



## CHAPTER 9

# NUTRITION, PHYSICAL ACTIVITY AND WEIGHT CONTROL

### INTRODUCTION

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The past few years have witnessed an escalating concern about the epidemic of obesity in the United States. From 1995 to 2005, the percentage of American adults who are obese rose from 15% to 24% (9a). Nationally, 13% of adolescents are overweight (9b). Obesity in adolescence may persist into adulthood, increasing later risk for chronic conditions such as diabetes, heart disease, high blood pressure, stroke, and certain cancers (9c). Obesity during adolescence is also related to psychological stress, depression, problems with family relations, and poor school performance (9d,9e).

On the other hand, an overemphasis on thinness during adolescence may contribute to eating disorders such as anorexia nervosa, a disease in which people severely limit their food intake, or bulimia nervosa, which involves compulsive overeating followed by “purging” through vomiting, taking laxatives, or excessive exercising (9f). About one in ten cases of eating disorders leads to death from cardiac arrest, starvation, or suicide (9f).

Because lifetime dietary patterns are established in youth, it is important for adolescents to choose nutritious foods and to develop healthy eating habits, such as eating five or more servings of fruits and vegetables per day and consuming adequate amounts of calcium. Calcium is essential to building strong bones and preventing late-life osteoporosis; it may also be important in the prevention of certain cancers and other chronic health problems. Adolescents should consume at least 1200mg of calcium per day, the amount found in about three glasses of milk (9g). Also, there is evidence that eating breakfast every day can significantly improve students’ attention in the classroom, attendance, and test scores (9h,9i,9j). The recently revised *Dietary Guidelines for Americans* (9k) and new Food Pyramid (9l) provide guidance for helping young people and adults develop healthy eating patterns.

In addition to proper nutrition and healthy eating habits, regular physical activity can help maintain a healthy body weight, muscle strength, and bone health (9m). Millions of Americans suffer from chronic illnesses that can be prevented or improved through regular physical activity, including coronary heart disease, diabetes, osteoporosis, certain cancers, and high blood pressure (9n-s). Regular physical activity increases life expectancy (9t), and is associated with good mental health and self-esteem (9m,9u). Yet almost one-third of adolescents do not engage in sufficient amounts of physical activity (9b).

School physical education programs promote higher levels of physical activity and have been found to have a positive effect on the health and fitness of young people (9v). In addition, there is evidence that participation in a health-related physical education program can have a positive effect on student achievement (9v). Further,

students who participate on sports teams are less likely than their peers to smoke tobacco or use drugs (9w), and more likely to stay in school and have high academic achievement (9x).

The Healthy People 2010 National Health Objectives include many objectives for improving the nutritional health and physical fitness of adolescents. These include:

- (a) reducing the prevalence of overweight among adolescents;
- (b) increasing the proportion of overweight adolescents who have adopted sound dietary practices and regular physical activity to reach appropriate body weight;
- (c) increasing to five or more the average daily servings of fruits and vegetables;
- (d) increasing the proportion of adolescents who attend a daily physical education class; and
- (e) increasing the proportion of adolescents who engage in vigorous physical activity at least three times a week and moderate physical activity at least five times per week.

The 2005 MYRBS asked students about their perception of their body weight, their efforts to change or maintain body weight, behaviors that might indicate eating disorders, and some of their food choices. Also, the MYRBS asked students to report their height and weight, thus permitting the calculation of Body Mass Index (BMI), a measure used to assess overweight (9z).

The MYRBS also asked students about their participation in vigorous and moderate physical activity, in physical education classes, and in team sports. Finally, because television viewing is considered a sign of a sedentary lifestyle, the survey asked about the number of hours students watched television on an average school day.

#### Key Findings from the MYRBS

- ◆ Since 1999, there have been significant declines in the percent of students who eat the recommended five servings of fruits and vegetables per day (14% to 10% in 2005) and in the percent who drink three or more glasses of milk per day (22% to 15%).
- ◆ Only one third of all students ate breakfast every day in the week before the survey.
- ◆ Most students (63%) participated in regular vigorous physical activity on at least three days of the previous week.
- ◆ More than half (59%) of students attended a physical education class at least once in an average school week; this figure represents a significant decline from the 80% reported in 1995.
- ◆ The percent of adolescents who were either overweight or at risk of overweight rose significantly from 1999 (22.5%) to 2005 (26.8%)
- ◆ Good nutrition, healthy weight, and participation in physical activity were all associated with higher rates of academic achievement.
- ◆ Nutrition, physical activity, and overweight varied significantly by gender, grade, race/ethnicity and kind of community.

## RESULTS

### *Nutrition*

On average, Massachusetts high school students ate 2.3 servings of fruits and vegetables per day in the seven days before the survey. This includes servings of fruit, fruit juice, potatoes, green salad, and other cooked or raw vegetables.

Only one student in ten (10%) ate five or more servings of fruits or vegetables per day as recommended by nutritional guidelines, continuing the decline from 14% in 1999 (see Figure 9a).

One third of students (33%) reported eating breakfast on all seven days of the past week; 16% did not eat breakfast at all. (Figure 9b).

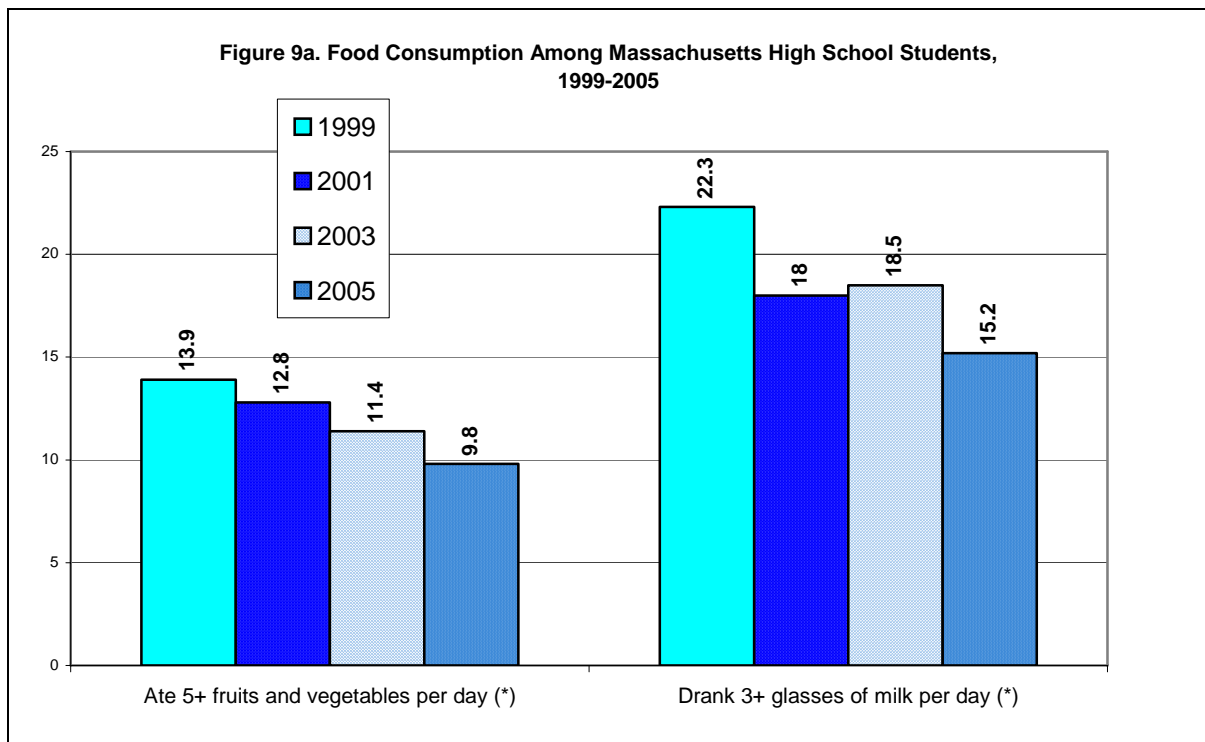
Fruit and vegetable consumption did not vary by gender. (Figure 9c) It did drop slightly, but not significantly during the high school years, from 10% in 9<sup>th</sup> grade to 8% among seniors.( Figure 9d)

Fruit and vegetable consumption varied by ethnicity. Black adolescents were the most likely to have five or more servings per day (14%), followed by Asians (13%), Hispanic and Mixed/Other youth (both 10%). Only 9% of White students ate the recommended number of servings per day.

Massachusetts adolescents drank 1.1 glasses of milk per day, on average. Only 15% of students drank the recommended 3 glasses of milk per day, a significant decrease from 22% reported in 1999. Males were more than twice as likely as females to drink 3 or more glasses of milk.

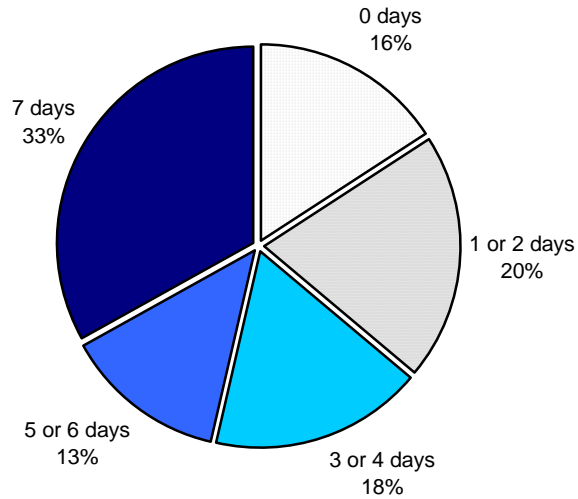
Recommended milk consumption dropped significantly from 9<sup>th</sup> grade (18%) to 12<sup>th</sup> grade (12%)

Female and male rates of eating breakfast were similar. Daily breakfast varied by ethnicity; White youth were most likely to eat breakfast every day (35%) and Black youth were the least (21%).

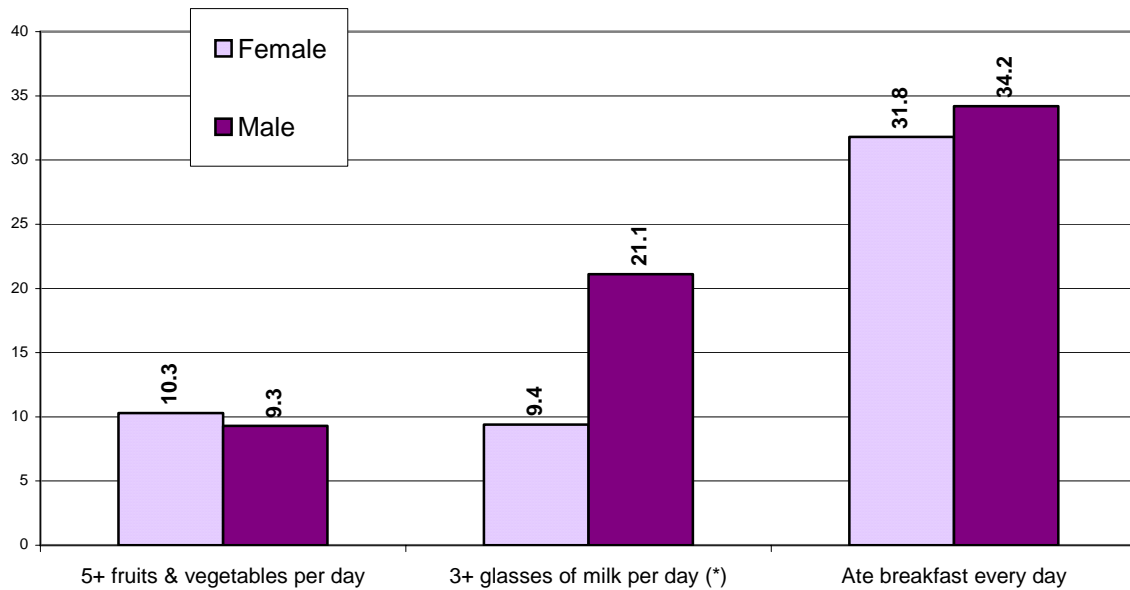


(\*) Statistically significant decline from 1999 to 2005,  $p < .05$

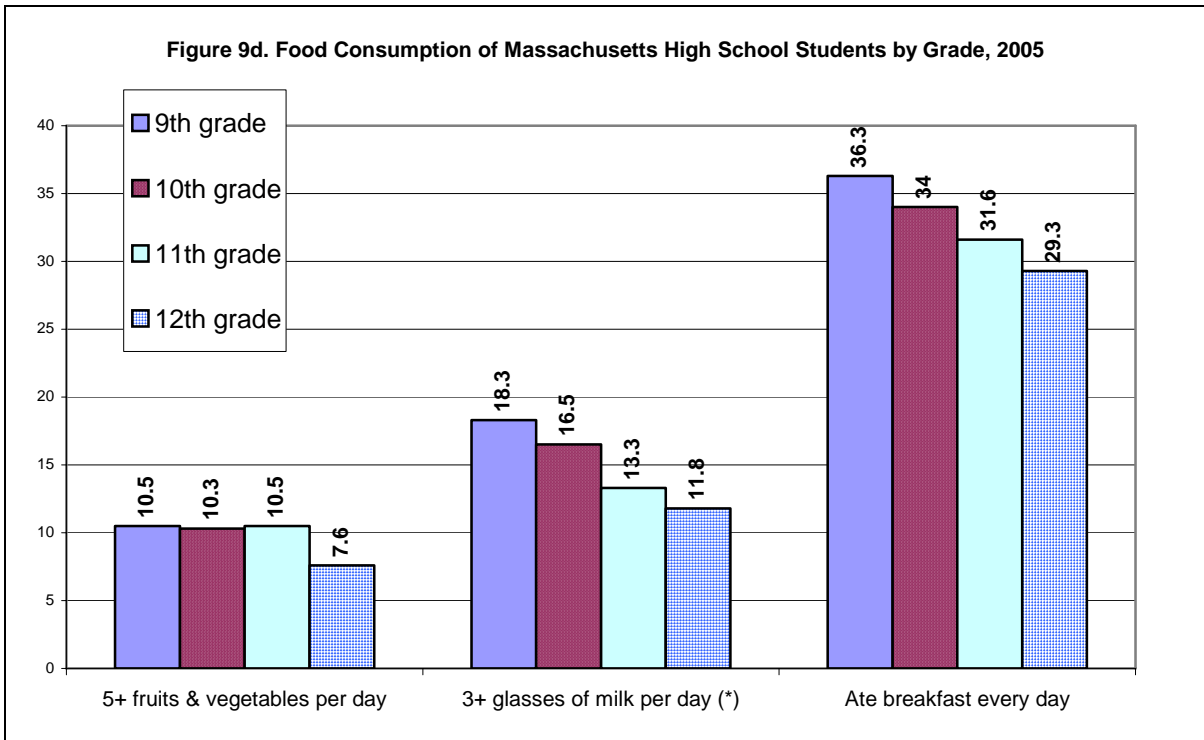
**Figure 9b. Number of Days Per Week Massachusetts High School Students Ate Breakfast, 2005**



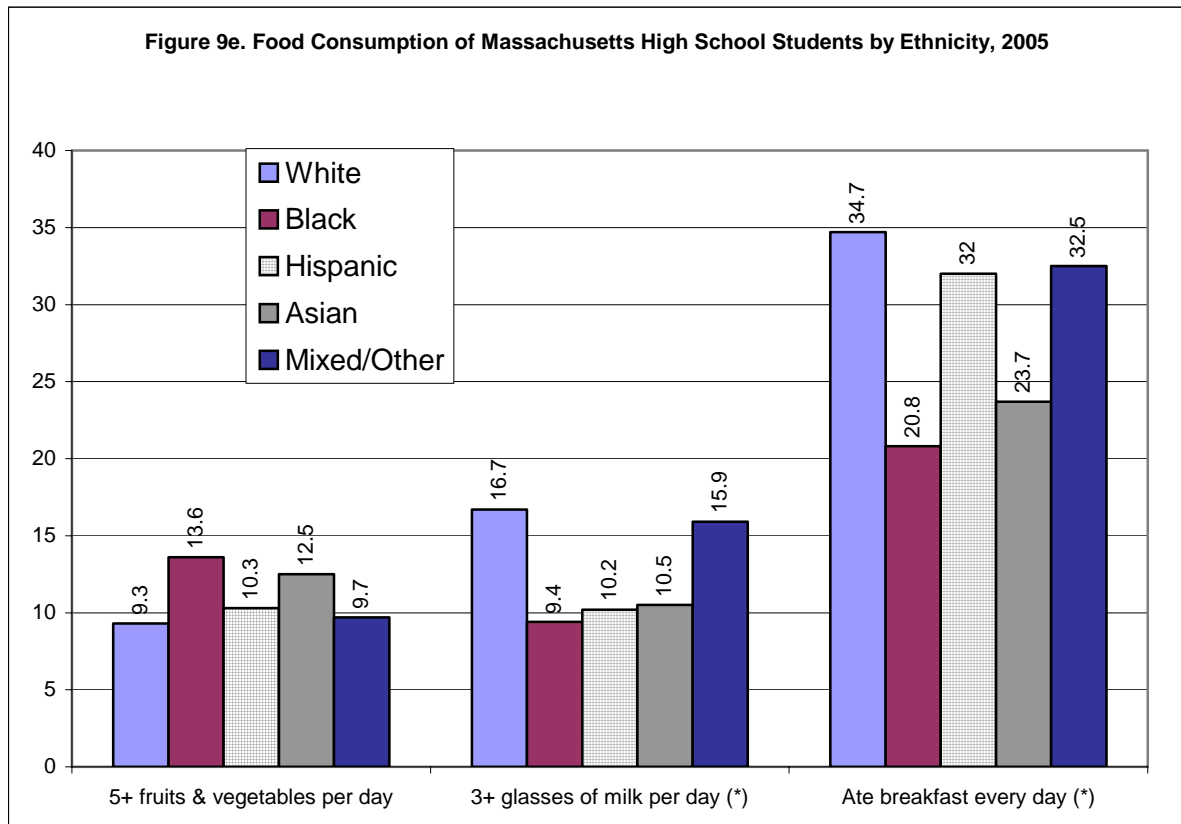
**Figure 9c. Food Consumption of Massachusetts High School Students by Gender, 2005**



(\*) Statistically significant gender difference,  $p < .05$



(\*) Statistically significant grade differences,



(\*) Statistically significant racial/ethnic differences,  $p < .05$

## PHYSICAL ACTIVITY

Most measures of physical activity have not changed significantly over the past decade. The one exception is a significant decline in the percentage of high school students reporting that they participated in physical education during an average school week, from 80% in 1995 down to 59% in 2005. In 2005, 18% of students attended daily physical education classes. (Figure 9f)

Nearly two-thirds of students (63%) reported participating in physical activity vigorous enough to make them sweat and breathe hard for at least 20 minutes at least three times in the previous 7 days. One in four (25%) had engaged in moderate physical activity that did not make them sweat or breathe hard for at least 30 minutes on at least 5 days of the past week.

One student in ten (10%) had engaged in no vigorous or moderate physical activity in the past 7 days.

Over half of all students (55%) played on at least one sports team in the previous 12 months.

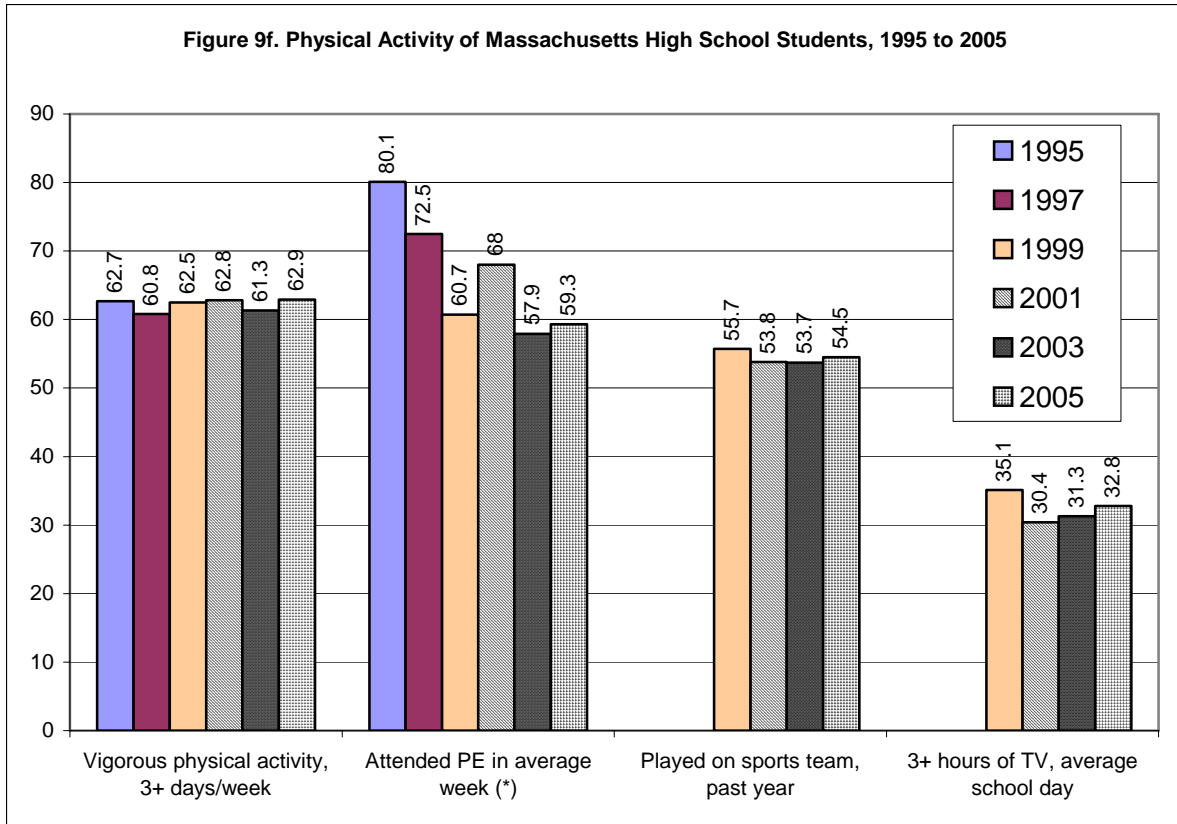
Females reported slightly, but not significantly, lower rates on most physical activity measures than males. Participation in team sports was significantly less among female students (50%) than among their male counterparts (59%). Figure 9g

From grade 9 to grade 12, significant decreases occurred in students reporting that they had not engaged in vigorous physical activity, attended physical education classes, and been on a sports team. (Figure 9h)

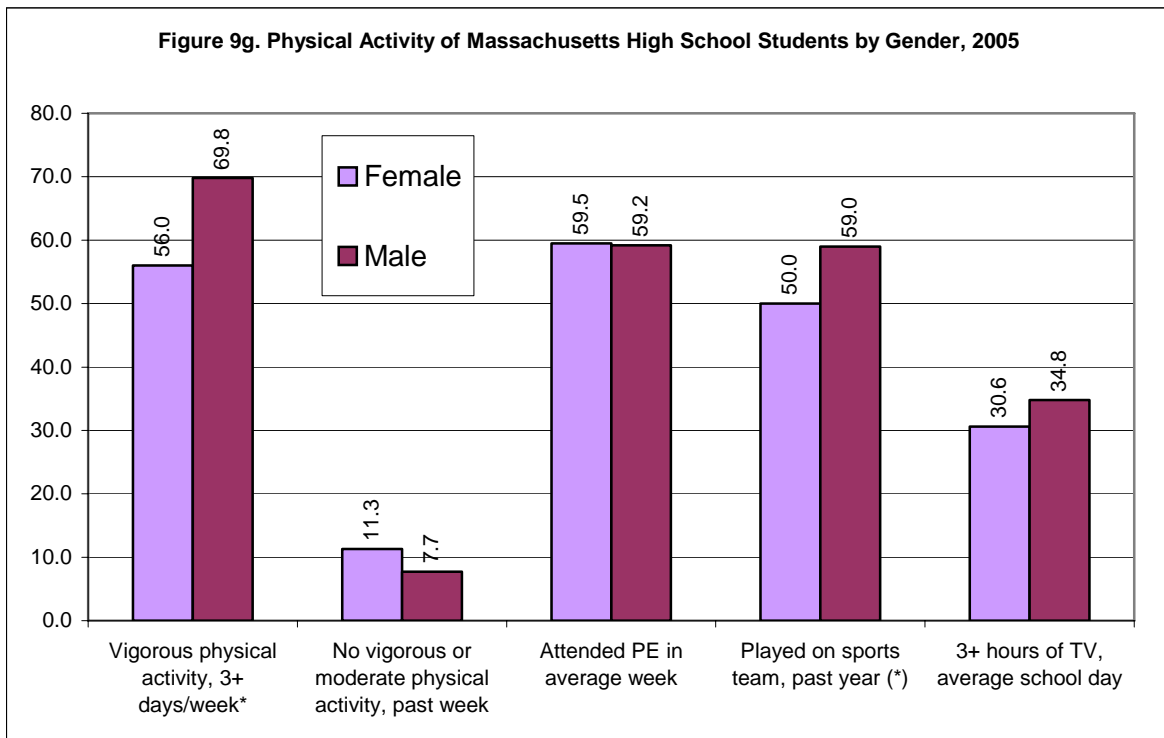
Physical activity levels varied significantly by ethnicity. Black and Hispanic adolescents were least likely to report sufficient vigorous physical activity. (Figure 9K)

Black students were less likely to have attended physical education classes than other students. Asian and Hispanic students were less likely to have been on a sports team than other youth.

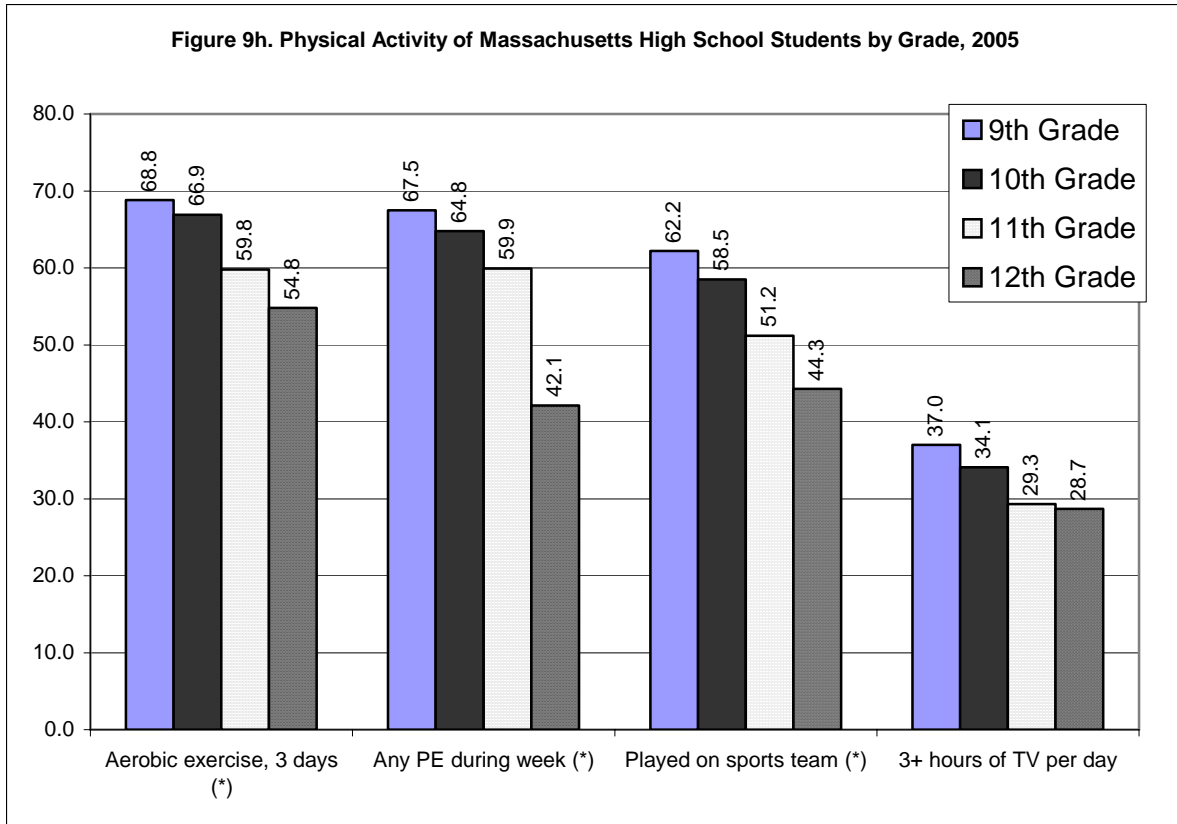
One in three students (33%) reported watching 3 or more hours of television on an average school day; over half of Black and Hispanic adolescents (each 52%) watched this much television.



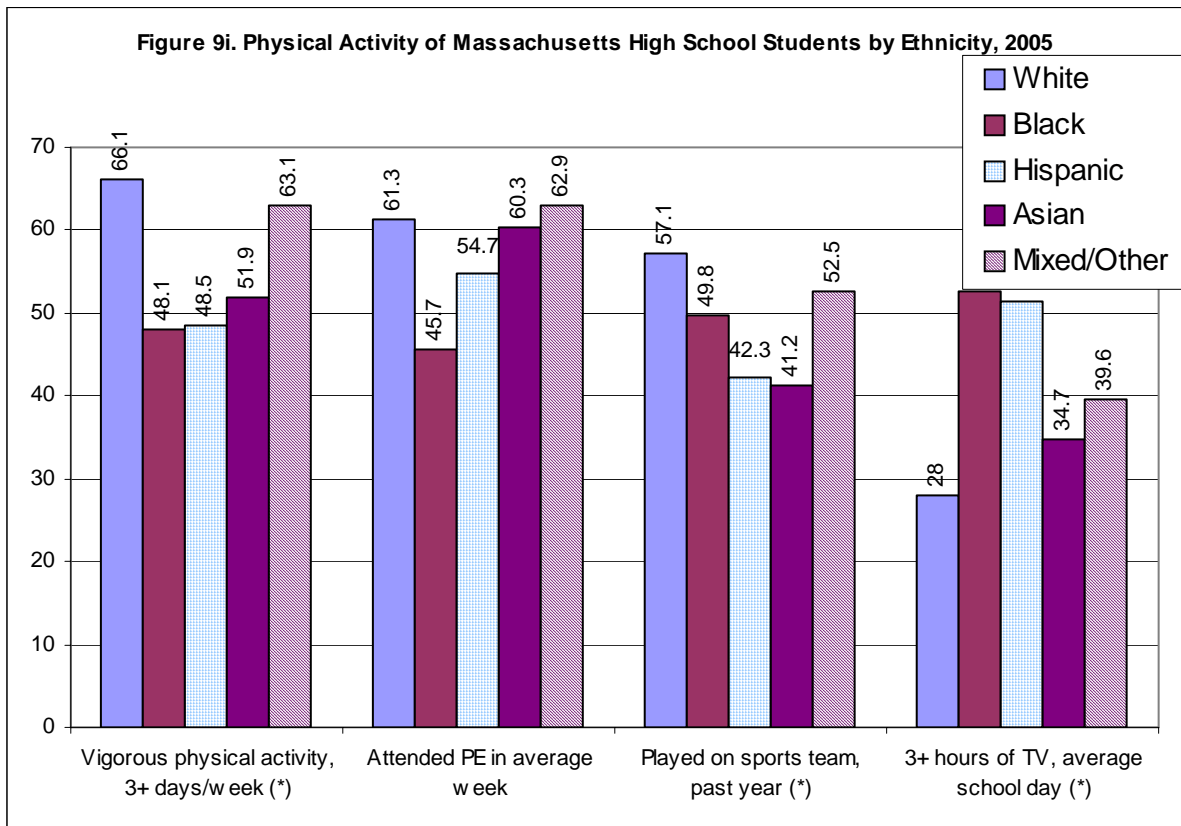
(\*) Statistically significant racial/ethnic differences,  $p < .05$



(\*) Statistically significant gender difference,  $p < .05$



(\*) Statistically significant grade level difference,  $p < .05$



(\*) Statistically significant racial/ethnic differences,  $p < .05$

## OVERWEIGHT AND WEIGHT CONTROL

According to their Body Mass Index, calculated on the basis of self-reported height and weight, 16% of Massachusetts high school students were at risk of being overweight and 11% were definitely overweight. These combined figures (27%) represent a significant increase over 23% reported in 1999, when BMI calculations were first included in the YRBS. (Figure 9j)

Approximately one-third (31%) of adolescents perceived themselves to be slightly or definitely overweight, and nearly one half (47%) reported that they were trying to lose weight. In 2005, youth were somewhat more likely than their counterparts four years earlier to be trying to control their weight through diet or exercise. (Figure 9k)

Fifteen percent (15%) of students reported trying to control their weight through unhealthy and potentially dangerous means such as

- ◆ Fasting or going without eating for 24 hours or more (11%)
- ◆ Using diet pills, powders, or liquids without a doctor's prescription (4%)
- ◆ Vomiting or using laxatives to control weight (6%)

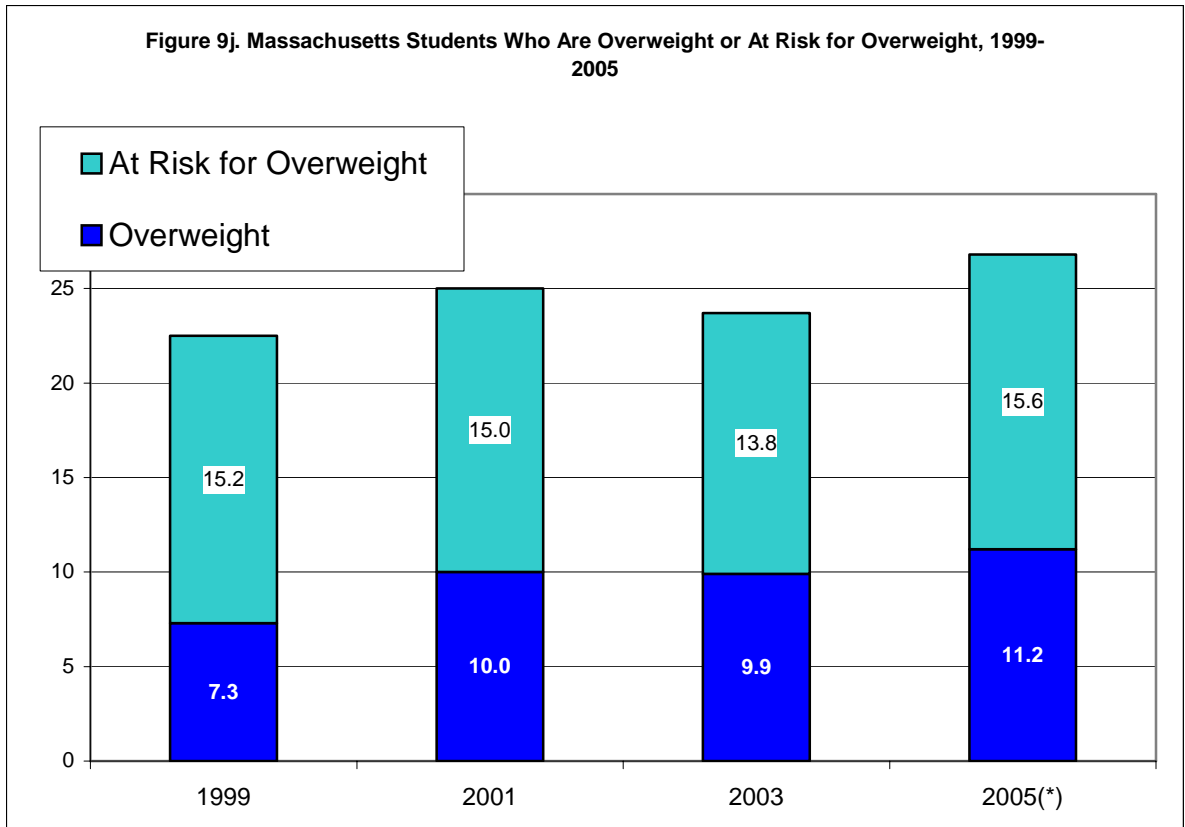
Males were more likely than females to be at risk or definitely overweight, yet they were significantly less likely to perceive themselves as overweight or be trying to lose weight. They were also significantly less likely than females to report using specific weight control methods. (Figure 9l)

Being overweight or at risk for overweight declined with increasing grade level, from 9<sup>th</sup> grade to 12<sup>th</sup> grade, but weight perceptions and weight control methods did not change significantly between 9<sup>th</sup> and 12<sup>th</sup> grade. (Figure 9m)

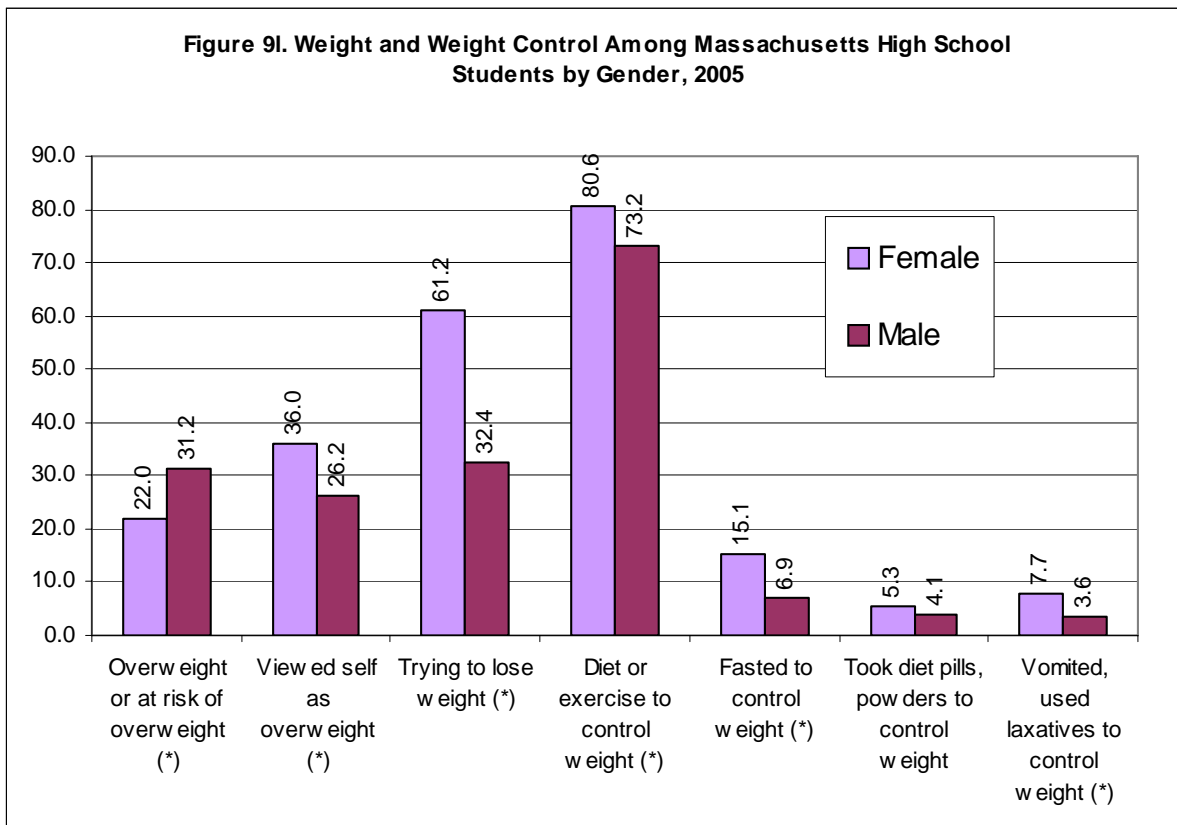
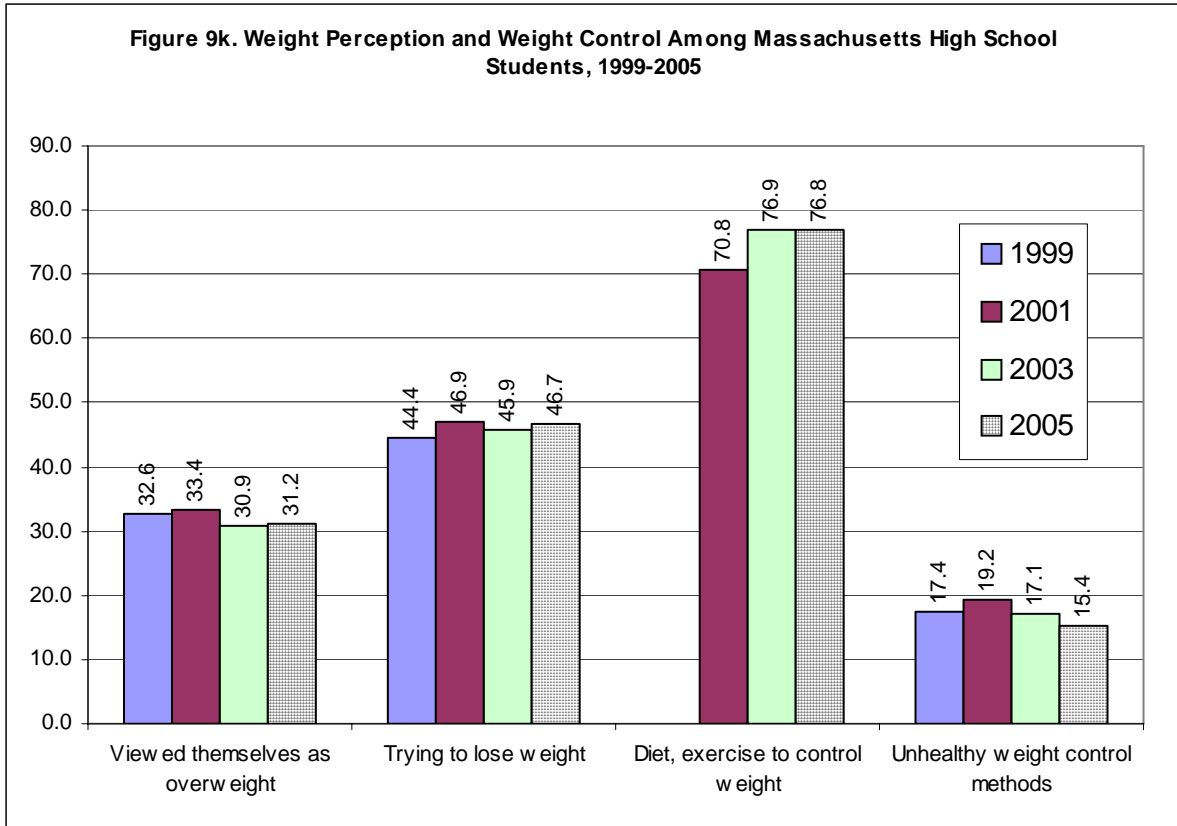
At least one third of Black, Hispanic, and Other/Mixed Ethnicity youth were at risk or overweight (38%, 35%, and 33% respectively). Rates for White and Asian students were lower. (Figure 9n)

Viewing oneself as overweight was more common among White and Other/Mixed Ethnicity youth than among Black, Hispanic, or Asian youth. White adolescents were the most likely to be trying to lose weight.

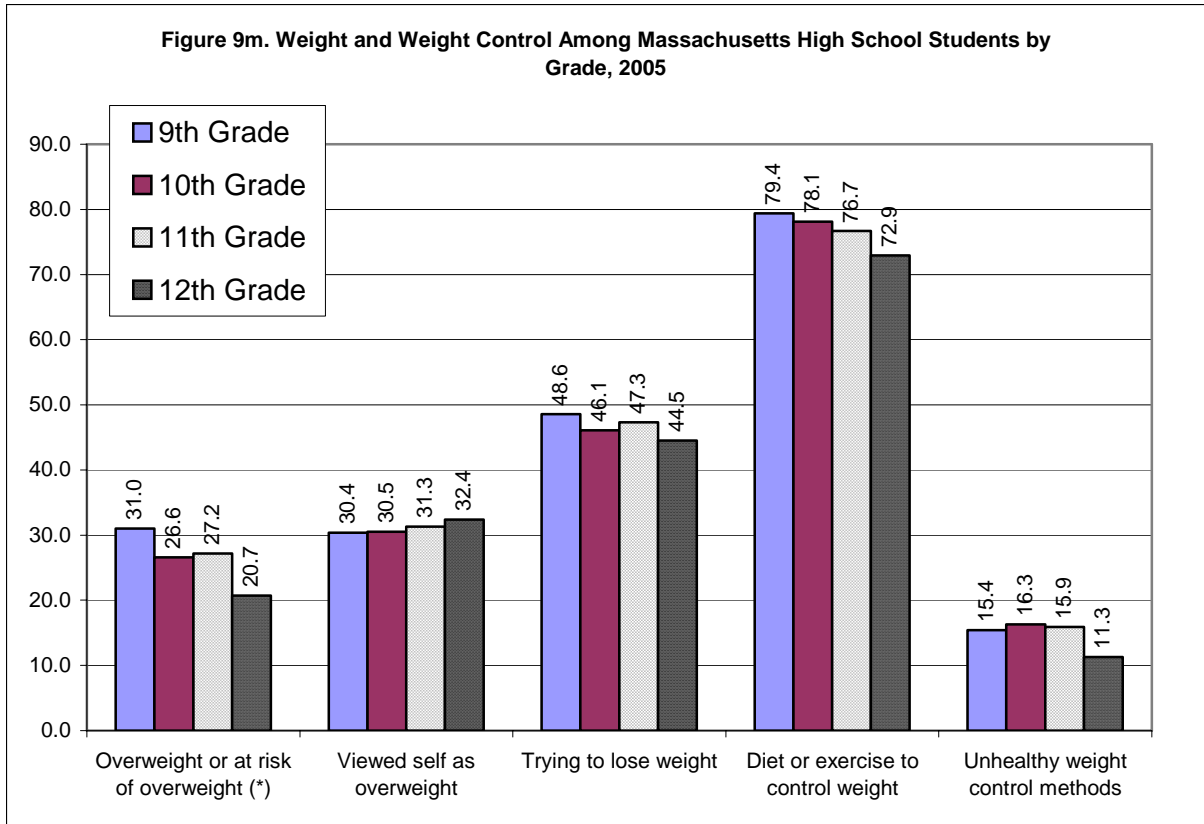
There were no significant ethnic differences in the proportions of youth who reported unhealthy weight control methods such as fasting, diet pills, vomiting or using laxatives. Black, Hispanic, and Asian adolescents, however, were less likely than White or Other/Mixed Ethnicity youth to use healthier methods such as dieting or exercising to control weight.



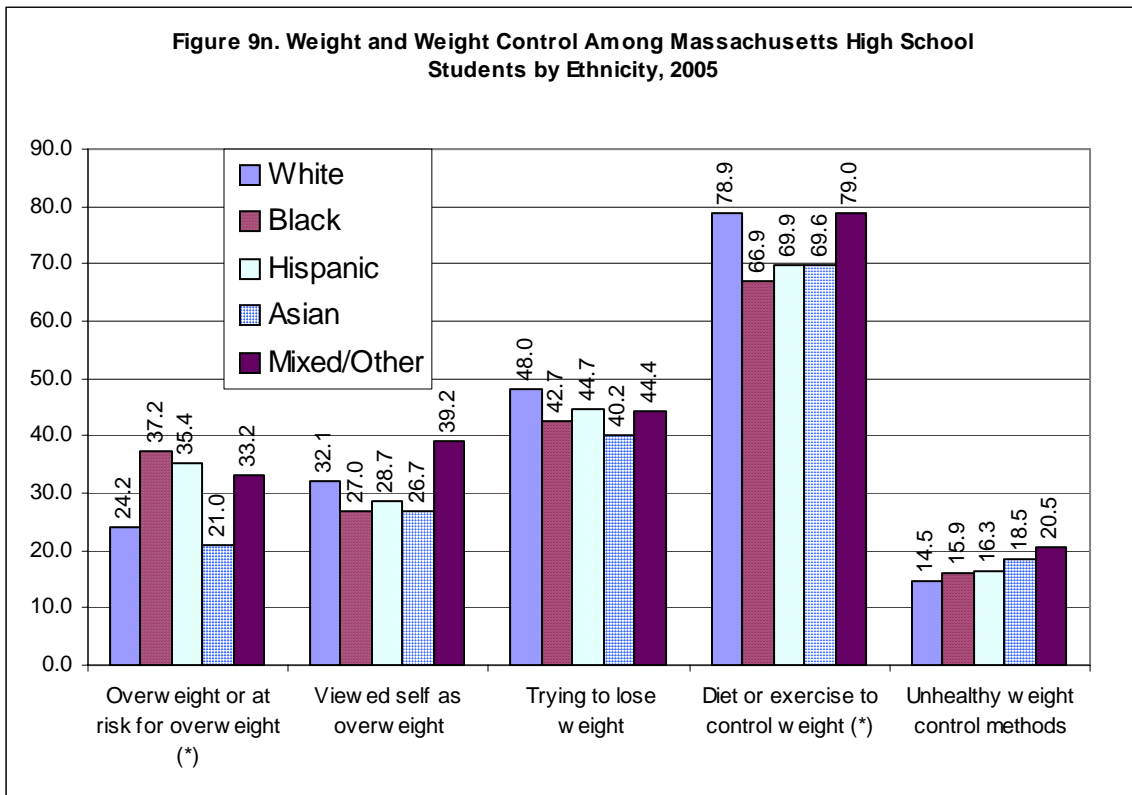
(\*) Statistically significant increase from 1995 to 2005 in youth who were overweight or at risk for overweight,  $p < .05$



(\*) Statistically significant gender difference,  $p < .05$



(\*) Statistically significant grade level difference,  $p < .05$



(\*) Statistically significant racial/ethnic difference,  $p < .05$

## ADDITIONAL GROUP DIFFERENCES

In general, adolescents in urban communities and districts are at greater risk than those in suburban and rural districts in terms of nutrition, physical activity, and weight. Urban youth were significantly more likely than their counterparts in other districts to be definitely overweight (14% vs. 8% suburban and 10% rural).

On the other hand, they were less likely to

- ◆ Eat breakfast every day (27% vs. 38% suburban and 32% rural)
- ◆ Engage in vigorous physical activity at least 3 times per week (55% vs. 69%, 64%)
- ◆ Attend Physical Education class in an average week (56% vs. 63%, 64%)

Homeless students, defined as those who did not usually sleep at night at home with their parents, were also at higher risk in some areas. Compared to their peers, they were

- ◆ Less likely to eat breakfast every day (21% vs. 33%)
- ◆ Less likely to be on a sports team (44% vs. 54%).
- ◆ More likely to be using unhealthy weight control methods such as fasting, using diet pills or liquids that hadn't been prescribed for them, vomiting, or using laxatives (36% vs. 14%)

## RELATIONSHIP OF NUTRITION, PHYSICAL ACTIVITY, AND WEIGHT TO OTHER BEHAVIORS AND EXPERIENCES

As might be expected, overweight among students was associated with both food consumption and physical activity. Compared to lower-weight teens, adolescents who were definitely overweight were

- ◆ less likely to eat breakfast every day (28% vs. 34%)
- ◆ less likely to be on a sports team (47% vs. 56%)
- ◆ more likely to watch 3 or more hours of TV on an average school day (46% vs. 31%).

Students who took PE class in an average school week were also more likely than their peers not taking PE to be getting sufficient vigorous exercise (70% vs. 52%) and to be participating on a sports team (60% vs. 47%)

Overweight students were more likely than others

- ◆ to be bullied in school (30% vs. 23%)
- ◆ to hurt themselves on purpose (24% vs. 17%)
- ◆ to have made a suicide attempt in the past year (9% vs. 6%).

Adolescents who engaged in regular vigorous physical activity were less likely than those who didn't

- ◆ to report feeling sad or hopeless for an extended period (24% vs. 33%)
- ◆ to have considered suicide in the past year (12% vs. 15%), or
- ◆ to engage in unhealthy weight control practices (14% vs. 17%)

## NUTRITION, ACTIVITY, WEIGHT AND ACADEMIC ACHIEVEMENT

Academic achievement is significantly associated with wellness in general and with nutrition, physical activity, and weight. Specifically, students who are achieving academically - receiving A's, B's, or C's - are more likely than students with lower grades to

- ◆ eat breakfast every day (35% vs. 22%)
- ◆ get regular vigorous exercise (65% vs. 53%)
- ◆ be enrolled in physical education class (61% vs. 51%)
- ◆ have a healthy weight, not overweight or at risk for overweight (75% vs. 65%).

Additionally, the academically successful students are less likely than their peers to watch 3 or more hours of television per day (31% vs 40%) or use unhealthy weight control measures (13% vs. 25%)

## CONCLUSIONS AND RECOMMENDATIONS

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Many Massachusetts adolescents are either currently overweight or at risk of becoming overweight as adults. Obesity in adolescence is likely to continue into adulthood and poses serious threats to health, including increased risk for high blood pressure, cardiovascular disease, diabetes, and other chronic health conditions. These findings suggest the importance of including obesity prevention topics, such as the importance of proper nutrition, physical activity, and healthy weight control in comprehensive school health education programs. The recently revised Dietary Guidelines and Food Pyramid are the guidelines to be used to develop healthy eating behaviors.

Most students appear to be attempting to control their weight in appropriate ways, through diet and exercise. However, some youth use weight-loss strategies that endanger health and may indicate signs of eating disorders such as anorexia or bulimia. Students should be informed of the dangers of eating disorders. Education about weight control should emphasize the physical risks of overweight, but actively discourage dangerous weight control techniques.

More education about the importance of proper nutrition is needed. It is disturbing that so few of our adolescents consume the recommended daily levels of five fruits and vegetables; they may instead be consuming less nutritious fast foods and soft drinks. Additionally, the low levels of milk consumption reported on this survey indicate that most adolescents may not be getting needed amounts of calcium in their diets (9y). This is especially a problem among girls, as they were significantly less likely than males to drink enough milk, and are more likely to suffer from osteoporosis later in life. Healthy eating habits, good nutrition, and responsible weight control can be fostered not only by comprehensive school health education, but also by school counseling programs and school nurses and through healthy food choices in school cafeterias.

Although most students in 2005 reported participating in regular exercise, one-third of all students participated in an insufficient amount of physical activity and about one in ten students reported no physical exercise at all. It is also troubling that participation in a physical education class even once in an average school week has decreased significantly, and two-fifths of all students did not attend a physical education class at all in an average school week. In addition, some measures of physical activity decreased with grade level, suggesting that many students are not maintaining the exercise patterns that will lead to good health as adults. School should support the development of healthy patterns of physical activity by ensuring that time is allotted in the school schedule for physical education, and that all students have the opportunity and are encouraged to participate in those classes and in other athletic activities. Families and communities can help as well by promoting physically active recreation activities for adolescents and restricting the amount of time children watch television.

Significant gender differences in diet, weight control, and physical activity behaviors were observed in the 200 MYRBS. Young male students were significantly more likely than female students to be overweight, but

less likely to realize they were overweight or to be attempting weight loss. In fact, just the opposite occurred: male students were more likely than female students to view themselves as *underweight* and to be trying to *gain* weight.

Conversely, female students were less likely than males to be overweight, but far more likely to consider themselves overweight, to be attempting weight loss, and to be using unhealthy methods of weight loss. Most females who were trying to lose weight had a healthy body weight. These findings suggest that education programs should recognize and incorporate the opposite views of male and female students regarding desirable body weight in an effort emphasize the importance of maintaining a *healthy* body weight. Also, significant racial/ethnic differences in overweight, weight control, and physical activity suggest that education programs should promote maintaining a healthy body weight and active lifestyle within a cultural context, incorporating varying cultural views on diet and body weight.

Finally, targeted interventions for students in urban communities may also be needed. Students in urban communities were more likely than non-urban students to be overweight and appeared to be particularly vulnerable to developing sedentary rather than active lifestyles.

## CHAPTER 9: REFERENCES

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- 9a. Centers for Disease Control and Prevention (2006). State-specific prevalence of obesity among adults - United States, 2005.
- 9b. Centers for Disease Control and Prevention. (2006). Youth Risk Behavior Surveillance - United States, 2005. *Morbidity and Mortality Weekly Report, 55, No.SS-5*.
- 9c. Public Health Service. (1988). *The Surgeon General's Report on Nutrition and Health, 1988*. (DHHS Publication No. 88-502110). Washington, DC: U.S. Department of Health and Human Services.
- 9d. Rotatori, A. & Fox, R. (1989). *Obesity in Children and Youth: Measurement, Characteristics, Causes, and Treatment*. Springfield, IL: Charles C. Thomas, Publisher.
- 9e. Stein, R. (1987). Comparison of self-concept of non-obese and obese university junior female nursing students. *Adolescence, 22, 77-90*.
- 9f. National Institute of Mental Health. (1993). *Eating Disorders*. (DHHS Publication No. 93-3477). Washington, DC: U.S. Department of Health and Human Services.
- 9g. Milk and other dairy products are valuable sources of calcium, which is important in preventing late-life osteoporosis and other chronic health problems. Adequate calcium consumption is especially critical in adolescence, because most bone mass is developed by age 20; the recommended level of calcium intake for adolescents is 1200mg per day, the amount found in three glasses of milk. See: Institute of Medicine. (1997). *Dietary reference intakes for calcium, phosphorous, magnesium, vitamin D, and fluoride*. Washington, DC: National Academy Press.
- 9h. Meyers, A.F., Sampson, A.E., Weitzman, M., Roger, B.L., & Kayne, H. (1989). School breakfast program and school performance. *American Journal of Diseases and Children, 143(10), 1234-9*.
- 9i. Kleinman, R.E., Hall, S., Green, H., Korzec-Ramirez, D., Patton, K., Pagano, M.E., & Murphy, J.M. (2002). Diet, breakfast, and academic performance in children. *Annals of Nutrition and Metabolism, 46(1), 24-30*.
- 9j. Project Bread. (2002). *Study Shows Link Between School Breakfast and Academic Achievement [on-line]*. Retrieved May 25, 2004, from <http://www.projectbread.org/MCH/mghbreakfaststudy.htm>.
- 9k. Public Health Service (2005). Dietary guidelines for Americans 2005. [on-line]. Retrieved December 10, 2006, from <http://www.health.gov/dietaryguidelines>
- 9l. United States Department of Agriculture (2005). My pyramid plan. [on-line]. Retrieved December 10, 2006, from <http://mypyramid.gov>
- 9m. Centers for Disease Control and Prevention. (1996). *Physical activity and health: A report of the Surgeon General*. Atlanta, GA: author.
- 9n. American Heart Association. (2002). *2002 Heart and Stroke Statistical Update*. Dallas, TX: American Heart Association.
- 9o. Centers for Disease Control and Prevention. (2002). *National diabetes fact sheet: general information and national estimates on diabetes in the United States, 2000*. Atlanta, GA: author.
- 9p. American Cancer Society. (2002). *Cancer facts & figures, 2002*. Atlanta, GA: author.
- 9q. Vainio, H. & Bianchini, F.. (Eds.) Weight control and physical activity. *LARC Handbooks of Cancer Prevention, vol. 6*.
- 9r. Powell, K., Casperson, C., Koplan, J., & Ford, E. (1989). Physical activity and chronic diseases. *American Journal of Clinical Nutrition, 49, 999-1006*.
- 9s. Paffenbarger, R., Hyde, R., Wing, A., & Hsieh, C. (1989). Physical activity, all-cause mortality, and longevity of college alumni. *New England Journal of Medicine, 314, 605-613*.
- 9t. Marinek, T., Cheffere, J. & Zaichkowsky, L. (1978). Physical activity, motor development, and self-concept: race and age differences. *Perceptual and Motor Skills, 46, 147-154*.
- 9u. U.S. Department of Health and Human Services. (1985). National children and youth fitness study. *Journal of Physical Education, Recreation, and Dance, 56, 44-90*.

9v. Sallis, J.F., MacKenzie, T.L., Kolody, B., Lewis, M., & Marshall, S., and Rosengrad, P. (1999). Effects of health-related physical education on academic achievement: project SPARK. *Research Quarterly for Exercise and Sport*, 70(2), 127-134.

9w. Escobedo, L.G., Marcus, S.E., Holtzman, D. & Giovino, G.A. (1993). Sports participation, age at smoking initiation and the risk of smoking among U.S. high school students. *Journal of the American Medical Association*, 269, 1391-5.

9x. Zill, N., Nord, C.W., & Loomis, L.S. (1995). *Adolescent time use, risky behavior, and outcomes: an analysis of national data*. Rockville, MD: Westat.

9y. The ability to digest dairy products varies by race/ethnicity; up to 75% of African-Americans and 90% of Asian Americans may be lactose intolerant. For many adolescents, alternate sources of calcium (such as soy products or dark green vegetables) may be preferable to heavy milk consumption. See: National Digestive Diseases Information Clearinghouse. (1998). *Lactose intolerance [on-line]*. Retrieved May 4, 2004, from: <http://digestive.niddk.nih.gov/ddiseases/pubs/lactoseintolerance/>.

9z. Body Mass Index measures height/weight ratio, and is calculated by dividing weight in kilograms by the square of height in meters. Among adults, a BMI of 25 or over is considered overweight and a BMI of 30 or over is considered obese. Different benchmarks are applied to children and adolescents, depending on age and gender. For example, according to standards obtained from the Centers for Disease Control and Prevention, a 16 year-old male with a BMI of 24.55 or greater is considered at risk of becoming overweight, and a BMI of 27.88 or greater is considered overweight. See: Kuczmarski, R.J., Ogden, C.L., Grummer-Strawn, L.M., et al. (2000). *CDC growth charts: United States. Advance data from vital and health statistics; no. 314*. Hyattsville, MD: National Center for Health Statistics.