaviors and habits are formed early in childhood and impact the long-term health outcomes. In addition, studies have shown greater reversibility of obesity at younger ages.[15] Thus, prevention and intervention efforts in the early stage of life are critical in slowing the trajectory of childhood obesity as well as reducing its long-term negative consequences.

Schools represent a critical arena for obesity prevention among children. School-based interventions can efficiently reach overweight and obese youth in promoting healthy eating and physical activity. In their intervention efforts, schools should provide a supportive environment by making lunch menus healthier and limiting access to unhealthy food or drinks, such as in vending machines, in school buildings. In addition, parents, schools and local communities should work together to make walking and/or bike riding to and from schools a viable option for students.

Prevention and treatment of obesity should be accompanied by a reliable monitoring of the obesity trend. Only through a continuous monitoring of the trend, prevention and treatment efforts can be evaluated and adjusted as needed to achieve successful results. The state of Arkansas provides a good example: Through school-based BMI assessment, they were able to document that multimodal interventions have apparently halted the progression of childhood obesity within 2 years of implementation.[16]

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[14] Goldschmidt AB, Aspen VP, Sinton MM, et al. Disordered eating attitudes and behaviors in overweight youth. *Obesity*; 16(2):257-264.

[15] Schwimmer JB. Childhood obesity: the case for coverage. *Harvard Health Policy Rev.* 2003; 4(2):62-72.

[16] Ryan KW, Card-Higginson P, McCarthy SG, Justus MB, Thompson JW. Arkansas fights fat: translating research into policy to combat childhood and adolescent obesity. *Health Aff (Millwood).* 2006; 25(4):992-1004.

Finally, BMI score is just one indicator of overall health and it should be evaluated within the context of other health indicators. We cannot assume someone is unhealthy just because his or her BMI score is high, any more than we can assume someone is healthy simply because the BMI score falls within a healthy range. The monitoring system should gather other meaningful health indicators in addition to BMI scores, and the prevention and treatment efforts should focus on developing a healthier and more active lifestyle, rather than simply reducing the number on a weight scale and getting slimmer.

Appendix

Odds ratios from multivariate logistic regression for weight-control behaviors

Dependent variable: Have tried to lose or control weight during the past year (1=yes; 0=no)			
Factors (reference category)	Total (n=75,057)	Males (n=36,316)	Females (n=38,741)
Gender (male)			
Female	3.215***		
Grade (9th)			
12th grader	.883***	.843***	.932
Race/ethnicity (white)			
American Indian	1.089	1.270*	.828
Black	.765***	1.084	.512***
Hispanic	1.195**	1.363***	.958
Asian/Pacific Islander	1.179***	1.433***	.934
Mixed	1.112**	1.377***	.866**
Household Income (high)			
Low [a]	.953*	1.112**	.812***
Residence (Metro)[b]			
non-metro	1.006	.989	1.029
BMI-based Weight Status (healthy weight)			
Overweight/obese	1.888***	2.109***	1.553***
Underweight	.508***	.673***	.417***
Weight Perception (about the right weight)			
Overweight	5.270***	4.477***	6.541***
Underweight	.463***	.547***	.361***

* p<.05 ** p<.01 *** p<.001

[a] Those who currently get free/reduced price lunch at school.

[b] Metro was defined as the 7 metro counties (Hennepin, Ramsey, Anoka, Carver, Scott, Dakota, Washington), as well as Stearns and St. Louis counties.

Odds ratios from multivariate logistic regression for healthy weight-control behaviors

Dependent variable: Have tried to lose/control weight during the past year by exercising or eating healthier (1=yes; 0=no)			
Factors (reference category)	Total (n=75,057)	Males (n=36,316)	Females (n=38,741)
Gender (male)			
female	2.862***		
Grade (9th)			
12th grader	.873***	.801***	.955
Race/ethnicity (white)			
American Indian	.881	1.102	.668**
Black	.692***	.948	.512***
Hispanic	1.053	1.244**	.851*
Asian/Pacific Islander	1.184***	1.445***	.955
Mixed	1.036	1.265***	.860**
Household Income (high)			
Low [a]	.861***	1.045	.727***
Residence (Metro)[b]			
non-metro	.964*	.952*	.980
BMI-based Weight Status (healthy weight)			
Overweight/obese	1.741***	1.932***	1.415***
Underweight	.502***	.626***	.426***
Weight Perception (about the right weight)			
Overweight	2.911***	3.134***	2.820***
Underweight	.426***	.508***	.336***

* p<.05 ** p<.01 *** p<.001

[a] Those who currently get free/reduced price lunch at school.

[b] Metro was defined as the 7 metro counties (Hennepin, Ramsey, Anoka, Carver, Scott, Dakota, Washington), as well as Stearns and St. Louis counties.

Odds ratios from multivariate logistic regression for unhealthy weight-control behaviors

Dependent variable: Have tried to lose/control weight during the past year by fasting/skipping meals, smoking, using diet pills/speed/other drugs, vomiting on purpose, or taking laxatives (1=yes; 0=no)			
Factors (reference category)	Total (n=75,057)	Males (n=36,316)	Females (n=38,741)
Gender (male)			
female	2.386***		
Grade (9th)			
12th grader	1.215***	1.390***	1.132***
Race/ethnicity (white)			
American Indian	1.261**	1.230	1.299*
Black	.935	1.145	.856*
Hispanic	1.097	1.141	1.077
Asian/Pacific Islander	1.105*	1.097	1.105
Mixed	1.437***	1.689***	1.316***
Household Income (high)			
Low [a]	1.210***	1.241***	1.207***
Residence (Metro)[b]			
non-metro	1.190***	1.273***	1.149***
BMI-based Weight Status (healthy weight)			
Overweight/obese	.971	1.323***	.794***
Underweight	.832*	.961	.780*
Weight Perception (about the right weight)			
Overweight	4.364***	3.885***	4.586***
Underweight	.800***	.855*	.781***

* p<.05 ** p<.01 *** p<.001

[a] Those who currently get free/reduced price lunch at school.

[b] Metro was defined as the 7 metro counties (Hennepin, Ramsey, Anoka, Carver, Scott, Dakota, Washington), as well as Stearns and St. Louis counties.