Stemming the Flood:

Childhood Obesity Prevention in Pennsylvania, 2005 – 2015

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The Obesity Epidemic: Health Consequences and Costs

Now an epidemic, obesity was fairly rare in the U.S. as late as the 1980s. Looking back, clearly no one event caused this rapid increase in obesity. Rather, like an unexpected and sudden nighttime flash flood caused by many separate, rapidly swelling and converging creeks and streams, many societal changes began in the 1950s and silently grew over 40-50 years into a new and different human ecology that profoundly influenced both population weight and health status. This rapid increase in unhealthy weight was only first detected between 1990 and 2000; the "blink of an eye" in human history. From 1990 to today, the US obesity rate doubled from less than 15% of adults to 29.4%. For Pennsylvania the obesity rate rose from less than 10% in 1990 to 30% today--ranking 30th among the 50 states.

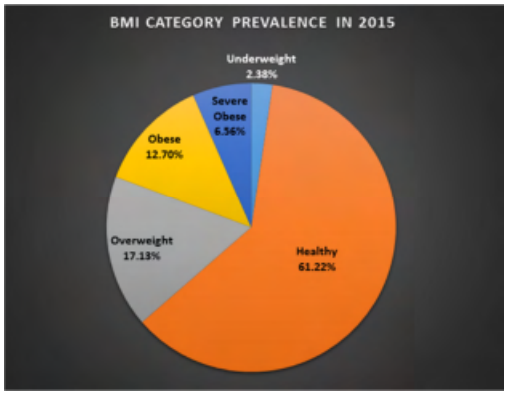
Obesity contributes to cancer, Type 2 diabetes, and cardio-vascular disease as well as accidental injury and disabling orthopedic problems among adults. Excess weight contributes to 1 in 5 U.S. cancer deaths today. By 2050, 1 in 3 U.S. adults may have diabetes. And, obesity is very costly; the total U.S. economic consequences of obesity (health care costs plus lost productivity) are minimally estimated at $147 billion annually. Much of this cost is shouldered by public sector health plans--Medicaid and Medicare. By 2030, the adult US obesity rate is projected to climb from the current 29.4% to over 40%, with severe obesity increasing even faster.

Today's youth are the adults of 2030 and, unfortunately, obesity has already dramatically expanded among U.S. youth of all ages with immediate negative physical health consequences, including pre-diabetes, hypertension, high cholesterol, sleep apnea, accidental injury, and bone and joint problems. Negative emotional and social consequences include poor self-esteem and stigmatization. Those who are overweight or obese as children and teenagers are highly likely to become or remain obese or severe obese as young adults. They are also at increased risk of developing chronic diseases previously only experienced much later in life.

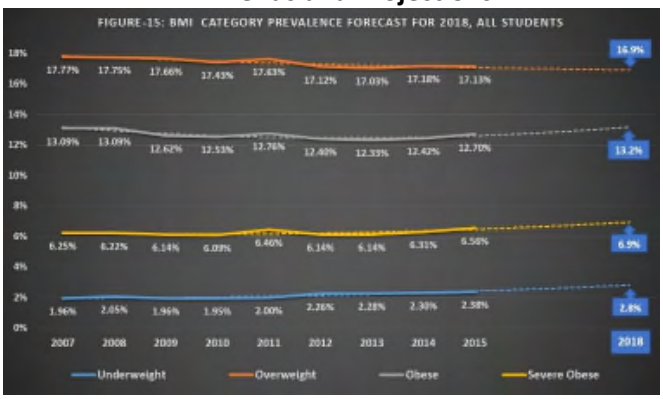
Pennsylvania Child and Adolescent Obesity: Rates, Trends, and Projections, 2007-2018

Through use of a system called *Health eTools for Schools,* 2.2 million de-identified student Body Mass Index (BMI) measures were accessed and analyzed (results are presented in the accompanying graphs). BMI data came from 1,114 schools in 293 districts and 53 counties. Pennsylvania's 10 largest cities and 18 largest counties are represented.

Current BMI Rates



BMI Trends and Projections



These graphs illustrate the following BMI rates and trends among school-aged Pennsylvania children and adolescents:

- Through 2015, healthy weight still predominates and is projected to predominate; 6 of every 10 school-aged Pennsylvania children and adolescents have a BMI within the healthy range.
- Levels of overweight among the Pennsylvania school-aged population slightly but steadily decreased from 2007 to 2012 and then leveled off from 2013 to 2015.
- After declining from 2007 to 2013, levels of obesity increased slightly in 2014 and again in 2015.

- After holding steady from 2007 to 2013, levels of severe obesity rose by 2015 to a rate which exceeded that of baseline in 2007.
- Based on statistical projections (Figure 15), the combined prevalence rates of obesity and sever obesity in 2018 could possibly exceed those of 2007.
- Despite a projected decline in overweight, the combined prevalence of overweight, obesity and severe obesity in 2018 (37%) is projected to approach that of 2007 (37.11%).
- The obvious conclusion to be drawn from the BMI change analysis is that too many individuals are still moving in the unhealthy direction. Nevertheless, additional analysis (see Figure 14 in the full report) also demonstrates that movement in the desired, healthy direction is possible; considerable percentages of individuals with an unhealthy weight can and do move to a healthy weight within a relative short time span (i.e., 2 years).
- Though not a focus of this report, underweight was found for a small percentage of children and adolescents. However, overweight and obesity affect far, far more children and youth.

Projections need not be destiny. Increases in child and adolescent obesity and severe obesity projected by 2018 are only likely if current trends continue. Trends on which these predictions are based could be reversed if the many well documented environmental conditions that foster unhealthy eating and inadequate physical activity are modified or discontinued. The goal should be to create a community environment within which *every child and adolescent can attain a healthy weight.*

Causes of the Obesity Epidemic

Over the past 50-60 years, many environmental factors that influence weight changed, making it harder for many individuals in the U.S. to engage in the behaviors that allow them to maintain a healthy weight. Most of the environmental changes that negatively impact adult BMI also occurred in the schools, surrounding neighborhoods, and homes of children, youth, and school employees. While none of these changes alone caused obesity, these changes in combination and with increased frequency have all contributed. Examples of changes that affected children and adolescents include:

- Pressures on school administrators to raise additional funds for materials, equipment and student activities leading to:
    - Marketing of less healthy food and drinks in schools through exclusive sales (pouring rights) contracts, especially with soft drink companies along with
    - Wide spread placement of food and drink vending machines, food sales for fund raisers, ala cart lines in cafeterias, and concession stands;
- Increased costs of food preparation in school cafeterias with greater reliance on pre-prepared foods and less reliance on fresh foods;
- Use of candy, sweets and other foods (i.e. pizza party) to reward good behavior and academic success;
- Replacement of milk consumption by soft drink consumption;
- Reduction or complete elimination of physical education and recess in some schools in an attempt to increase standardized test scores;
- Lack of access to adequate and healthy foods after school and on weekends and breaks;
- Concentration of fast food outlets around schools and/or in low income neighborhoods;
- Unsafe neighborhoods due to criminal activity;
- Lack of safe walking and biking routes to schools even in otherwise safe neighborhoods;
- Building of new schools at community outskirts, limiting access via walking and biking;
- More types of screens (e.g., computers, tablets, cell phones) and increased screen time.

Pennsylvania Schools help Stem the Flood

Over the past decade, Pennsylvania schools, in collaboration with the Pennsylvania Departments of Education and Health and private funders such as the Highmark Foundation, have substantially

improved health policies and related school breakfast and lunch programs, wellness programs, nutrition education, physical education, and opportunities for physical activity. Based on 93 repeated questions a state-wide school health policy and program (SHP) survey administered to representative samples of secondary schools in 2008, 2010, 2012, and 2014 determined that:

- In almost every category, favorable levels already in place in 2008 were maintained in 2010 or, in many instances, improved between 2008 and 2012, the year when new USDA regulations about the nutritional quality of foods in schools went into effect.
- For many areas addressed by SHP questions, favorable levels of policy and program implementation in 2010 or 2012 eroded substantially by 2014.
- Regarding significance of changes, the trend lines for 19 questions had moved significantly in the unfavorable direction by 2014 compared to 6 that had moved significantly in the favorable direction: a 3:1 ratio of unfavorable to favorable.

Although no cause and effect relationship can be claimed, it appears that downward trends in student BMI from 2007 to 2013, especially for overweight among secondary school students, coincided with improvements in school health policies and programs over the same time span.

Call to Action: Enhanced Community Involvement and Family Engagement

The child and adolescent obesity epidemic in Pennsylvania peaked in 2008 and slightly receded by 2013, the essential first step in controlling any epidemic. However, BMI data from 2014 and 2015 indicate that this progress may be in jeopardy. While the many, many school-based policies, programs and activities implemented by 2012 likely facilitated positive BMI trends through 2013, *schools simply cannot be expected to bear disproportionate responsibility for reversing the child and adolescent obesity epidemic.* To continue progress toward reversing Pennsylvania's child and adolescent obesity epidemic requires both greater family engagement and intensive community involvement along with vigilant maintenance and further enhancement of health-positive school policies and programs.

Clearly, everyone has a vested interest in reversing obesity and preventing associated diseases that cause needless distress and human suffering. For communities, improving population health makes additional sense because a healthy citizenry is essential to economic development. Employers have an added vested interest in child and adolescent health because today's youth are their employees of tomorrow. Bottom line? Investing in child and adolescent health is good business.

The full report that follows lists many recommended actions for multiple community stakeholders including community leaders, medical providers, insurers, philanthropic organizations, faith communities, employers, school districts, and parents to implement in order to *encourage, support and reinforce the healthy eating and regular physical activity habits that help children and youth maintain a healthy, normal weight. A key for all is to "make the healthy choice the easy choice."*

Stemming the Flood: Childhood Obesity Prevention in Pennsylvania, 2005-2014

Obesity—An Unexpected Epidemic

Now an epidemic, obesity was fairly rare in the U.S.as late as the 1980s.[1] Looking back, clearly no one event caused this rapid increase in obesity. Rather, like an unexpected and sudden nighttime flash flood caused by many separate, rapidly swelling and converging creeks and streams, many separate societal changes began in the 1950s and silently grew over 40-50 years into a new and different human ecology that profoundly influenced both population weight and health status. This rapid increase in unhealthy weight was only first detected between 1990 and 2000; the "blink of an eye" in human history. From 1990 to today, the US obesity rate doubled from less than 15% of adults to 29.4%.[1] In Pennsylvania the obesity rate rose from less than 15% in 1990 to 30% today, ranking Pennsylvania 30th among the 50 states.[2] Among Pennsylvania counties, Chester in the southeast ranks lowest for obesity at 24% and, at 37%, Fayette in the southwest ranks highest.[3] At 21.3% Colorado has the lowest obesity rate among the 50 states; West Virginia the highest at 35.1%.[2] By 2030, the adult US obesity rate is projected to climb from the current 29.4% to over 40%, with severe obesity increasing at an even faster rate.[4]

Linked to increasing rates of cancer, Type 2 diabetes, nonalcoholic fatty liver disease, osteoarthritis, and cardio-vascular disease as well as accidental injury and disabling orthopedic problems, obesity has had a dramatic impact on population health.[1] The American Cancer Society estimates that excess body weight contributes to 1 out of every 5 U.S. cancer deaths today[5] and the U.S. Centers for Disease Control and Prevention (CDC) estimates that as many as 1 in 3 U.S. adults will have diabetes by 2050 if current trends continue.[6] Type 2 diabetes causes damage to organs and structures throughout the body, including blood vessels and nerves, which commonly lead to disability and premature death.[7] A new word, "diabesity" was coined to highlight this dramatic relationship between obesity and Type 2 diabetes.[8]

U.S. Childhood Obesity Epidemic

Today's youth are the young adults of 2030. Unfortunately, as with today's adults, obesity rates have already dramatically expanded among U.S. youth of all ages.[9] Also as with adults, obesity can have immediate negative physical health consequences, including pre-diabetes, hypertension, high cholesterol, sleep apnea, accidental injury, and bone and joint problems as well as negative emotional and social consequences such as poor self-esteem and stigmatization.[9] Additionally, symptoms of diseases such as hypertension and elevated blood sugar levels that occur along with obesity in adults often start during the childhood and teen years.[10] Furthermore, individuals who are overweight or

obese as children and teenagers are highly likely to become or remain obese as adults or even move into the severe obese category.[11] Research focused on long-term adolescent obesity trends found that obesity prevalence doubled between the teen years and early 20s and doubled again by late 20s or early 30s.[12] Due to obesity, many young adults are developing diseases and disabilities that were mainly experienced by the elderly 20 years ago.[11]

Financial Impact of Obesity

Obesity is very costly. Total economic consequences of obesity (health care costs plus lost productivity) for the US were estimated at $147 billion annually in 2008.[4] Even if obesity rates stabilize over time, both obesity-related disease and obesity-related costs will increase due to severe obesity. Because obesity rates vary from state-to-state, costs are not uniform. Differences, such as lower cost of less-healthy foods in some states, can affect obesity and severe obesity rates along with current and projected health care costs. Much of the high cost of obesity-related disease is paid by public sector health plans--Medicaid and Medicare.[4]

Determining Adult Obesity Rates

Rates of obesity among adults are determined via annual national and state public health surveys.[1,3] Measured height and weight numbers are entered into a formula for calculating Body Mass Index or BMI, the best available way of determining obesity rates of entire populations. For adults, obesity is defined as BMI of 30.0 to 39.9 and severe obesity as BMI of 40 or higher.[1]

Measuring and Compiling Pennsylvania Child and Adolescent BMI Data

Similar to adults, overweight, obesity and severe obesity for youth are determined by using height and weight to calculate BMI.[13] Because of a number of factors that influence height and weight in children and adolescents, BMI categories are derived from age and sex based growth chart percentiles developed by the US Centers for Disease Control and Prevention (CDC), with 2000 as the growth reference year.[14,15] Instead of reporting BMI ranges, like with adults, overweight, obesity, and severe obesity for youth are expressed in percentiles. Overweight is defined as ≥ 85th percentile but less than 95th percentile and obese is defined as ≥ 95th percentile but less than 1.2 times of 95th percentile.[16] Severe obese is at or above 1.2 times of 95th percentile or 35.0 of absolute BMI value regardless of age and sex.[16] For this report, actual measured heights and weights of thousands of school children in grades preK - Grade 12 who attended hundreds of schools located in most Pennsylvania counties from 2007 to 2014 were used to calculate BMI rates. Over 2.2 million height and weight measures were analyzed for this report.

Capturing these BMI data was possible because school nurses in Pennsylvania are required by state law to measure the height and weight[17] of all students annually by following steps that are recommended by CDC.[18] Nurses are also required by law to mail annual letters to parents/guardians that include their child's calculated BMI plus an explanation of age and gender factors that can influence BMI. These letters include a recommendation that parents share the BMI and other information in the letter with their child's physician.[17]

The student health record section of a computer software program called *Health eTools for Schools* (*eTools*) allows nurses to efficiently enter student health data for Early and Periodic Screening, Diagnosis and Treatment (EPSDT) including measurement of exact height and weight used to calculate BMI.[19,20] Data are either entered directly on line or through a mobile device or tablet. (*Health eTools for Schools* was initially funded by the Highmark Foundation and is used in hundreds of schools throughout Pennsylvania.[19] Currently, *eTools* is owned and technically supported by Population Health Innovations, LLC which provides access through a grant from the Force for Health Foundation.) Student health record data from *eTools* are downloaded monthly by participating schools and, via computerized programming, are regularly compiled by Population Health Innovations. De-identified height and weight data from these student health records were made available for use in preparing this report. De-identified means that any student names in the data files are replaced with unique code numbers to protect privacy. No student names are ever shared with or known to those who prepared this report.

CHILD AND ADOLESCENT OBESITY IN PENNSYLVANIA, 2007-2018

Overweight and obesity among Pennsylvania children and adolescents is the primary focus of this report because having accurate information is vital for helping all involved (including community and school leaders and policy makers, community and school employees, as well as and parents/guardians) decide on actions that that are needed to reverse the obesity epidemic among children and adolescents both statewide and locally. The relevant information presented in this section includes:

- Current levels (i.e., prevalence) of healthy weight, overweight, obesity, severe obesity and underweight among Pennsylvania school children along with trends (i.e., whether up, down or not changed) in these four categories over eight years, 2007-2015.
- Comparisons of Pennsylvania data with data from other states regarding the prevalence and trends of childhood obesity.
- BMI category change patterns that, when known, can be very helpful for determining if and when trends are moving in a desired or undesired direction as well as for projecting future trends.

Sources of Child and Adolescent BMI Data for Pennsylvania

Results reported below are based on analysis of over 2.2 million student height and weight measurements , converted to BMI, that were taken by school nurses in 2007-2015 (Figure 1). Summaries of results are reported for all students as well as by student gender and school level defined as elementary grades (pre-k to 5), middle school grades (6 to 8) and high school grades (9 to 12).

- Data from 1,114 schools in 293 school districts located in 53 of Pennsylvania's 67 counties is represented. Based on population size:
    - All ten of the largest Pennsylvania cities are represented.
    - The 18 largest Pennsylvania counties are represented.
- For all school levels, the number of males and females were approximately equal.
- The number of height and weight measures for high school grades increased substantially after 2010 but decreased somewhat after peaking in 2013.
- Data on student race/ethnicity or socio-economic status were not available.

Some differences noted below are identified as being "significant", meaning that the likelihood of a finding occurring by chance or luck is very, very slight. (Findings that are significant tend to be most important.) This may seem strange when actual percentage differences seem very small; however, finding significant differences like these is not unusual when very large numbers are analyzed. Over 2

million is an exceptionally large number. The findings reported throughout this section are based on appropriate statistical analysis procedures used previously.[19,20]

Figure 1 below provides the total number student BMI records that were available for each year from 2007-2014 by school level—elementary school, middle school and high school.

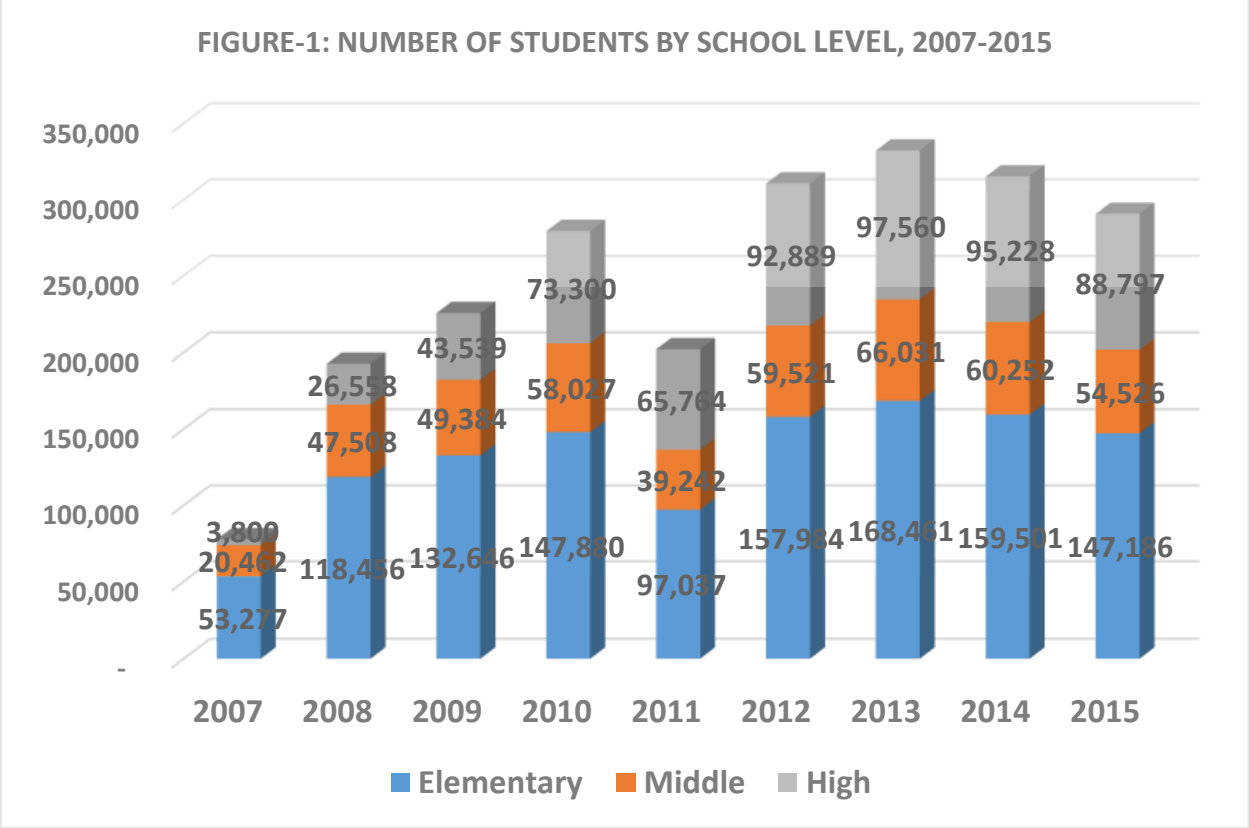
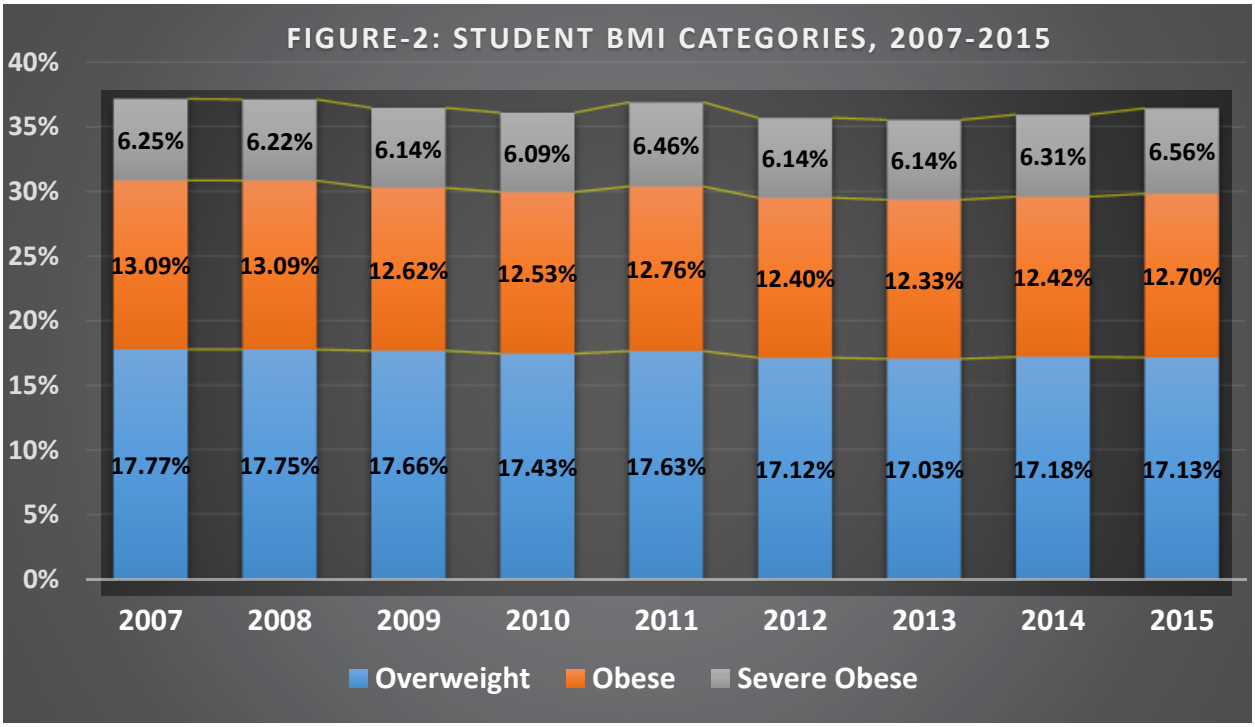


Figure 1 above provides the total number of BMI measurements analyzed for this report by year, 2007-2015. These include a total of 1,182,428 BMI measurements from elementary students, 454,953 from middle school students and 587,435 high school students. Given these large number of BMI readings across a very broad geographical distribution, data analysis results generated from these readings are representative of pre- K to 12 students in Pennsylvania.

Current Unhealthy BMI Rates for All Pennsylvania Students (Figure 2)



In 2015, 61.23% of Pennsylvania pre-K to 12 students had a normal (healthy) weight, while 17.13% were overweight, 12.70% were obese, 6.56% were severe obese, and 2.38% were underweight. Because children and adolescents whose BMI is already in these categories are more likely to experience negative health effects and remain in these categories into adulthood, the combined severe obese/obese rate of 19.26% is of greatest concern. When all three categories of unhealthy weight are combined, 36.39% of Pennsylvania children and adolescents were classified as severe obese, obese and overweight. Assuming an average class size of 30 students, this means that two students in every Pennsylvania classroom have a BMI in the severe obese category, four in the obese category, and another five in the overweight category—a total of 11 students per classroom.

Comparison of Obesity and Overweight Rates and Trends with Findings from Other Studies (Tables 1&2)

Recent evidence indicates that the U.S. national rates of obesity for children and adolescents ages 2 to 19 have leveled off. Still, overall rates remain too high. For example, despite decline of obesity among 2 to 5 year-olds since 2003, almost 10% of U.S. children become obese by their 5th birthday.

Declines in childhood obesity rates and/or combined overweight and obesity rates were recently reported by 19 states, one U.S. territory, and 12 other geographic entities, such as cities, counties, or districts (Tables 1 & 2). For the U.S., in general, obesity decreased for elementary children but increased

substantially for middle and high school youth from 2004 to 2012. While the timeframes and school levels differ, results from previous studies illustrate that changes in Pennsylvania overweight and obesity rates, both declining through 2013, are consistent with those reported from other parts of the U.S. Additionally, Pennsylvania is the only state that can report rates and trends based on K-12 student data over many years up to and including 2015.

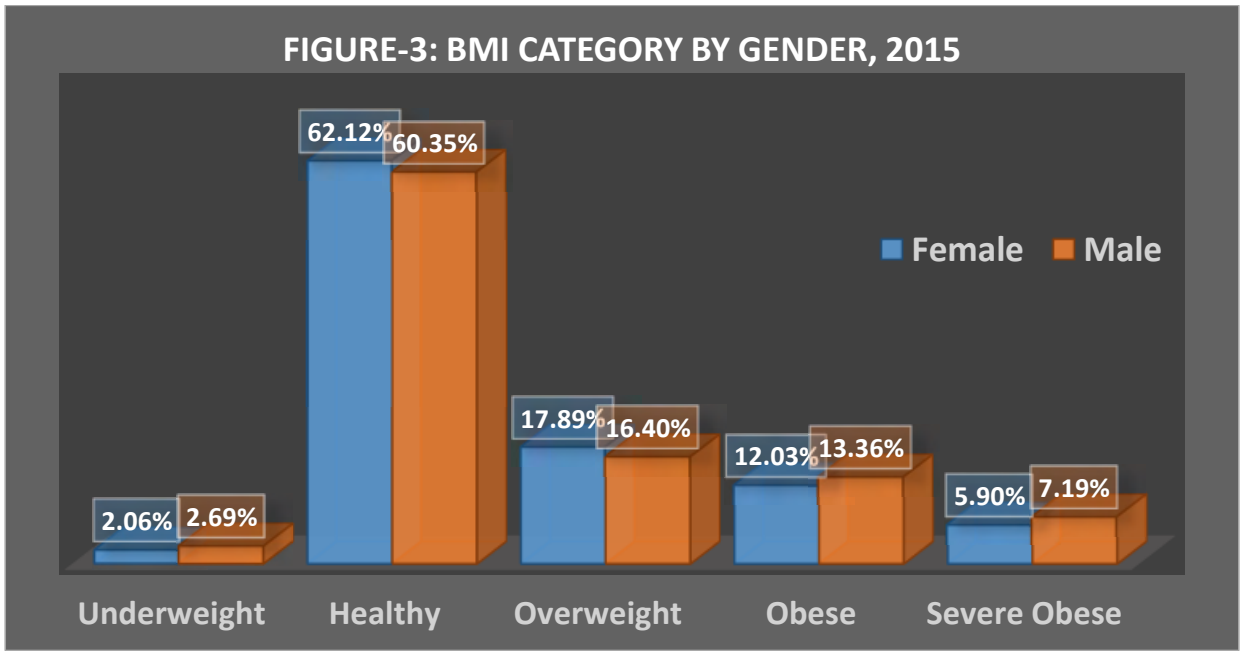
Table-1: Comparison of Obesity Trends in Comparison States and Nationally, 2004-2015

Geographical Entity	Grades	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Time-1 Rate	Time-2 Rate	Relative Change
New Mexico	3													22.60%	19.90%	-11.90%
Philadelphia, PA	K-12													21.50%	20.50%	-4.70%
New York City	K-8													21.90%	20.70%	-5.50%
Anchorage, AK	K, 1, 3, 5, 7													16.80%	16.30%	-3.00%
United States	1-6													18.80%	17.70%	-5.85%
United States	7-12													17.40%	20.50%	17.82%
Current PA Report	K-12													19.34%	19.26%	-0.41%

Table-2: Comparison of Combined Overweight and Obesity Trends in Comparison States, 2004-2015

Geographical Entity	Grades	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Time-1 Rate	Time-2 Rate	Relative Change
California	5, 7, 9													38.40%	38.00%	-1.10%
Mississippi	K-5													43.00%	38.00%	-11.60%
Tennessee	K, 2, 4, 6, 8, 9-12													41.10%	38.50%	-6.30%
Current PA Report	K-12													37.11%	36.39%	-1.94%

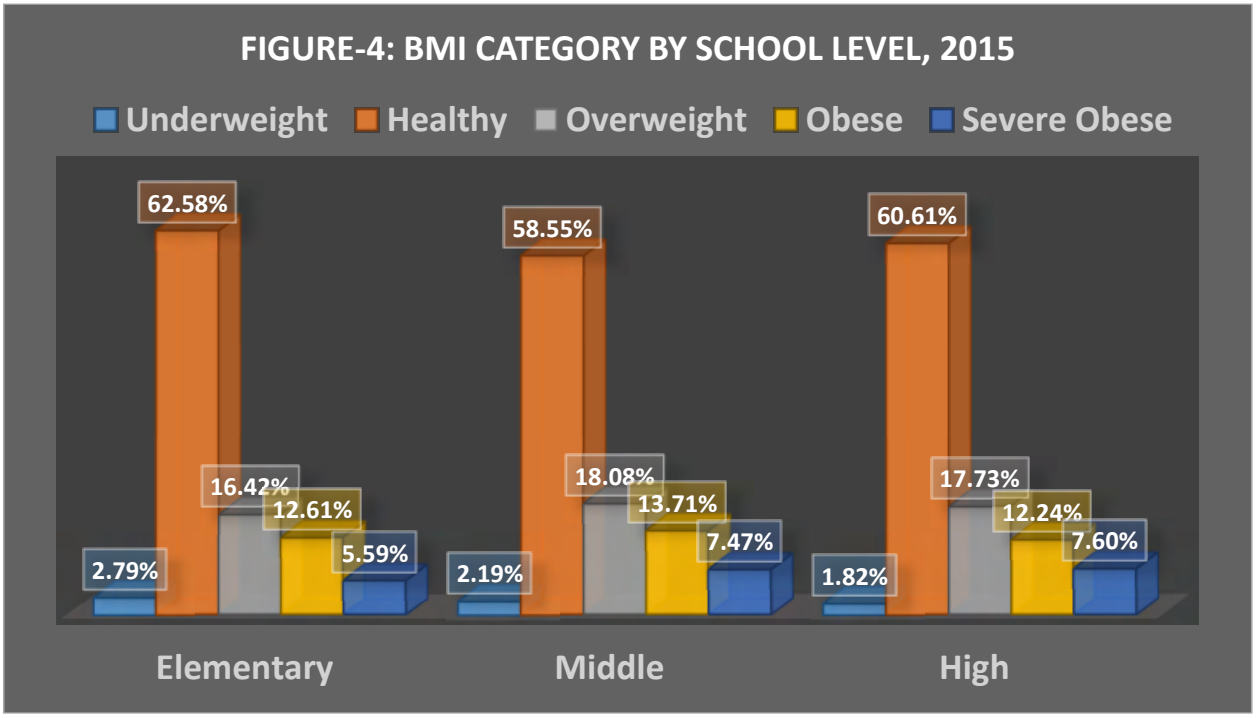
Current BMI Rates by Gender (Figure 3)



Analysis of BMI categories by gender (Figure 3) found that:

- Girls were significantly more likely than boys to be normal weight;
- Overweight was significantly higher among girls;
- Obesity and sever obesity were significantly higher among boys; and
- Underweight was significantly higher among boys.

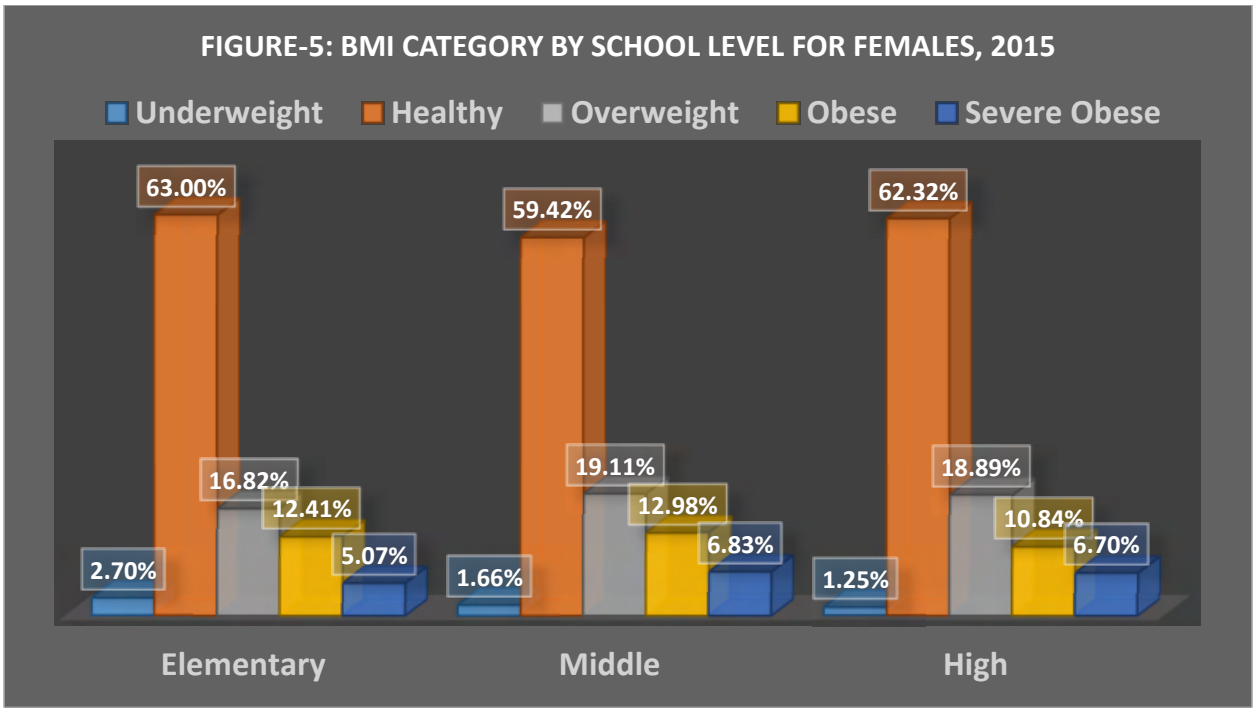
Current BMI Rates by School Level (Figure 4)

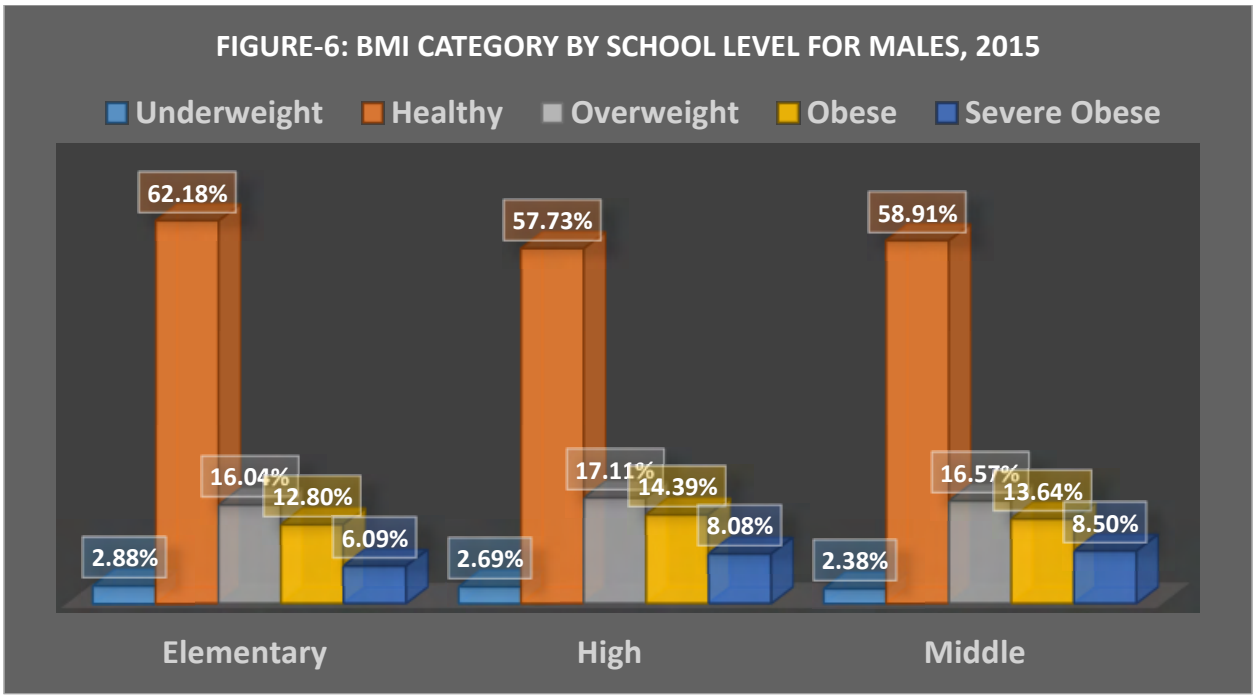


Analysis of BMI categories by school level (Figure 4) revealed that:

- Elementary students were significantly more likely than middle and high school students to be normal weight;
- Elementary students had the lowest combined rates of obesity and severe obesity (18.20%);
- Middle school students had the highest combined rates of obesity and severe obesity (21.18%).
- The obesity level (combined obese and severe obese) for Pennsylvania elementary children in 2012 (17.8%) was comparable to the U.S. rate of 17.7% in 2012 (see Table 1 above).
- The obesity level (combined obese and severe obese) for Pennsylvania middle and high school youth in 2012 (19.3%) was lower than the U.S. rate of 20.5% in 2012 (see Table 1 above).

Current BMI Rates by Both School Level and Gender (Figures 5 & 6)



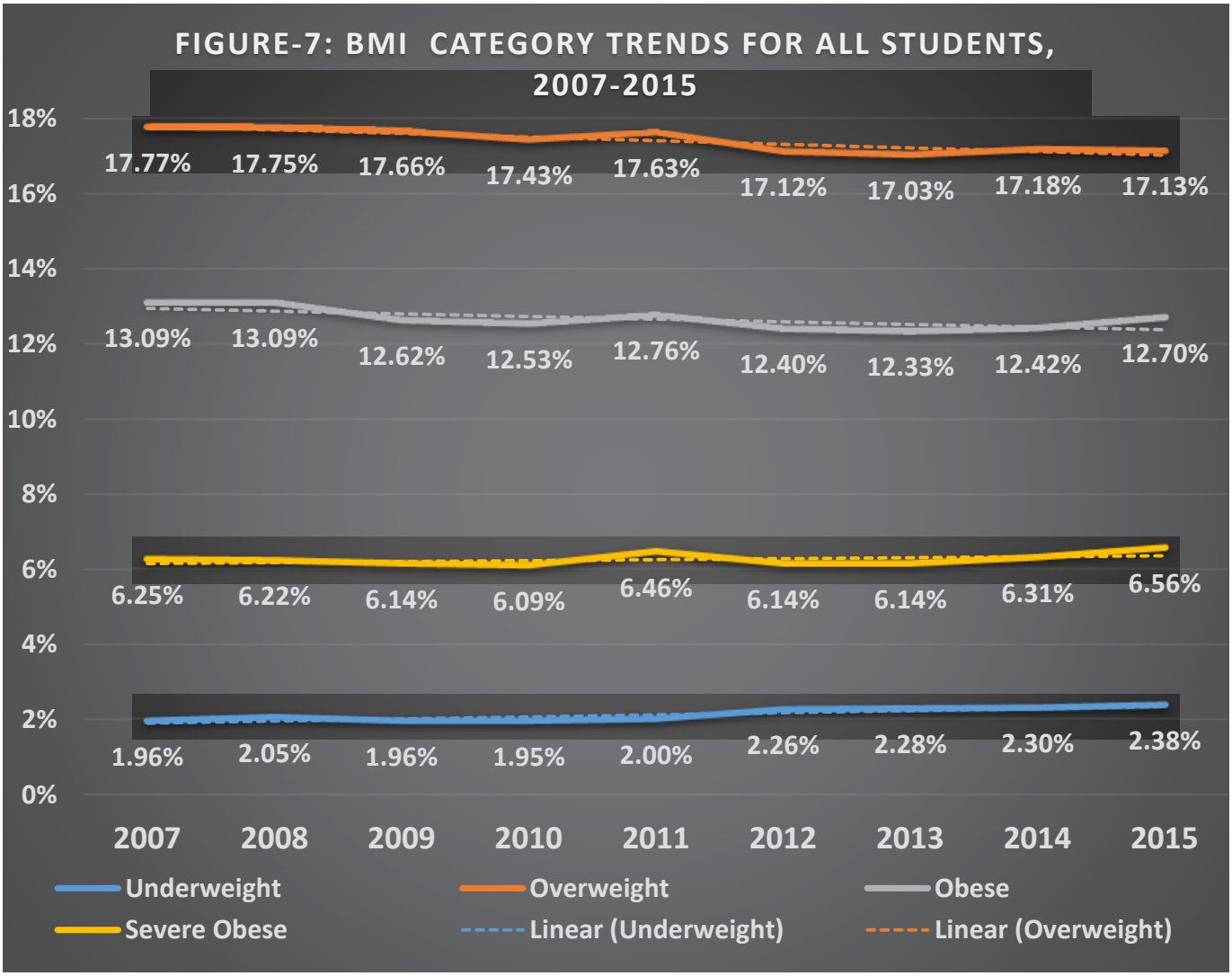


When BMI categories were analyzed together by both school level and gender (Figures 5 and 6):

- Normal weight and overweight were significantly more common for girls than boys in all three school levels.
- Underweight, obesity, and severe obesity were significantly more common for boys than girls in all three school levels.

NOTE: The graphs in Figures 7-13 below include dotted lines that are labeled as "linear (underweight)", "linear (overweight)", "linear (obese)" and "linear (severe obese)". These dotted lines represent the actual trends in the four weigh categories over time from 2007 to 2015. Because rates can fluctuate up or down over time, findings based on a larger the number of data points (in this case years) are most accurate.

Overweight, Obesity, Severe Obesity and Underweight Trends, 2007-2015 (Figure 7)



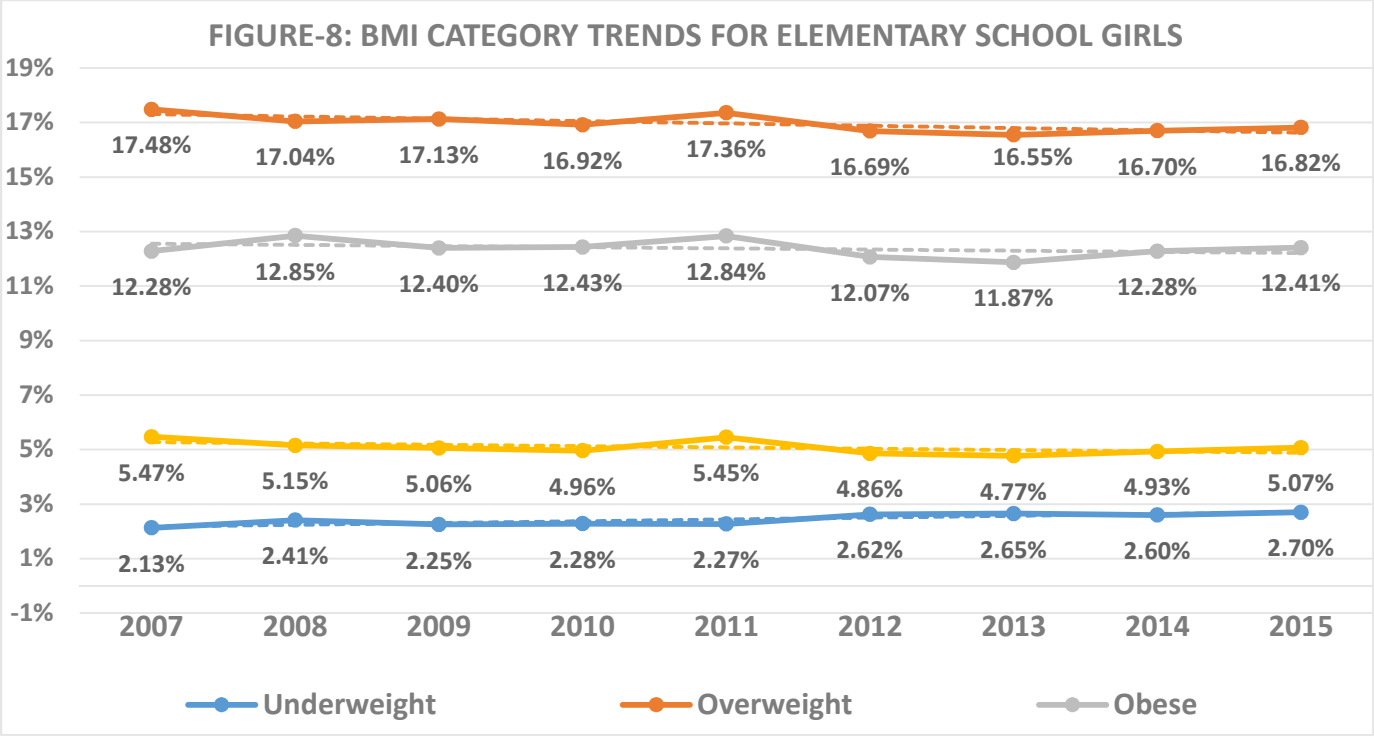
Analysis of eight-year data from all students (Figure 7) revealed that:

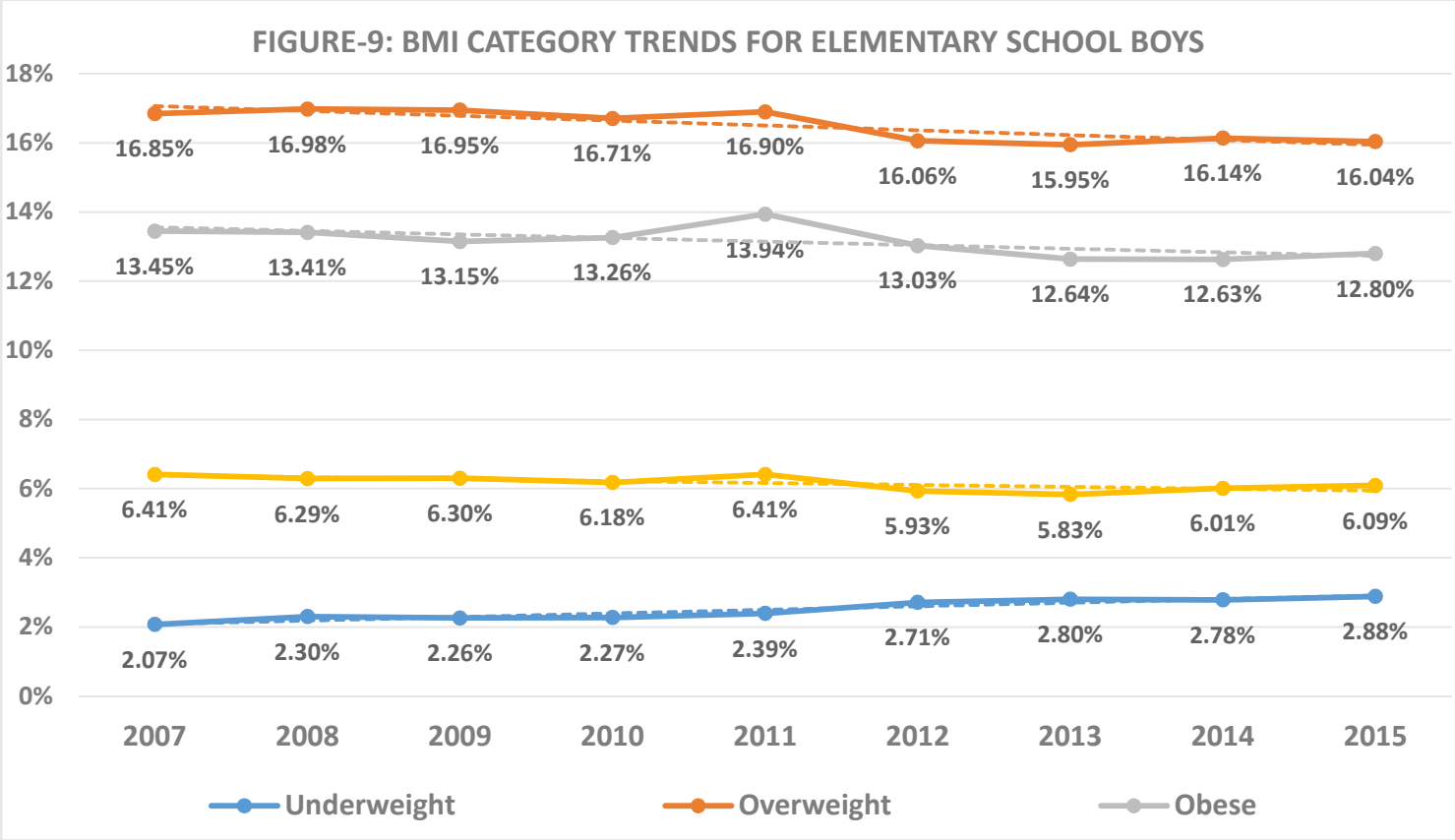
- Healthy weight still predominates; 6 of every 10 Pennsylvania children and adolescents have a healthy BMI.

- After decreasing by 2009 and remaining steady through 2013, severe obesity rose from 2013 to 2015; severe obesity was more common in 2015 than in 2007.
- Obesity decreased from 2007 to 2013, and then slightly but steadily increased by 2015.
- Overweight slightly decreased from 2007 to 2012 and remained steady through 2015.
- Underweight slightly but steadily increased from 2007 to 2015.

Trends were also analyzed by both gender and school level (Figures 8-12). Significant trends for both girls and boys were found at the elementary and high school levels. At the middle school level, significant trends were only found for boys.

Overweight, Obesity, Severe Obesity and Underweight Trends by Gender and School Level, 2007-2014 (Figures 8 - 9)





At the elementary school level (Figures 8-9):

- For girls, prevalence of overweight decreased significantly but obesity and severe obesity stayed the same over time.
- For boys, prevalence of overweight and severe obesity decreased significantly but obesity prevalence stayed the same over time.
- For both girls and boys, underweight prevalence increased significantly over time.

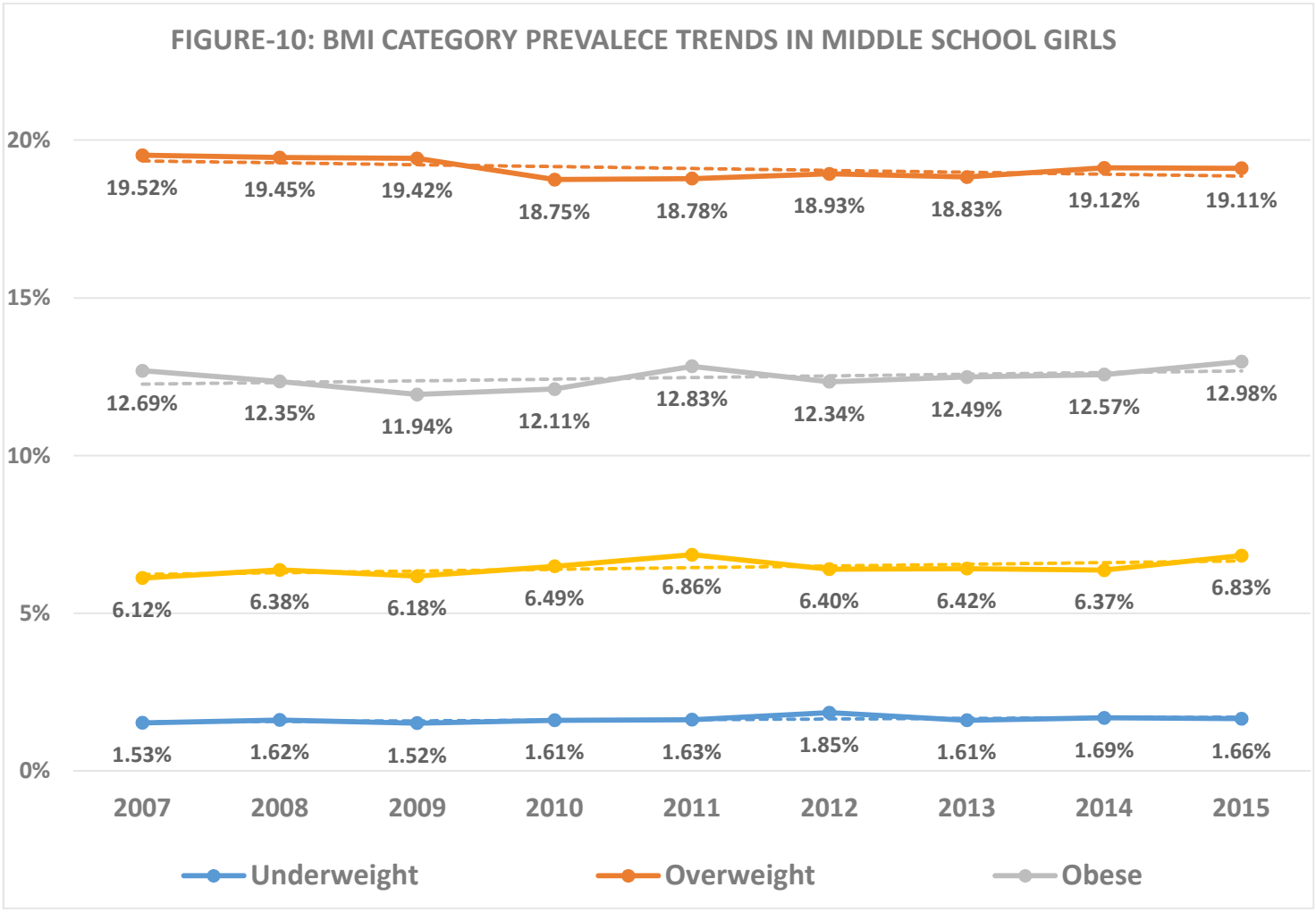
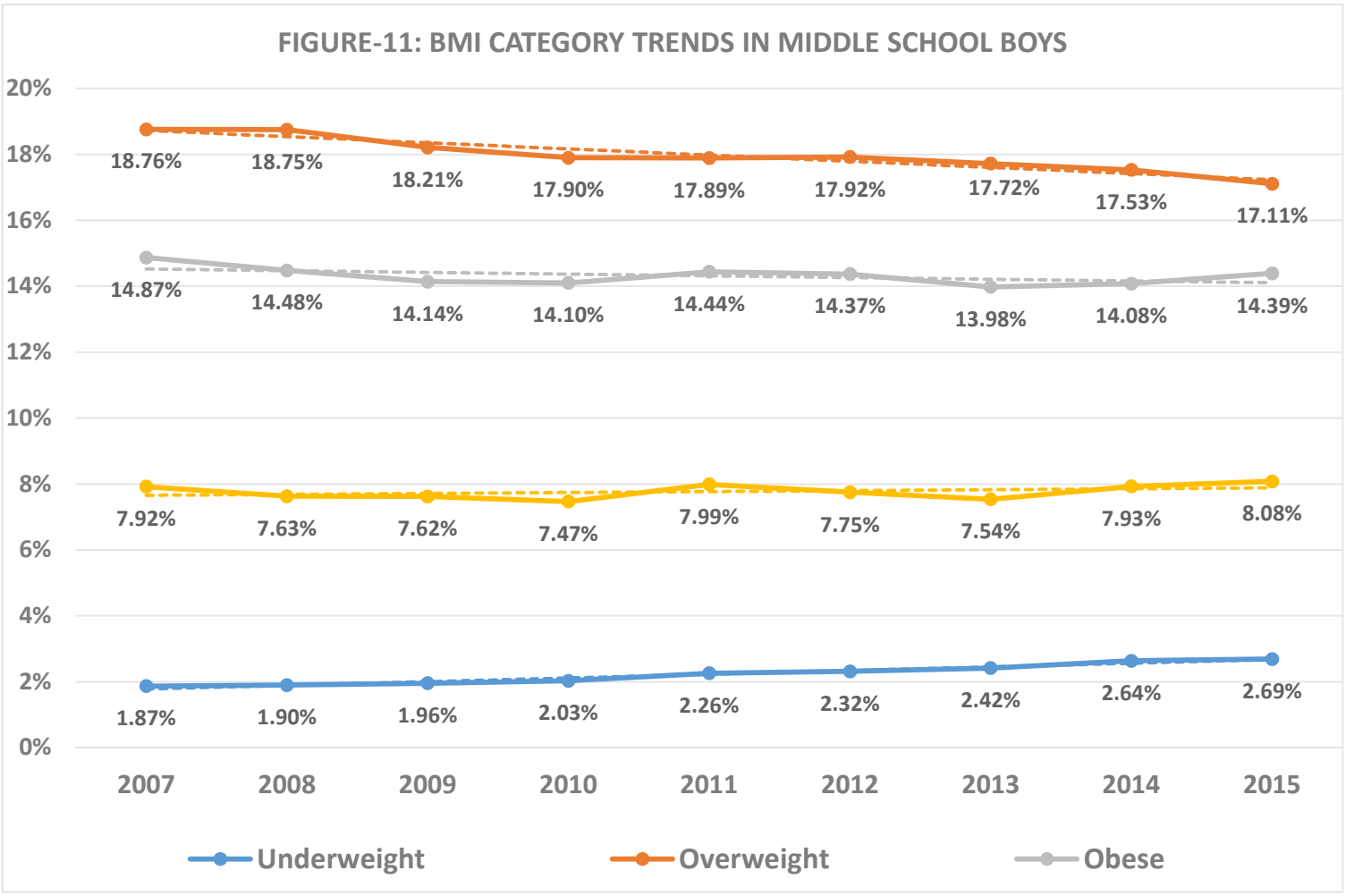


FIGURE-10: BMI CATEGORY PREVALECE TRENDS IN MIDDLE SCHOOL GIRLS
20%
15%
10%
5%
0%
19.52%
19.45%
19.42%
18.75%
18.78%
18.93%
18.83%
19.12%
19.11%
12.69%
12.35%
11.94%
12.11%
12.83%
12.34%
12.49%
12.57%
12.98%
6.12%
6.38%
6.18%
6.49%
6.86%
6.40%
6.42%
6.37%
6.83%
1.53%
1.62%
1.52%
1.61%
1.63%
1.85%
1.61%
1.69%
1.66%
2007
2008
2009
2010
2011
2012
2013
2014
2015
Underweight
Overweight
Obese



At the middle school level (Figure 10-11):

- For boys, prevalence of overweight decreased significantly over time.
- For boys, underweight increased significantly over time.
- For girls, no significant trends were detected.

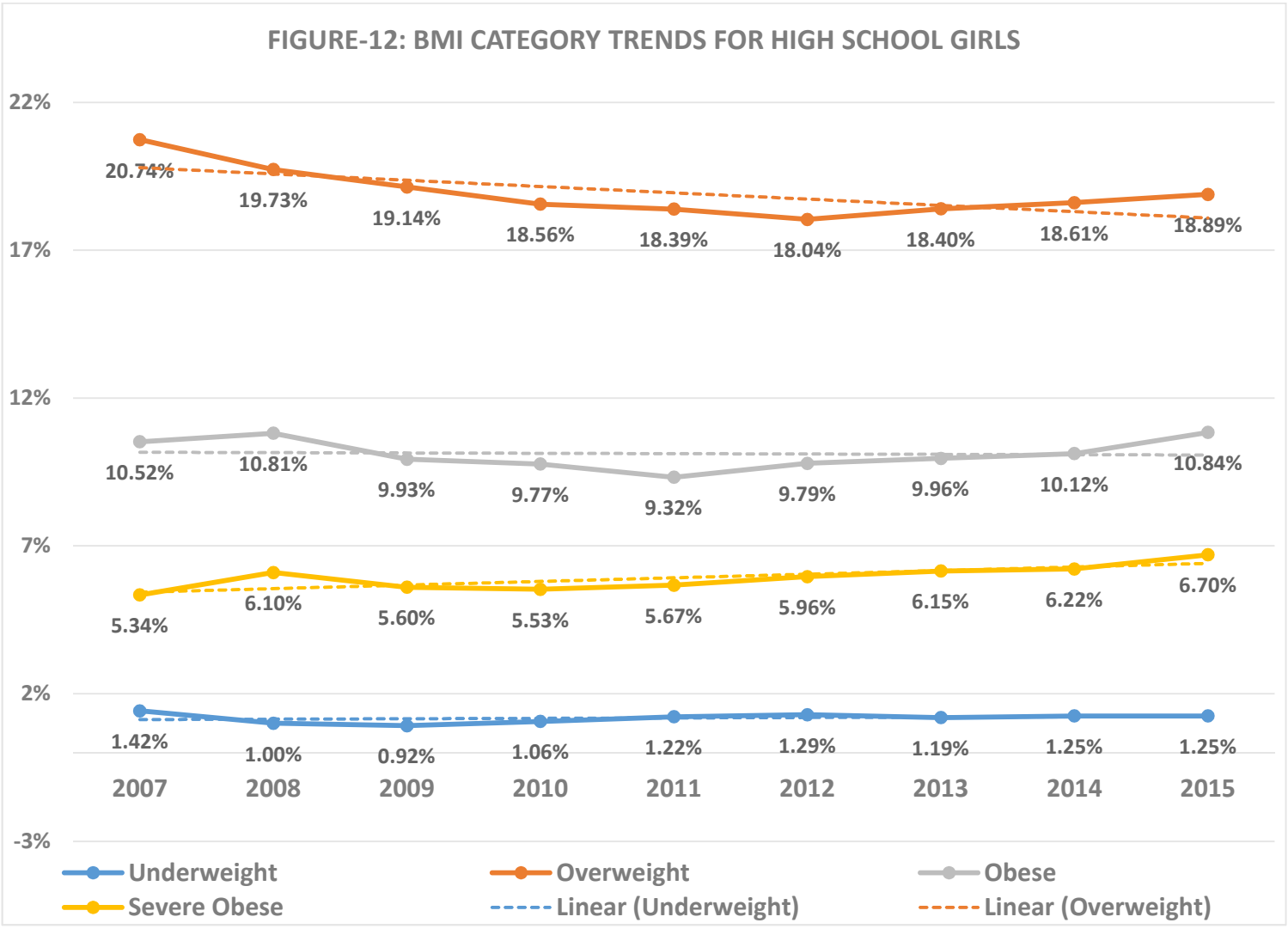
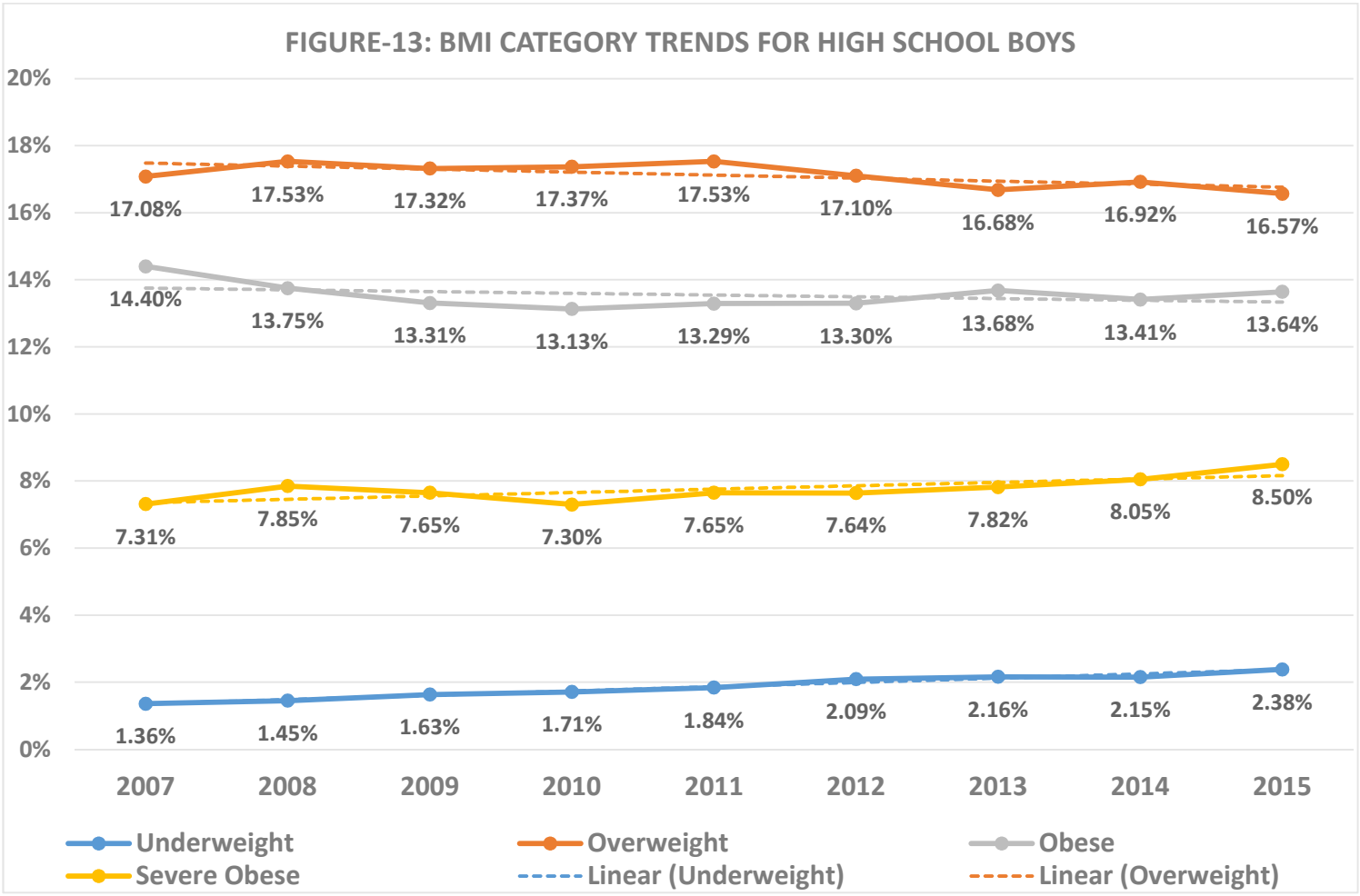


FIGURE-12: BMI CATEGORY TRENDS FOR HIGH SCHOOL GIRLS
22%
17%
12%
7%
2%
-3%
20.74%
19.73%
19.14%
18.56%
18.39%
18.04%
18.40%
18.61%
18.89%
10.52%
10.81%
9.93%
9.77%
9.32%
9.79%
9.96%
10.12%
10.84%
5.34%
6.10%
5.60%
5.53%
5.67%
5.96%
6.15%
6.22%
6.70%
1.42%
1.00%
0.92%
1.06%
1.22%
1.29%
1.19%
1.25%
1.25%
2007
2008
2009
2010
2011
2012
2013
2014
2015
Underweight
Overweight
Obese
Severe Obese
Linear (Underweight)
Linear (Overweight)



At the high school level (Figure 12 & 13):

- For both girls and boys, prevalence of severe obesity increased significantly over time.
- For both girls and boys, prevalence of overweight decreased significantly over time.
- For boys only, underweight prevalence increased significantly over time.

Rates and Direction of BMI Changes at the Individual Level, 2012-2014 (Figure 14)

This section describes the BMI movement patterns, if any, that occurred for normal weight, overweight, obese, and severe obese among Pennsylvania elementary, middle, and high school students. Data analysis was based on a sub-set of matched, viable BMI records for 106,245 K-12 students from two time points, 2012 and 2014. Uniquely, results of this analysis and results from two previous studies (i.e., 2006-2008 and 2009-2011) [19,20] utilized *eTools*-generated data and employed mathematical modeling to determine whether the BMI status of Pennsylvania students remained the same or changed over time. The current analysis confirmed the previous findings that child and adolescent BMI status moved substantially in both the desirable and undesirable directions (Figure-14).

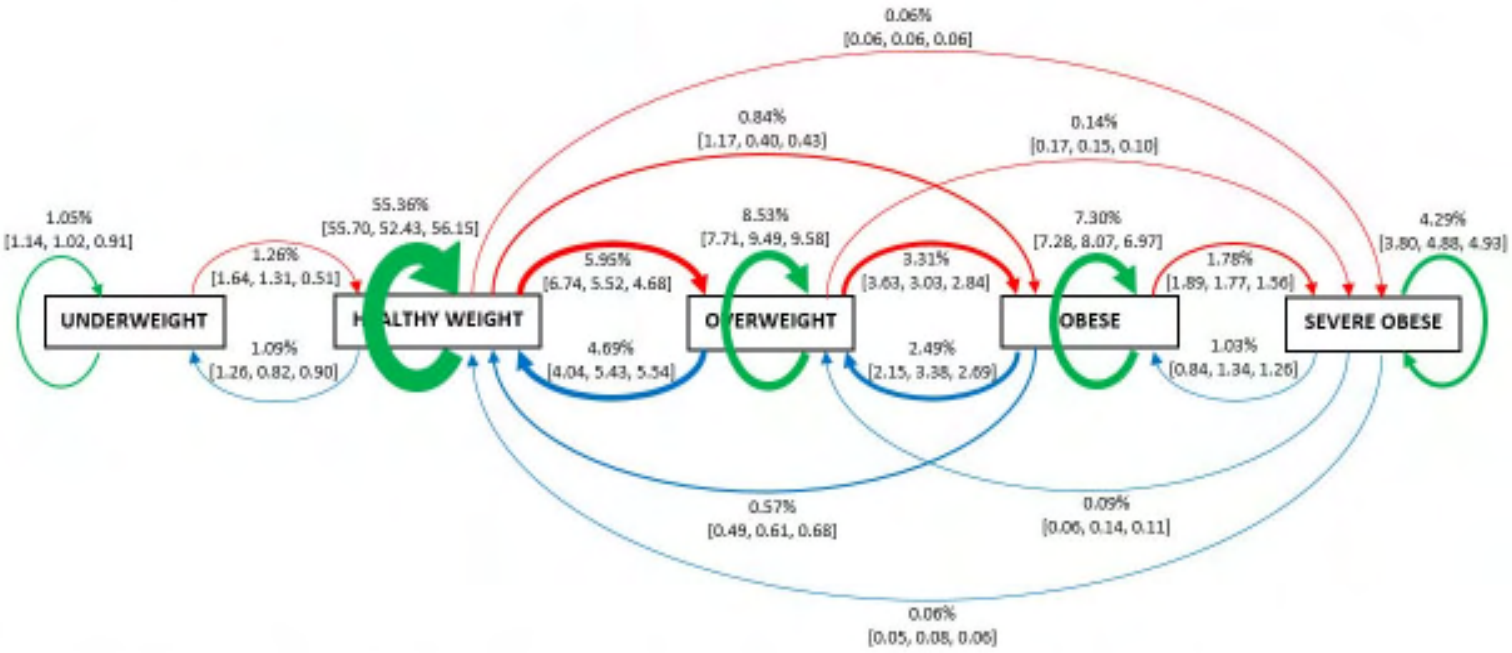
Results indicated that, during this two-year period, the movement of both male and female students in the "weight gain" direction (red arrows in Figure-14) tended to overshadow movement in the opposite ("weight loss") direction (blue arrows in Figure-14); this pattern is most prominent among elementary school students. While movement occurred for many individuals, 76.53% of the 106,245 individuals experienced no change in BMI status; 1.05% stayed underweight, 55.36% stayed healthy weight, 8.53% stayed overweight, 7.3% stayed obese, and 4.29% stayed severe obese (green arrows in Figure-14).

The remaining 23.72% of students migrated from one weight category to another, in either the undesirable or desirable direction (Figure-14). The most noteworthy migrations in the undesirable direction were healthy to overweight (5.95%), overweight to obese (3.31%), obese to severe obese (1.78%), healthy to underweight (1.09%) and healthy to obese (.84%). Most noteworthy migrations in the desirable direction also demonstrated the same order, i.e., overweight to healthy (4.69%), obese to overweight (2.49%), severe obese to obese (1.03%), and underweight to healthy (1.26%) and obese to healthy (.57%). In almost all instances, the highest percentage of elementary school students had weight gain and the lowest percentage had weight loss, compared to middle and high school students. Importantly, the elementary student group included:

- The lowest percentages of those who were overweight and severe obese in 2012 and remained at overweight and severe obese in 2014.
- Almost identical percentages of those who transitioned from overweight to normal weight and overweight to obese.
- The highest percentage of those who transitioned from underweight to healthy weight.

The percentage of students who remained severe obese was greatest for high school, perhaps indicating that going from severe obese to a healthier BMI becomes less likely as teens get older.

Figure-14: Pattern of Student Body Mass Index Migration between 2012 and 2014, Reported by Percentage and School Level (N=106,245)



Only those students with viable records pertaining to both time points (2012 and 2014) were included (N=106,245). Each value indicates the percent of students who represented the corresponding transition pattern; six values which were less than 0.05% were not included in order to simplify the diagram.

Red color is for weight gain from 2012 to 2014, blue for weight loss, and green for continuation within one weight category. Arrow thickness is proportionate to the size of the percentage.

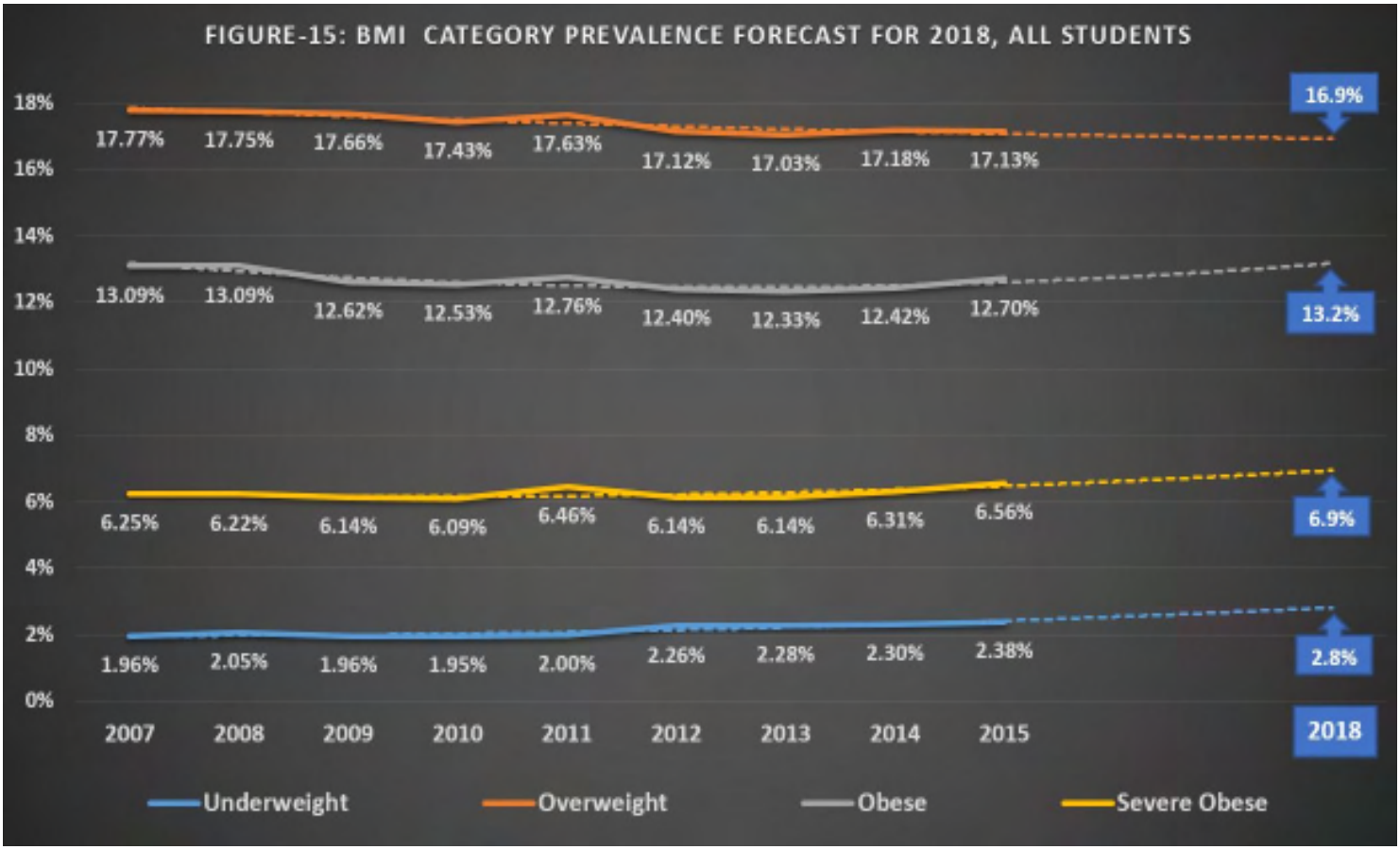
For percentages enclosed in parentheses, the first percentage pertains to students of elementary schools (n=59,278), the second percentage pertains to students of middle schools (n=15,461), and the third percentage pertains to students of high schools (n=31,506).

Some differences in BMI movement patterns were found based on gender. Compared to boys, girls were more likely to remain within the most prevalent weight categories, i.e., stay healthy weight (57.28% vs 53.47%) or overweight (9.17% vs 7.89%). Girls were also less likely to remain within extreme weight categories, i.e., stay obese (6.74% vs 7.86% boys), severe obese (3.80% vs 4.77% boys) or underweight (0.90% vs 1.2% boys).

Projected Pennsylvania Child and Adolescent BMI Status for 2018 (Figure 15)

An important question that comes to mind is, "What might be expected in the future if the current BMI change patterns continue?" To address this question, projections to 2018 were calculated (Figure 15). Projections indicate that, if current BMI transition patterns continue, the percentage of children and adolescents who are overweight is likely to continue a gradual decline. However, the prevalence of all other unhealthy weight categories is projected to increase substantially by 2018; the prevalence of both obesity and severe obesity likely will be greater in 2018 than in 2007. Despite the general decline of obesity and plateau of severe obesity from 2007 to 2010, the data from 2013 to 2015 suggest that

combined rate of obesity plus severe obesity is likely to increase because some healthy and overweight students will move into the obese category; a more likely pattern for boys (Figure 14). Overall, the combined percentage of youth who are overweight, obese and severe obese in 2018 (37%) could equal that of 2007 (37.11), thus possibly erasing all gains achieved between 2007 and 2013.



Summary of Findings

Several conclusions can be drawn from the findings presented above:

- Through 2015, healthy weight still predominates and is projected to predominate through 2018; 6 of every 10 Pennsylvania children and adolescents have a BMI within the healthy range (Figures 7 & 15).
- Levels of overweight among the Pennsylvania school-aged population slightly but steadily decreased from 2007 to 2012 and then leveled off from 2013 to 2015 (Figures 7 & 15).
- After having declined from 2007 to 2013, levels of obesity increased slightly in 2014 and again in 2015 (Figures 7 & 15);
- After having held steady from 2007 to 2013, levels of severe obesity rose by 2015 to a rate that exceeded the 2007 baseline prevalence rate (Figures 7 & 15);

- Levels of underweight gradually and steadily increased from 2007 to 2015 (Figures 7 & 15).
- Based on statistical projections (Figure 15), the prevalence rates of both obesity and severe obesity could possibly exceed those of 2007;
- Despite a projected decline in overweight, the combined prevalence of overweight, obesity and severe obesity in 2018 (37%) is projected to approximate that of 2007 (37.11%).
- In general, at all school levels girls were more likely to be normal weight or overweight and boys were more likely to be obese or severe obese
- The obvious conclusion to be drawn from the BMI change analysis (Figure 14) is that too many individuals are still moving in the unhealthy direction. Nevertheless, this analysis also demonstrates that movement in the desired, healthy direction is possible; considerable percentages of individuals with an unhealthy weight can and do move to a healthy weight within a relative short time span.
- Though not a focus of this report, underweight was found for a small percentage of children and adolescents. However, overweight and obesity affect far, far more children and youth.

Trends are determined by following changes in percentages over multiple years. Eventually, overall patterns (i.e., trend lines) emerge even though percentages may increase or decrease from year to year. For Pennsylvania youth, linear trend lines (Figure 7) indicate that overweight and obesity decreased from 2007 through 2013 and severe obesity remained level. These trends were promising and clearly demonstrated that the prevalence of excess weight among children and adolescents can be reduced.

Nevertheless, it appears that gains achieved through 2013 began to erode by 2014, a development that was confirmed in 2015. Alarmingly, the prevalence of sever obesity in 2015 exceeded that of 2007, the baseline year. Even more alarming, projections indicate that the Pennsylvania childhood obesity epidemic could resurge by 2018 to a level equaling that of 2007 (Figure 15).

An obvious shortcoming of these results is lack of explanations. For example, a possible reason for more boys (especially older boys) to have higher BMIs is that a small number purposely choose to put on weight for sports. This may be especially true for those who play a sport like football where some elite athletes may purposely gain muscle mass, moving their BMI into the overweight category without becoming overfat. While plausible, this explanation, would involve only a very small percentage of individuals and is highly unlikely to be true for adolescents with BMI in the obese and severe obese ranges.[21,22] Additionally, the reasons for a small percentage of children and adolescents to be underweight are not known. Possible explanations include genetic tendencies, illness, food scarcity, eating disorders, or other factors; however, data analyzed for this report cannot provide specific explanations.

Finally, projections need not be destiny. Increases in child and adolescent obesity and severe obesity projected by 2018 are only likely to occur if trends detected in 2014 and 2015 continue. The positive trends experienced from 2007 to 2013 can possibly be regained, but only if environmental conditions are favorable. This may require redoubled and coordinated efforts within and among families, schools and communities aimed at promoting healthy eating and adequate physical activity.

WHAT CAUSED THE OBESITY EPIDEMIC?

Human health is determined by a mix of factors with individual behavior being the most important. While body weight is partially dependent on genes inherited from our ancestors, throughout history most individuals were able to maintain a normal weight by practicing two behaviors--relatively healthy eating and regular, moderate physical activity—primarily walking. In fact, through most of human history the risk of starvation was a much greater concern; individuals needed to put on weight when food was plentiful in order to survive when food was scarce, especially if the food provided a lot of fat calories and tasted sweet. Plus, in many locations the essential mineral, salt, was hard to come by. In other words, for most of human history consuming high calorie, fatty foods and salt, when available, was most often beneficial--even necessary for survival.[23]

Over the past 50-60 years, however, the environmental factors that influence weight changed, making it harder for many individuals in the U.S. to engage in the behaviors that allow them to maintain a healthy weight. As a result, many who in the past would not have had a weight problem are now having difficulty maintaining a healthy weight. Environmental changes over time that influenced food consumption patterns include[24,25]:

- Greater food abundance coupled with relative lower cost;
- Substantially increased salt, fat and sugar content added through food processing;
- For many families, limited availability of fresh fruits, vegetables, and other whole foods;
- Aggressive marketing of processed products by the food and beverage industries, include soft drinks sweetened with high-fructose corn syrup;
- Hectic lifestyles that lead to fast-food purchase and consumption;
- More eating out at restaurants along with increased portion sizes served up at restaurants.

Environment changes that impacted physical activity include:

- Communities designed for vehicle traffic rather than pedestrian and bike access;
- Inadequate facilities and/or or unsafe neighborhoods for routine physical activity, including walking;
- Hectic lifestyles that don't allow time for formal exercise/working out;
- Reductions in routine, daily physical activity, such as walking;
- Universally available passive entertainment through television;
- Participation in sedentary activities such as computer games and on-line social networks;

- Use of television and other screens to directly market food to children with less-healthy foods often connected to the most popular movies, cartoon characters, and super heroes.

Together, these and many other environmental changes encourage the overconsumption of the less healthy food and sedentary living that contribute to obesity and related diseases such as Type 2 diabetes, cancer and heart disease.

Most of the environmental changes that negatively impact BMI also occurred in the schools, surrounding neighborhoods, and homes of children, youth, and school employees.[24,25] While none of these changes alone caused obesity, these changes in combination and with increased frequency have all contributed. Examples of changes that affected children and adolescents included:

- Pressures on school administrators to raise additional funds for materials, equipment and student activities leading to:
    - marketing of less healthy food and drinks in schools through exclusive sales (pouring rights) contracts, especially with soft drink companies along with
    - wide spread placement in schools of food and drink vending machines, food sales for fund raisers, ala cart lines in cafeterias, and concession stands;
- Increased costs of food preparation in school cafeterias with greater reliance on pre-prepared foods and less reliance on fresh foods;
- Use of candy, sweets and other foods (i.e. pizza party) to reward good behavior and academic success;
- Replacement of milk consumption by soft drink consumption;
- Lack of access to adequate and healthy foods after school and on weekends and breaks;
- Concentration of fast food outlets around schools and/or in low income neighborhoods;
- Reduction or complete elimination of physical education and recess in some schools in an attempt to increase standardized test scores;
- Unsafe neighborhoods due to criminal activity;
- Lack of safe walking and biking routes to schools even in otherwise safe neighborhoods;
- Building of new schools at community outskirts, limiting access via walking and biking;
- More types of screens (e.g., computers, tablets, cell phones) and increased screen time.

Research studies and public health surveillance system reports provide several pertinent nutrition and physical activity findings that likely are associated with these environmental changes. Over ten years, overweight young children in the U.S. were found to gain just under one lb. of excess weight per year. This 9-10 lb. excess weight gain could be prevented by reducing energy intake and/or increasing energy expenditure by 110-165 calories per day, a relatively small, manageable amount. In comparison, overweight U.S. adolescents were found to consume an excess of 678 to 1017 calories per day more than was needed to maintain a healthy weight, resulting in excess weight gain of approximately 58 lbs. over ten years.[26] (A tangential but critical point is that Initial prevention of excess weight gain in children

and adolescents is much less difficult to achieve than either initial weight loss and weight loss maintenance for individuals who have already gained excess weight over time.[25])

Both excess sugar and highly processed grains play a role in excess calorie consumption. For example, the four food products from which U.S. children and adolescents get the highest amount of calories every day are grain-based desserts, pizza, soda/energy/sports drinks, and yeast breads.[27] While of little or no benefit to athletic performance and little different from soda relative to sugar content, sports drinks are still readily available in many middle and high schools.[28]

In 2013, less than half of U.S. adolescents met minimal standards for physical activity on five days per week and less than 30% did so on seven days per week.[29] High percentages of adolescents engaged in sedentary behaviors such as played non-school related video and computer games for more than 3 hours per day (41%) or watched television for over 3 hours per day (33%) on an average school day.[29] Furthermore, sedentary behavior and unhealthy diet among children and adolescents are inter-related—children and adolescents who are sedentary also are more likely to eat fewer fruits and vegetables; eat more energy-dense (i.e., higher fat and sugar content) snacks, drinks and fast foods; and to consume more total calories.[30] Finally, family environment affects the BMI of offspring; adolescents with obese parents are more likely to be overweight or obese as young adults.[31]

For adults, children and teens alike, broader contributing cultural accommodations about body size have gradually occurred over time. For example, language has changed. Instead of the once dreaded "midriff bulge", we now hear the term "muffin top"; the term "thick" has replaced "fat". Clothes sizes have gradually become more generous and clothes now come in many levels of L—XL, XXL and XXXL. Medical waiting rooms commonly have "double-wide" chairs. And, television commercials for several types of diabetes medications, once extremely rare, are very commonly seen. These accommodations all add to the social perception that overweight and obesity are the accepted, irreversible "new normal".[25]

These realizations about the many combined causes of the obesity epidemic should make one crucial point quite clear. Engaging in the healthy eating and physical activity behaviors needed to maintain a healthy weight has become increasingly difficult for individuals in the present day environment. While individuals still ultimately need to make healthy choices, it is essential that we recreate environments which encourage, support and reinforce the ability to make healthy choices.[23] Therefore current thinking is that environments need to be changed so as to "make the healthy choice the easy choice."

This does not mean that we go back to the way things used to be 30 or 40 years ago—that is not possible. What this does mean is that we make modifications such as changing vending machine content to provide healthier options, put fresh fruit in front of candy in concession stands, encourage use of stairs instead of the elevator (after making stairways bright, clean and inviting), implement "brain breaks" (short activities) throughout the work and school day, acquire funds for making safe routes to schools, and design in accommodations for pedestrians and bikers when rebuilding city streets.

The obesity epidemic emerged over many years so will not be controlled overnight. Nevertheless, with concerted, coordinated efforts involving federal, state, and local government agencies, public health departments, medical providers, insurers, philanthropic organizations, faith communities, employers, school districts, and average citizens, over time, the rate of increase in obesity can first be arrested and, then, rolled back.[23,24] Importantly, these efforts should support healthy eating and regular physical activity with the goal of attaining a healthy weight, without stigmatizing and alienating individuals who are obese. Such efforts can be implemented at many levels from national to local by using the following steps with the realization that lags will occur between the time any one step is taken and positive results are realized.

- Collect accurate baseline, surveillance data to document the extent of the obesity epidemic across all age groups, including children and adolescents.
- Adopt sound policies and practices designed to create healthy food environments and encourage physical activity with the goal of make the healthy choice the easy choice.
- Implement and sustain evidence-based actions and programs, small and large, at many levels, including social marketing campaigns.
- Continue to identify and share new and promising initiatives that can be added to ongoing efforts.
- Regularly monitor progress toward creating healthy food environments and physical activity opportunities; use results to make adjustments to plans and timelines as well as modify and expand activities over time in order to maximize effect.
- Monitor participation in healthy eating and physical activity events and programs and, adjust as needed, to maximize participation rates.
- Monitor trends in overweight and obesity, over time, among all age groups.
- Be both exceptionally persistent and patient over time.

The good news for Pennsylvania is that many the processes required to stem further increases in overweight and obesity among children and adolescents began almost ten years ago, and due to recent

efforts at many levels, a substantial number of beneficial actions continue to occur in schools and communities across the Commonwealth.

SCHOOL ENVIRONMENT CHANGES TO PROMOTE HEALTHY EATING AND PHYSICAL ACTIVITY, 2005-2015

Through the 2004 reauthorization of the Child Nutrition Act, Congress mandated that the US Department of Agriculture (USDA) require all local districts participating in the federal school lunch program, including those in Pennsylvania, to adopt a Local Wellness Policy effective for the 2006-2007 school year.[32] The 2010 re-authorized of this statue, called the Healthy Hunger-Free Kids Act, further strengthened Local Wellness Policy mandate[32,33] This requirement allowed school districts to tailor policies to the needs of their specific students and communities while requiring that the policy address physical activity, nutritional education, provision and sales of food on campus, and other school-based activities to promote student wellness. Other national developments also supported changes in the school food and beverage environment. For example, following an agreement with the Clinton Foundation the soft drink industry reduced the amount of calories distributed to schools by 90% by either changing the beverages offered in vending machines and other venues (e.g., school stores, snack bars) or removing vending machines from schools.[34]

In concert with the USDA, the Pennsylvania State Board of Education adopted physical activity and nutritional standards for public schools in May 2006,[35] calling for schools to assure that all students participate in 30 minutes of physical activity each day, incorporate opportunities for students to be physically active including recess and physical education, and promote Safe Routes to School. Nutrition standards for competitive foods in schools were also mandated and school districts were incentivized to improve the nutritional quality of foods in schools so as to be consistent with recommendations made by the U.S. National Academy of Sciences Institute of Medicine.[35] To assist families and communities in addressing healthy weight, the Pennsylvania Department of Health added Body Mass Index screening (BMI) to other student health screenings historically performed in schools. Under this latter mandate, qualified school personnel in every Pennsylvania public school, usually school nurses, are required to measure each student's height and weight annually, calculate BMI for each student, and send a letter home to the parents/guardians of each student informing them of their child's BMI and providing guidance on how to interpret and apply BMI results.[18]

Yet another support for promoting the health and well-being of school children was added in 2006 when the Pennsylvania Department of Education and Pennsylvania Department of Health partnered with the Healthy Highmark High 5 initiative, a five-year, $100 million innovation of the Highmark Foundation.[36] Through a variety of strategies, the High 5 Initiative addresses physical activity and nutrition as well as other critical issues such as bullying, self-esteem, and grieving. A key facet of High 5 was "*Health eTools for Schools*" developed and disseminated to Pennsylvania school systems initially

through Highmark Foundation funding. As described earlier, *Health eTools for Schools* is a web-based software application portal used to disseminate health education and promotion programming across multiple Coordinated School Health (CSH) components and provides a means of assisting school nurses, physical education teachers, and other staff members with routine collection of student health record, physical fitness assessment and other types of data.

The 2010 reauthorization of the U.S. Child Nutrition Act saw even more dramatic changes to the school breakfast and lunch program.[33] This reauthorization charged the Secretary of Agriculture with establishing national standards for all foods sold on school campuses throughout the school day, including competitive foods sold in vending machines, concession stands, and school stores. The act allowed serving of only lower-fat milk options (i.e., 1% or skim) and mandated that water be made available free of charge at meal times. In 2013, new regulations took effect to require increased amounts and varieties of fruits and vegetables offered and whole grains served, set minimum and maximum caloric parameters for meals, and reduced saturated fat, sodium and trans-fats. A six cent per school lunch meal performance-based incentive in the federal reimbursement rate was also provided to school food services.[33]

A benefit of these regulations is that the food industry now has only one set of school food standards to meet (rather than 50 different ones) and, therefore, can provide more cost-effective, healthier and appealing food options to schools. School food service personnel can also taste-test new options with students to determine which ones they like and are more likely to purchase. Contrary to some perceptions and newspaper headlines, several recent studies have found that the vast majority of students like the new school lunches and studies show no increase in the amount of food waste has resulted. A recent USDA summary of newly-published research states[37]:

- The vast majority of Americans, and especially parents, support healthier school meals;
- Students like the taste of healthier school meals;
- Updated school food standards have led to increased fruit and vegetable consumption;
- School lunch revenue has increased and more students are eating breakfast and lunch at school;
- Nationwide, only .51% of schools have dropped out of the USDA program.

Under the 2010 reauthorization, the Local Wellness Policy mandate was also revised to add rules that require greater public input, transparency, and implementation, including:

- Add wellness policy goals for nutrition promotion in addition to nutrition education;

- Permits teachers of physical education and school health professionals to serve on advisory groups in addition to parents, students, and representatives of the school food authority, school board, school administrators, and the public;
- Permits all stakeholders to participate in implementation, periodic review, and updating of the wellness policy;
- Requires that school districts inform and update the public about the wellness policy content and implementation;
- Requires that school districts periodically measure and make available to the public an assessment of wellness policy implementation; and
- Requires that school districts designate one or more official to assure wellness policy compliance in each and every school.[32]

Possible Relationships between School Changes to Promote Healthy Eating and Physical Activity and Student BMI Trends, 2008-2014

The Centers for Disease Control and Prevention conducts the School Health Profiles (SHP) survey to monitor school health policies and practices in states, large urban school districts, territories, and tribal governments.[38] Profiles surveys are conducted biennially by state education and health agencies among middle and high school principals and lead health education teachers. SHP was conducted in Pennsylvania in 2008, 2010, 2012 and 2014 with a large enough number of schools participating to consider the results as representative of all Pennsylvania middle and high schools. Elementary school personnel are not asked to complete SHP surveys.[38]

SHP included multiple questions related to Nutrition, Physical Activity and School Health Council plus Wellness Policy that were repeated from 2008 to 2010 to 2012 to 2014,[38] thus allowing the ability to determine trends in how these questions were answered across the seven years. The SHP included 27 consistent questions about the school food environment including purchase of snack foods, access to fruits and vegetables, and food advertising (Table 2); 14 about school health program coordination, including school health council (Table 3); 10 about professional preparation and professional development of health education and physical education teachers (Table 4); 16 about Nutrition Education questions (Table 5); and about 27 Physical Education (Table 6).

These five tables provide the SHP questions asked, the answer source (either lead health teacher or principal), percent responses to each question for each survey year, a trend line for the answers that represents if and how they changed over time, an indication as to whether the trend was favorable or unfavorable, and the level of significance (a denotation of “ns” means that the change in a trend over time was not significant). While the level of implementation of the practices addressed by each SPH

question can be identified for each year, along with trends in implementation over time, no information is available to explain either.

In general, the results presented in Tables 2-6 indicate the following:

- In almost every category, favorable levels already in place in 2008 were maintained in 2010 or, in many instances, improved between 2008 and 2012, the year when new USDA regulations about the nutritional quality of foods in schools went into effect.
- For many practices addressed by SHP questions, favorable levels in 2010 or 2012 eroded by 2014.
- Regarding trend lines overall, almost twice as many moved in an unfavorable direction as moved in a favorable direction over time.
- Regarding significance of trend line changes, the trend lines for 19 questions had moved significantly in the unfavorable direction by 2014 compared to 6 that had moved significantly in the favorable direction: a 3:1 ratio of unfavorable to favorable.

Several observations can be made about changes in the school food environment over time as presented in Table 2. Three important nutrition issues improved significantly by 2014; students being allowed to purchase fruit and non-fried vegetables in school and use of taste testing to determine food preferences of nutritious items. Still, less than half of secondary schools engaged in these positive practices in 2014. Conversely, sale of less nutritious foods in almost all categories increased substantially from 2012-2014; this unfavorable trend was significant for five of eleven food items. Sale of less nutritious foods ranged from a low of 23% of schools for chocolate candy (significant increase) to a high of 64% of schools for sports drinks (significant increase) in 2014.

Surprisingly, in 2014 almost half (47%) of secondary schools still provided students with access to 2% or whole milk despite 2013 USDA regulations which specified that only low fat (1% or skim) milk is to be offered.[33] While the 2014 level was only slighter higher than in 2010 (44%), just over one-third (35%) of schools would have been non-compliant in 2012. Also, somewhat surprising was the jump from 2012 to 2014 in the percentage of schools that allowed students to purchase grain based deserts (31.5% to 41.1%) and sports drinks (45.3% to 63.7%). Both are found among the four food products from which U.S. adolescents get the most calories every day.[27]

Nevertheless, with the exception of milk these findings may not tell the whole story about less nutritious foods and beverages offered for purchase in 2014. For example, no SHP questions asked about the nutritional content of the less nutritious foods and beverages (i.e., grain-based desserts and sports drinks) offered for sale. Quite possibly, the less nutritious foods and beverages that more

secondary schools allowed students to purchase 2014 actually met the USDA nutritional content standards that went in effect in 2013.[33]

Prohibition of all types of food advertising in secondary schools eroded from 2008 to 2014. This erosion was significant for advertising on school buses and other vehicles and school publications. Despite these trends, still 7 in 10 schools prohibited food advertisements in school buildings and 6 in 10 on school grounds in 2014.

Table 3 provides information related to some provisions of the USDA Local Wellness Policy mandate. Regarding oversight of school health, the number of schools with a school health council dropped significantly from a high of 77% in 2010 to 59% by 2014; representation of nutrition and food staff on school health councils also significantly dropped from 89% to 67% for the same time period. These are erosions of substantial magnitude. Even though schools were required by 2012 to designate an individual who would assure compliance with the district wellness policy, the percentage of schools that had appointed someone to oversee and coordinate health programs decreased significantly from 93% in 2008 to 87% in 2014. On the positive side, representation of mental health and social services staff on health councils rose dramatically from 55% in 2008 to 77% in 2014.

Information about past professional development opportunities for health education and physical education teachers is presented in Table 4. The percent of lead health teachers who received professional development about nutrition and dietary behaviors in the previous two years dropped incrementally and significantly from 2008 to 2014. Likewise, the percent who received professional development about physical activity and fitness declined significantly after peaking in 2010 at almost two-thirds of lead health teachers. The percentage of physical education teachers who received professional development also declined significantly from 2008 to 2014. None of the SHP questions inquired about the perceived need for professional development year to year, availability of professional development opportunities, or resources available to support professional development.

For the most part, the number of nutrition and fitness topics covered in health education and fitness topics covered in physical education remained constant from 2008-2014. The percentages of schools that provided instruction on identified topics began quite high and remained so over time. Significantly more schools taught about physical activity opportunities in the community in 2014 than in 2008. A real bright spot was the high percentages of schools that required a physical education course in all grades, 6-12.

The crucial question that comes to mind is: “Did changes in school health practices over time have an effect on student BMI trends? While not possible, for technical reasons having to do with appropriate use of statistical analysis procedures, to calculate correlations between SHP trends and student BMI trends, the separate SHP trend lines and BMI trend lines can be visually compared. Such a comparison

indicates that the percentage of Pennsylvania students with BMI in the overweight, obese and severe obese categories decreased during the same timeframe in which the quality of school health practices improved. However, such evidence is circumstantial and, therefore, no conclusive claim that improved student BMI trends were caused by improvements in school health practices is unwarranted.

Nevertheless, trends in both student BMI and school health practices though 2013 appear promising as research evidence from other sources suggests that environmental factors can help to promote healthy weight. For example, previous research has found that student fat, sugar and calorie intake was reduced and BMI was positively affected in states with laws regulating foods sold in schools outside of the federal school meal program (i.e., competitive foods).[39,40] At the local level, implementation of an elementary school-level comprehensive physical activity and food environment initiative resulted in a relative 15% reduction in obesity prevalence over six years of implementation. The greater the number of strategies implemented in this initiative, the greater the reduction in obesity over time.[41] Regarding communities, closer proximity to parks and recreation resources was shown to reduce the likelihood of BMI increases among children.[42]

Table-2: Food Environment

Survey Variable (i.e., Program or Policy)	Percentage				Trend Line	Trend Interpretation	Trend Significance
	2008	2010	2012	2014			
Percentage of Secondary Schools That Allowed Students to Purchase Snack Foods or Beverages from One or More Vending Machines or at the School Store, Canteen, or Snack Bar, the Percentage That Allowed Students to Purchase Fruits and Non-Fried Vegetables From These Venues, and the Percentage That Offered Fruits or Non-Fried Vegetables at School Celebrations, PA: School Health Profiles, Principal Surveys							
Allowed students to purchase snack foods or beverages	69.8	67.8	65.8	64.9		Favorable	ns
Allowed students to purchase fruits (not fruit juice)	39.8	40.5	35.6	49.8		Favorable	p<0.05
Allowed students to purchase non-fried vegetables (not vegetable juice)	31.5	33.2	29.2	41.1		Favorable	p<0.05
Always offered fruits or non-fried vegetables at school celebrations	42.0	40.4	40.3	38.5		Unfavorable	ns
Made fruits and non-fried vegetables available in both ways	20.0	17.9	18.0	14.9		Unfavorable	p<0.05 (1-t)
Percentage of Secondary Schools That Allowed Students to Purchase Less Nutritious Foods and Beverages From Vending Machines or at the School Store, Canteen, or Snack Bar, PA: School Health Profiles, Principal Surveys							
2% or whole milk (plain or flavored)	44.0	47.6	35.1	47.9		Unfavorable	ns
Foods or beverages containing caffeine	31.4	27.2	23.4	36.7		Unfavorable	ns
Ice cream or frozen yogurt*	25.0	28.2	20.9	27.3		Unfavorable	ns
Water ices or frozen slushes that do not contain juice	18.1	21.1	14.9	16.1		Favorable	ns
Cookies, crackers, cakes, pastries, or other baked goods	31.4	35.6	31.5	41.1		Unfavorable	p<0.05
Salty snacks	26.6	33.7	28.4	40.9		Unfavorable	p<0.05
Chocolate candy	16.9	19.3	17.2	22.6		Unfavorable	p<0.05 (1-t)
Other kinds of candy	23.2	23.0	21.5	28.9		Unfavorable	ns
Soda pop or fruit drinks	28.3	24.1	22.6	26.8		Favorable	ns
Sports drinks	51.5	48.5	45.3	63.7		Unfavorable	p<0.05
Did not sell any of previous 6 items (in 2008, previous 5 items, excluding sports drinks)	53.9	41.4	43.9	47.5		Unfavorable	p<0.05 (1-t)
Percentage of Secondary Schools That Implemented Strategies to Promote Healthy Eating, PA: School Health Profiles, Principal Surveys							
Priced nutritious foods and beverages at a lower cost while increasing the price of less nutritious foods and beverages	13.2	13.3	16.1	15.0		Favorable	ns
Collected suggestions from students, families, and school staff on nutritious food preferences and strategies to promote healthy eating	62.2	61.1	58.7	57.0		Unfavorable	ns
Provided information to students or families on the nutrition and caloric content of foods available	66.1	65.8	69.8	65.0		Unfavorable	ns
Conducted taste tests to determine food preferences for nutritious items	33.3	40.2	45.1	44.4		Favorable	p<0.05
Provided opportunities for students to visit the cafeteria to learn about food safety, food preparation, or other nutrition-related topics	24.3	25.6	24.8	26.1		Favorable	ns
At least 3 of these 5 strategies	34.4	37.3	39.2	38.2		Favorable	ns
Percentage of Secondary Schools That Prohibited Advertisements for Candy, Fast Food Restaurants, or Soft Drinks in Specific Locations; and the Percentage That Prohibited All Forms of Advertising and Promotion, PA: School Health Profiles, Principal Surveys							
Prohibited advertisements for candy, fast food restaurants, or soft drinks in the school building	72.0	73.0	66.7	70.1		Unfavorable	ns
Prohibited advertisements for candy, fast food restaurants, or soft drinks on school grounds	60.4	64.8	58.8	58.9		Unfavorable	ns
Prohibited advertisements for candy, fast food restaurants, or soft drinks on school buses or vehicles used to transport students	72.0	75.2	65.6	68.3		Unfavorable	p<0.05 (1-t)
Prohibited advertisements for candy, fast food restaurants, or soft drinks in school publications	67.5	70.0	62.5	61.0		Unfavorable	p<0.05
Prohibited all forms of advertising and promotion	51.8	56.1	50.5	49.4		Unfavorable	ns

Table-3: Coordination

Survey Variable (i.e., Program or Policy)	Percentage				Trend Line	Trend Interpretation	Trend Significance
	2008	2010	2012	2014			
Percentage of Secondary Schools in Which Health Education Staff Worked on Health Education Activities with Other School Staff During the School Year, PA: School Health Profiles, Lead Health Education Teacher Surveys							
Physical education staff	89.5	92.5	91.0	90.0		Favorable	ns
School health services staff	76.3	80.0	76.4	69.4		Unfavorable	p<0.05
School mental health or social services staff	57.5	62.2	62.8	56.0		Unfavorable	ns
Nutrition or food service staff	45.6	37.9	45.2	39.3		Unfavorable	ns
Percentage of Secondary Schools That Had One or More School Health Councils, and Among Schools with Councils, the Percentage That Have Specific Groups Represented, PA: School Health Profiles, Principal Surveys							
School health council	73.5	77.4	74.7	59.2		Unfavorable	p<0.01
Groups represented: School administration	95.6	93.9	92.3	95.2		Unfavorable	ns
Groups represented: Health education teachers	92.6	89.1	90.8	89.3		Unfavorable	ns
Groups represented: Physical education teachers	92.6	91.6	91.2	89.8		Unfavorable	ns
Groups represented: Mental health or social services staff	54.8	63.0	71.8	76.8		Favorable	p<0.01
Groups represented: Nutrition or food service staff	89.2	80.3	75.1	66.8		Unfavorable	p<0.01
Groups represented: Health services staff	93.5	90.1	92.2	89.1		Unfavorable	p<0.05 (1-t)
Percentage of Secondary Schools That Had Someone Who Oversees or Coordinates School Health and Safety Programs and Activities and the Percentage That Ever Used the School Health Index or Other Self-Assessment Tool to Assess School Policies, Activities, and Programs in Specific Areas, PA: School Health Profiles, Principal Surveys							
Had someone who oversees or coordinates school health and safety programs and activities	92.7	88.4	88.3	87.1		Unfavorable	p<0.05
Ever used School Health Index or other self-assessment tool: Physical activity	44.5	47.0	42.6	41.7		Unfavorable	ns
Ever used School Health Index or other self-assessment tool: Nutrition	46.8	47.7	45.2	41.0		Unfavorable	p<0.05 (1-t)

Table-4: Professional Preparation and Professional Development

Survey Variable (i.e., Program or Policy)	Percentage				Trend Line	Trend Interpretation	Trend Significance
	2008	2010	2012	2014			
Percentage of Secondary Schools in Which the Major Emphasis of the Lead Health Education Teacher's Professional Preparation Was in Each Specific Discipline, PA: School Health Profiles, Lead Health Education Teacher Surveys							
Health and physical education combined	88.1	86.0	84.0	84.4			ns
Health education only	3.3	2.2	4.3	2.6			ns
Physical education only	3.8	2.9	2.4	4.2			ns
Other education degree	0.5	1.3	2.2	0.9			ns
Kinesiology, exercise science, or exercise physiology; home economics or family and consumer science; biology or other science	2.6	3.8	3.4	3.7			ns
Nursing or counseling	1.2	2.6	1.2	1.5			ns
Public health, nutrition, or another discipline	0.5	1.2	2.5	2.8			p<0.05
Percentage of Secondary Schools in Which the Lead Health Education Teacher Received Professional Development During the Two Years Preceding the Survey on Specific Health Topics, PA: School Health Profiles, Lead Health Education Teacher Surveys							
Nutrition and dietary behavior	46.5	40.1	35.7	28.5		Unfavorable	p<0.01
Physical activity and fitness	59.8	64.4	52.8	50.4		Unfavorable	p<0.01
Percentage of Schools in Which at Least One Physical Education Teacher or Specialist Received Professional Development on Physical Education During the Two Years Preceding the Survey, PA: School Health Profiles, Principal Surveys							
Physical education teacher or specialist received professional development on physical education	96.0	91.2	81.1	82.0		Unfavorable	p<0.01

Table-5: Nutrition Education

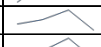
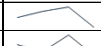
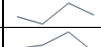
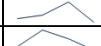
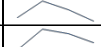
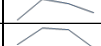
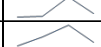
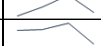
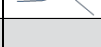
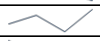
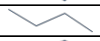
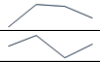
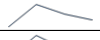
Survey Variable (i.e., Program or Policy)	Percentage				Trend Line	Trend Interpretation	Trend Significance
	2008	2010	2012	2014			
Percentage of Secondary Schools in Which Teachers Taught Specific Nutrition and Dietary Behavior Topics in a Required Course During the School Year, PA: School Health Profiles, Lead Health Education Teacher Surveys							
Benefits of healthy eating	95.2	95.8	95.6	95.9		Favorable	ns
Food guidance using MyPyramid or current dietary guidelines	89.7	90.8	93.5	88.0		Unfavorable	ns
Using food labels	90.4	90.5	93.1	88.7		Unfavorable	ns
Balancing food intake and physical activity	93.9	94.9	95.6	92.3		Unfavorable	ns
Eating more fruits, vegetables, and whole grain products	94.5	93.6	95.9	93.1		Unfavorable	ns
Choosing foods that are low in fat, saturated fat, and cholesterol	93.1	91.3	94.3	91.9		Unfavorable	ns
Using sugars in moderation	91.5	90.7	93.0	91.7		Favorable	ns
Using salt and sodium in moderation	88.9	89.3	91.3	88.3		Unfavorable	ns
Eating more calcium-rich foods	86.7	88.4	87.5	86.3		Unfavorable	ns
Food safety	77.2	82.4	81.3	79.0		Favorable	ns
Preparing healthy meals and snacks	84.7	90.2	89.6	83.6		Unfavorable	ns
Risks of unhealthy weight control practices	90.2	90.3	92.5	90.6		Favorable	ns
Accepting body size differences	84.7	86.8	89.7	85.7		Favorable	ns
Signs, symptoms, and treatment for eating disorders	84.1	84.3	86.5	79.8		Unfavorable	ns
Percentage of Secondary Schools in Which Teachers Tried to Increase Student Knowledge on a Specific Health-Related Topic in a Required Course During the School Year, PA: School Health Profiles, Lead Health Education Teacher Surveys							
Nutrition and dietary behavior	97.5	98.1	97.1	97.0		Unfavorable	ns
Percentage of Secondary Schools That Provided Parents and Families with Health Information on Specific Topics Designed to Increase Parent and Family Knowledge, PA: School Health Profiles, Lead Health Education Teacher Surveys							
Nutrition and healthy eating	49.7	43.7	43.8	41.3		Unfavorable	p<0.05

Table-6: Physical Education and Physical Activity

Survey Variable (i.e., Program or Policy)	Percentage				Trend Line	Trend Interpretation	Trend Significance
	2008	2010	2012	2014			
Percentage of Secondary Schools That Taught Specific Physical Activity Topics in a Required Course During the School Year, PA: School Health Profiles, Lead Health Education Teacher Surveys							
Physical, psychological, or social benefits	96.6	96.2	95.0	94.0		Unfavorable	p<0.05 (1-t)
Health-related fitness	96.2	96.8	95.6	97.3		Favorable	ns
Phases of a workout	94.9	94.1	94.7	93.8		Unfavorable	ns
How much physical activity is enough	91.5	92.4	93.1	92.2		Favorable	ns
Developing an individualized physical activity plan	77.0	75.8	83.9				
Monitoring progress toward reaching goals	75.6	76.3	83.3				
Overcoming barriers to physical activity	78.2	79.9	83.3				
Decreasing sedentary activities	89.0	94.1	95.0	94.6		Favorable	p<0.05
Opportunities for physical activity in the community	83.1	84.9	86.4				
Preventing injury during physical activity	93.8	90.3	91.9	91.3		Unfavorable	ns
Weather-related safety	77.6	79.5	84.8	77.1		Unfavorable	ns
Dangers of using performance-enhancing drugs	87.2	81.7	85.9	83.5		Unfavorable	ns
All physical activity topics	52.4	52.3	64.8	65.5		Favorable	p<0.01
Percentage of Secondary Schools in Which Teachers Tried to Increase Student Knowledge on a Specific Health-Related Topic in a Required Course During the School Year, PA: School Health Profiles, Lead Health Education Teacher Surveys							
Physical activity and fitness	98.8	98.7	98.1	98.5		Unfavorable	ns
Percentage of Secondary Schools That Provided Parents and Families with Health Information on Specific Topics Designed to Increase Parent and Family Knowledge, PA: School Health Profiles, Lead Health Education Teacher Surveys							
Physical activity	45.7	44.2	44.4	41.9		Unfavorable	ns
Percentage of Secondary Schools That Provided Those Who Teach Physical Education with Materials for Teaching Physical Education, PA: School Health Profiles, Principal Surveys							
Goals, objectives, and expected outcomes for physical education	94.1	96.8	94.5	96.5		Favorable	ns
Chart describing annual scope and sequence of instruction for physical education	82.0	86.6	86.2	83.8		Favorable	ns
Plans for how to assess student performance in physical education	87.0	88.8	85.2	87.3		Favorable	ns
Written physical education curriculum	88.7	91.3	90.2	89.5		Favorable	ns
All types of materials	75.4	81.0	77.7				
Percentage of Secondary Schools That Taught a Required Physical Education Course in Each Grade, PA: School Health Profiles, Principal Surveys							
Grade 6	99.5	94.7	97.9	100.0		Favorable	ns
Grade 7	99.4	96.2	98.5	98.1		Unfavorable	ns
Grade 8	98.3	96.1	98.5	99.1		Favorable	ns
Grade 9	94.5	90.7	93.8	96.0		Favorable	ns
Grade 10	92.3	94.2	95.3	94.3		Favorable	ns
Grade 11	92.5	89.9	91.0	89.7		Unfavorable	ns
Grade 12	84.7	85.4	87.9	79.9		Unfavorable	ns

CALL TO ACTION: COMMUNITIES, FAMILIES AND SCHOOLS, TOGETHER, MAKE THE HEALTHY CHOICE THE EASY CHOICE

While schools have a vital contributory role, they simply cannot be expected to bear disproportionate responsibility for reversing the child and adolescent obesity epidemic. To prevent the projected 2020 BMI increases identified earlier and simultaneously begin the process of reversing this epidemic over time will require both greater family engagement and intensive community involvement at all levels while simultaneously maintaining the health-positive policies and practices already adopted by schools.

As with all epidemics, stemming any further increase in excess weight prevalence rates is the essential first step toward resolution. The child and adolescent obesity epidemic in Pennsylvania clearly peaked by at least 2008 and, since then, decreased somewhat through 2013. Circumstantially, the many, many school-based policies, programs and activities implemented over a number of years appear to have contributed to this positive trend. However, BMI data from 2014 and 2015 indicate that this progress may now be in jeopardy.

Pennsylvania secondary schools made substantial improvements in health practices from 2008-2012. However, erosion occurred in some areas by 2014. The reasons for this erosion are unknown but might have been caused by such factors as fatigue due to having to maintain efforts at an elevated level over time or to a change of focus by elected officials, administrators, faculty members, and school staff members to other pressing issues such as student achievement test scores, school funding, and/or reduced availability of the time and resource required to maintain positive health practices. Regardless of the reasons, this development means that others who care about healthy children and adolescents must step up!

All stakeholders, not just schools, have a vested interest in reversing obesity and preventing associated diseases that cause needless distress and suffering. For communities, improving population health makes sense because having healthy citizens is essential to economic development. Employers remain and invest in communities and new employers choose to locate in communities that offer lower costs along with higher productivity. Both are threatened by poor population health associated with obesity and other health problems such as high rates of smoking.

Employers have an added vested interest in child and adolescent health because today's youth in their communities are the dependents of their employees and often are covered by employer-provided health insurance. Healthy, normal weight minor dependents of current employees equate to 1) lower health care costs in the short term and 2) offer the promise of lower future costs as prospective employees in a very few years—today's students are tomorrow's employees. Additionally, current

working parents miss less work time and are more productive when their children are healthy. Bottom line? Investing in child and adolescent health is good business.

For these reasons, the following actions are recommended in order to create communities that foster the conditions required for children and youth to grow up at a healthy, normal weight.

A. Community Decision Makers:

- Use the "Health in All Policies" approach, as recommended by the American Public Health Association, when adopting all new local laws and policies.
- Convene community stakeholders for the purpose of creating a broad-based force for health by adopting common and consistent policies and programs, delivering a common message, facilitating resource sharing, and providing meaningful incentives for "making the healthy choice the easy choice."
- Include "healthy choice the easy choice" initiatives in economic development plan
- Provide additional resources for schools so they do not have to rely on food and beverage sales and advertising for raising additional funds
- Assure that neighborhoods are safe for children and families
- Construct or modify physical structures to facilitate physical activity (e.g., parks and playgrounds, neighborhood walking trails, sidewalks in subdivisions, etc.)
- Adopt "complete streets" program to facilitate and encourage walking and biking
- Initiate community-wide, family-friendly opportunities for physical activity
- Conduct assessments to determine if food deserts exist and, if so, rectify so that affordable, healthy food options are available to all families
- Conduct community-wide public information campaigns that encourage healthy eating and physical activity
- Adopt "healthy choice the easy choice" practices in all government/community facilities

B. Business Leaders

- "Adopt a School" for student and staff wellness and assist with needs assessments, planning, community report preparation and dissemination and fund-raising; coordinate corporate employee wellness programs with school employee wellness programs
- Encourage employees to volunteer for school and community wellness activities
- Adopt "healthy choice the easy choice" environments and practices in all facilities to especially support and encourage employees with children
- Provide incentives and opportunities for employees and their families to be physically active
- Encourage more healthful eating by providing nutrition education and food preparation programs for employees

C. Parents and Families:

- Personally, model healthy eating and being physically active
- Provide healthy meals and snacks at home, require that your child(ren) make healthy choices when eating out
- Support your child(ren) in being physically active—do this as a family, provide opportunities, and turn off the screens

- Get informed--know what your school is doing with regard to nutrition and physical activity
- Volunteer—join your school district's Wellness Policy advisory group (see below)
- Help Implement the Wellness Policy—work with officials designated to insure wellness policy compliance in your child's school
- Demand accountability—assure that schools monitor Wellness Policy implementation and regularly report progress to the community

D. School Decision Makers:

- Assure compliance with USDA standards for all foods sold in schools, on school grounds and during school-sponsored events, activities and celebrations, including fund-raisers
- Develop, implement and continuously maintain a comprehensive Wellness Policy along with plans for assuring policy compliance in every school
- Solicit active participation of members from diverse stakeholder groups in district-level and school-level wellness councils
- Encourage family engagement and community involvement in implementing and monitoring plans to insure wellness policy compliance
- Participate in Alliance for Healthier Generation or Action for Healthy Kids healthy schools awards program
- Assure that high-quality nutrition education is taught at all grades, pre-K to 12, as part of a comprehensive health education curriculum
- Provide high-quality physical education for all grades, pre-K to 12
- Offer elective physical activity and nutrition programs for students with unhealthy BMI, especially those who are obese or severe obese
- Incorporate multiple opportunities for students in all grades, pre-k to 12, to be physically active throughout the school day
- Coordinate school health programming both across schools within the district and within schools
- Implement innovative food programs such as school gardens and use of locally-produced foods, including fresh vegetables and fruit
- Implement innovative physical activity programs such as "walking school bus"
- Establish a "health and wellness" account within a school district education foundation to allow targeted giving
- Intentionally seek out community partners who can provide the added resources required to implement effective health promotion programming for both students and school staff
- Work with local government officials to insure "safe routes to school" that facilitate walking and biking.

E. Early childhood day-care, pre-school and after school programs

- Adopt and adhere to national HEPA (Healthy Eating and Physical Activity) standards
- If school-based, comply with applicable wellness policy requirements
- Sponsor healthy eating programs for parents, including food shopping/acquisition and food preparation
- Inform parents of opportunities for physical activity with young children in the community

F. Medical Care Providers

- Ask parents for a copy of the letter the schools provided on their child's BMI and help them interpret the results
- Especially for pre-school aged children, inform parents of their child's BMI, what it means and what they need to do if their child has an unhealthy weight
- Refer families and other patients to community based programs for nutrition counseling, physical activity and interventions programs such as the Diabetes Prevention Program (DPP)

G. Health Insurers

- If insuring school employees, provide incentives and funding for employee wellness programs that promote healthy eating and physical activity
- As community service efforts, encourage employees to become involved in local school health and wellness policy planning, implementation, evaluation and information dissemination

H. Philanthropic organizations

- Provide grant funding for joint school and community healthy weight promotion programs, especially those that focus on pre-school children and their parents
- Convene conferences for school/community partnership groups, especially to share successes and effective strategies
- Fund evaluations of healthy weight promotion program evaluation

I. Faith Communities

- Make suitable facilities available for individual physical activity (walking) and group programs
- Become sites for community health outreach programs such as health fairs, blood pressure screenings, nutrition/cooking classes, etc.
- Provide healthy food guidelines for communal meals and larger events, including fundraisers

ADDITIONAL RESOURCES

The following websites provide recommendations for specific community and school actions to address the obesity epidemic.

1. Highmarkfoundation.org. Childhood Obesity. 2015. Available at: http://www.highmarkfoundation.org/initiatives/childhood_obesity/index.shtml. Accessed November 30, 2015.

2. Rudolph, L., Caplan, J., Ben-Moshe, K., & Dillon, L. (2013). Health in All Policies: A Guide for State and Local Governments. Washington, DC and Oakland, CA: American Public Health Association and Public Health Institute. .Available at: http://www.phi.org/resources/?resource=hiapguide. Accessed November 16, 2015

3. Pennsylvania Department of Health. Obesity Prevention & Wellness Program Strategies/Initiatives 2015. Available at: http://www.health.pa.gov/Pages/search.aspx?searchBox=obesity+prevention#.VkoQRiYo6Uk. Accessed November 30, 2015.

4. Pennsylvania Department of Education. Food and Nutrition. 2015. Available at: http://www.education.pa.gov/Teachers%20-%20Administrators/Food-Nutrition/Pages/default.aspx#.VkoVGv6FOUl. Accessed November 30, 2015.

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6. Alliance for a Healthier Generation. About Childhood Obesity. 2015. Available at: https://www.healthiergeneration.org/about_childhood_obesity/. Accessed November 30, 2015.

7. Alliance for a Healthier Generation. Take Action. 2015. Available at: https://www.healthiergeneration.org/take_action/. Accessed November 30, 2015.

8. Action for Healthy Kids. Tools for Schools. Available at: http://www.afhk.org/. Accessed November 30, 2015.

9. Centers for Disease Control and Prevention. Why Schools? | Adolescent and School Health | CDC. 2015. Schools: The Right Place for a Healthy Start. Available at: http://www.cdc.gov/healthyyouth/about/why_schools.htm. Accessed November 30, 2015

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