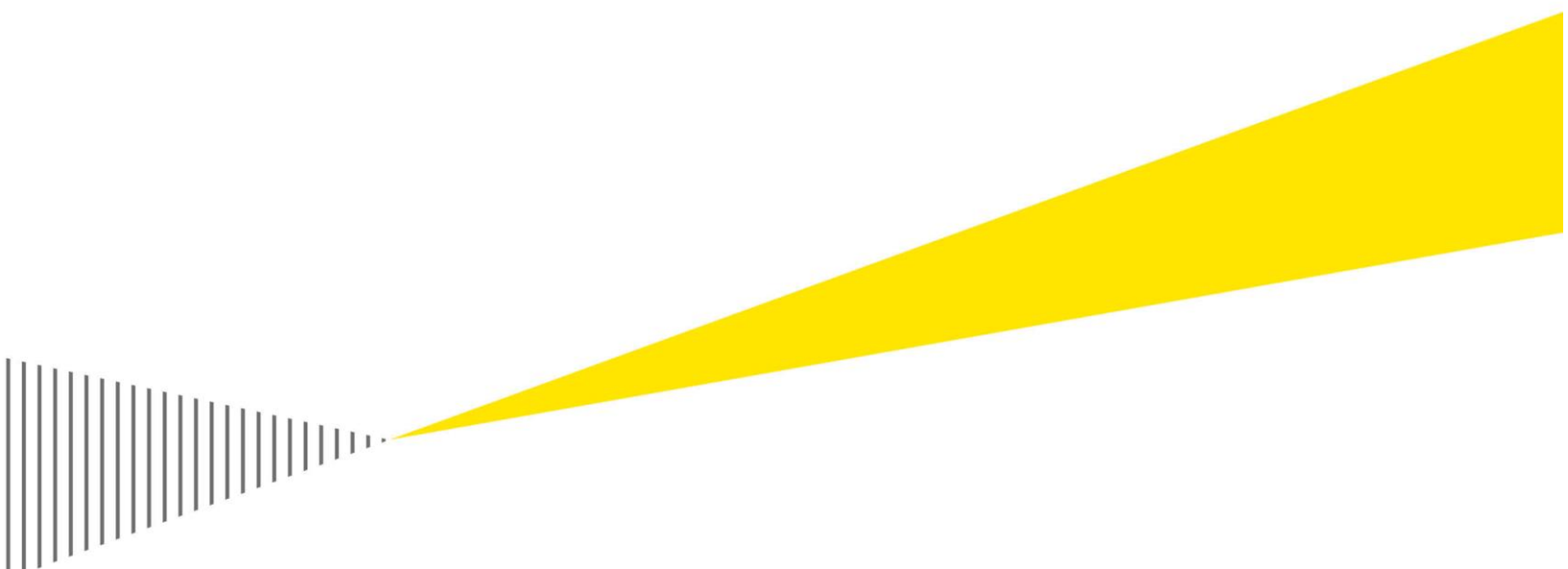


The economic impact of healthier school lunches
Prepared for the Campaign to End Obesity



Acknowledgements

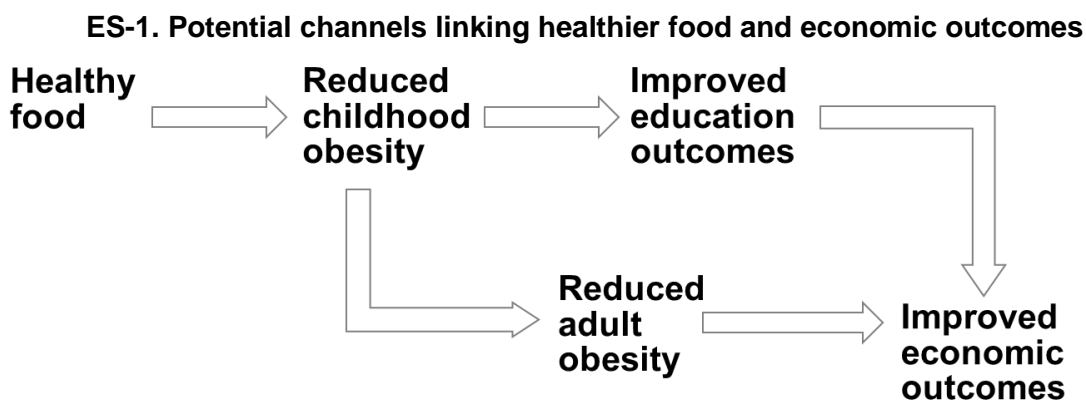
This report was prepared for the Campaign to End Obesity with support from Kids' Safe and Healthful Foods Project – a joint initiative of The Pew Charitable Trusts and the Robert Wood Johnson Foundation.

Executive summary

Access to healthy food has been shown to reduce obesity and other serious diseases. For many children, food sold and served at school – through breakfast and lunch programs, as well as vended snacks and bottled drinks – is a substantial part of their diet. In 2012, the United States Department of Agriculture began requiring schools participating in the School Breakfast Program and National School Lunch Program to meet updated nutrition standards, based on the 2010 *Dietary Guidelines for Americans*. This report uses findings from academic research to illustrate the potential impact of providing healthier school lunches to US students. The report finds that serving healthier meals via school lunch programs could improve health outcomes, lead to improved academic performance, and increase economic opportunity for children in the United States.

The childhood obesity rate in the United States has tripled in the last three decades. During the same period, the adult obesity rate has also increased significantly, in part due to children with obesity becoming adults with obesity. Studies have shown that, when compared to their peers with obesity, children and adults at a healthy weight experience increased educational attainment, increased wages, lower incidence of obesity-related diseases, and reductions in the medical expenses those diseases entail.

This report examines two channels through which access to healthier food and lower childhood obesity rates may improve outcomes for children throughout their lives. The first is the *education outcomes channel*, which investigates how lower rates of childhood obesity may increase academic performance and educational attainment. The second is the *adult obesity channel*, which investigates how lower rates of childhood obesity can lead to lower rates of adult obesity. Figure ES-1 illustrates how these channels may operate.



Source: EY analysis.

Research shows that providing children with healthier food at school can increase test scores in math and reading, and students who are at a healthy weight pay closer attention in class and have fewer school absences. Conversely, childhood obesity and obesity-related diseases may interfere with a student’s ability to do well at school and participate in extracurricular activities. Childhood obesity has been shown to reduce high school graduation rates and reduce college

attendance. Adults with higher levels of educational attainment tend to earn more money and have better job opportunities.

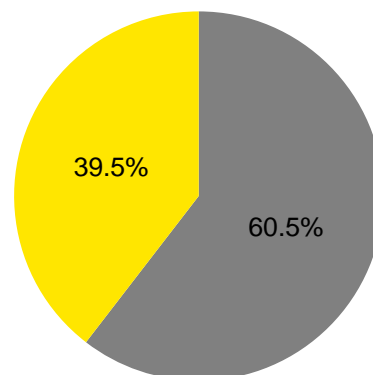
Access to healthier foods is particularly important during childhood because childhood obesity is a strong predictor of adult obesity. Therefore, reducing the childhood obesity rate may lead to lower adult obesity rates in the United States. Adults with obesity and related diseases face medical expenses up to 100% greater than healthy-weight adults. Healthy-weight adults are, on average, more productive at work and miss fewer work days. As a result, research finds that they often earn higher wages than adults with obesity.

This report uses the findings of numerous academic studies in economics, public policy, and public health to illustrate the connections between healthier school lunches and childhood obesity, academic, and economic outcomes. The results of the report reflect the estimated long-term impact of a fully implemented, nationwide, healthier school lunch program. This report's key findings are:

- ▶ If healthier school lunches were implemented in all public elementary schools, it is estimated there would be 200,000 fewer children with obesity in each annual class completing 6th grade.
- ▶ Lower childhood obesity rates are likely to boost educational attainment, resulting in an estimated 40,000 new high school graduates and 9,000 new college graduates every year.
- ▶ Going forward, lower obesity rates are estimated to increase economic opportunity by increasing each annual class' income when they reach adulthood by \$1.1 billion each year (\$44 billion in lifetime income) (see Figure ES-2).
- ▶ \$3.8 billion in lifetime obesity-related costs per annual class could be avoided as a result of healthier school lunches served in elementary schools.
- ▶ Taken together, each annual class of students receiving healthier school lunches throughout their elementary school career would generate \$47.8 billion of lifetime benefits for themselves and the US economy.

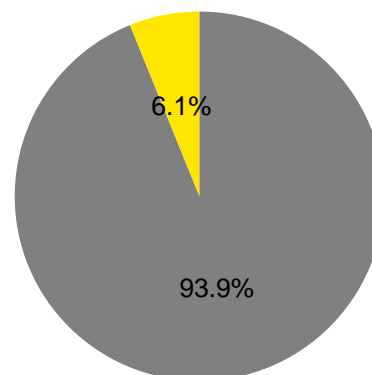
Figure ES-2. Estimated total economic benefit of healthier school lunches, in 2012 dollars

Annual increase in wages: \$1.1 billion



■ Education outcomes channel ■ Adult obesity channel

Lifetime cost savings: \$3.8 billion



■ Direct medical costs ■ Disability payments

Source: EY analysis.

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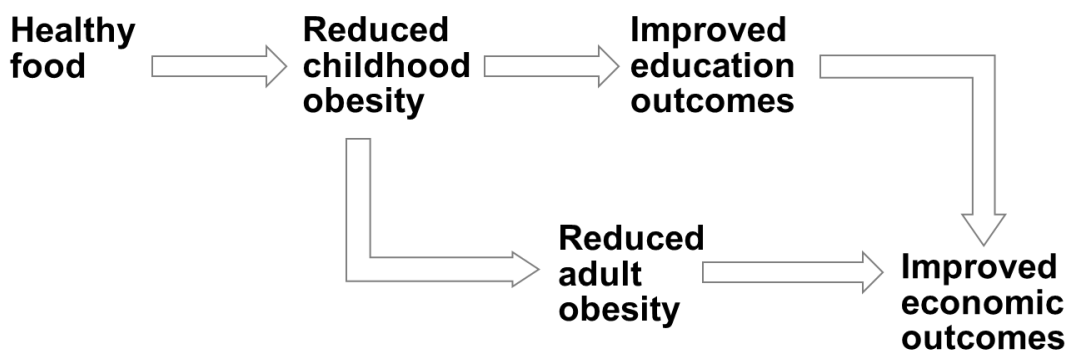
Economic impact of healthy school lunches

I. Introduction

Food served and sold at school provides a substantial component of many young people's diets. Breakfast and lunch programs, as well as vended snacks and bottled drinks, all contribute to the school food environment. As the childhood obesity rate in the United States has risen, increased attention has been paid to the nutritional quality of food served at school. Over the past decade, many states and non-profit organizations have worked with schools to improve their nutrition environment, and in 2012, the United States Department of Agriculture updated the meal patterns and nutrition standards required for meals in the School Breakfast Program and National School Lunch Program and offered additional reimbursement to districts meeting updated standards. The new standards reflected the latest science on children's nutrition and health, including the 2010 *Dietary Guidelines for Americans*. These changes to meal guidelines included increased fruits, vegetables, and whole grains and reduced sodium and saturated fat.¹

This report estimates the economic impact of serving these healthier school lunches by using results from academic studies in economics, public policy, and public health.² Estimates in the academic research are used to illustrate the potential magnitude of particular links between healthy food, childhood obesity, and economic outcomes. Figure 1 illustrates how these links may operate.³

Figure 1. Potential links between healthy food and economic outcomes



Source: EY analysis.

This report examines two series of links, or channels, through which access to healthy food and lower childhood obesity rates may ultimately improve outcomes for children throughout their lives. The first channel is the *education outcomes channel*, which illustrates how lower rates of childhood obesity may increase academic performance and educational attainment. The second is the *adult obesity channel*, which shows how lower rates of childhood obesity can lead to lower rates of adult obesity.

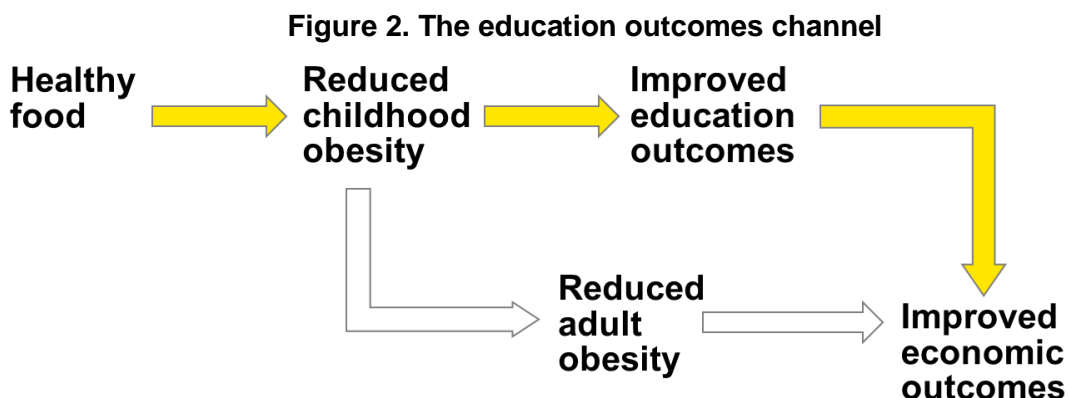
Access to healthier foods has been shown to reduce childhood obesity and other serious diseases.⁴ In addition to improving health outcomes, reducing childhood obesity can yield other benefits, like increased math and reading scores, higher graduation rates, and less medical spending.⁵ Reducing childhood obesity may also reduce adult obesity and increase lifetime

The economic impact of healthier school lunches

earnings; children with obesity are more likely to be obese in adulthood, and adults who are healthy weight have been found to receive wage premiums and other economic benefits that exceed those of their obese peers.

II. The education outcomes channel

The education outcomes channel contains three links. The first link is the relationship between healthier food and childhood obesity. The second link examines how obesity and related diseases can interfere with a student's ability to perform at school. The final link is the connection between educational attainment and economic outcomes, such as income levels and employment status. Figure 2 illustrates the links in the education outcomes channel.



Source: EY analysis.

The link between healthy food and childhood obesity

The lack of healthy food is directly related to obesity which is also associated with over 90 other chronic conditions.⁶ Providing healthy food for students is important because children who have improved access to healthy food are at lower risk for obesity and related outcomes.⁷ For many school-age children, food served and sold at school constitutes a major portion of their diets. Many children consume up to half their total calories at school through breakfast and lunch programs, as well as foods and beverages sold outside of school meals.⁸

Diet-related diseases, including childhood obesity, are an increasing problem in the United States. Figure 3 illustrates how the childhood obesity rate has more than tripled over the last three decades.⁹ Studies have found that many aspects of a child's diet can affect his or her risk of obesity. For example, children who consume dairy products may be less likely to have obesity, while children who drink sugar-sweetened beverages or regularly consume processed foods may be at a higher risk for obesity and weight gain.¹⁰

Serving and selling healthier foods at school may be an important part of improving children's diets and reducing diet-related diseases.¹¹ Studies that estimate the responsiveness of children's body weight to the relative price and availability of healthy and less healthy foods show that prices influence diet quality, which in turn, has a significant impact on weight. Consumption of fruits, vegetables, and milk is associated with

"In order to prevent obesity, and to avoid the disorders associated with this condition, it appears to be necessary not only to regulate energy intake, but also to control composition of the diet...*Special attention should be given to improving the dietary habits of overweight and obese children and adolescents.*"

- *British Journal of Nutrition (1995)*

decreased body weight while consumption of sugar-sweetened beverages and fast food are associated with increased body weight.¹² School lunch programs and the overall school food environment have been shown to have a substantial influence on the nutrient density of children's daily food consumption.¹³

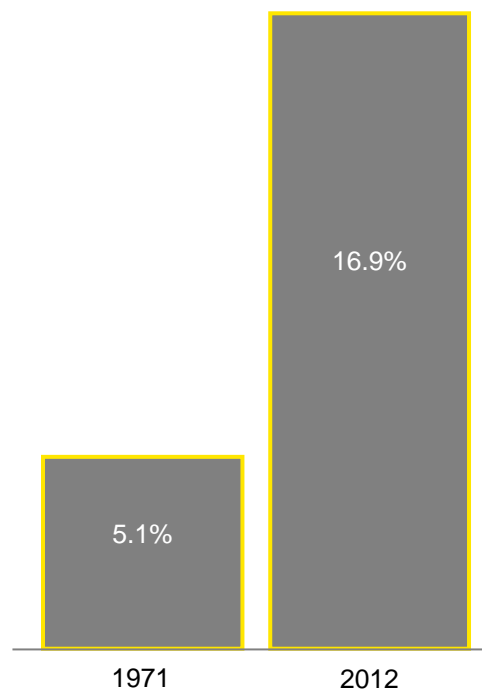
As one component of new nutrition standards is aimed to ensure proper calorie intake at lunch by setting appropriate limits for each grade, studies that measure the impact of calories on body weight may be a guide to the likely impact of healthier school lunches. Research on children who eat school lunch has shown that differences in the number of calories consumed during lunch can explain observed differences in obesity rates.¹⁴ Reducing the number of calories in a lunch served at school by 40 or 120 could potentially lead to a 1.7 or 7.2 percentage point reduction, respectively, in the childhood obesity rate.¹⁵

The content of school meals has also been shown to be correlated with childhood obesity. A national study of 2,228 students at 228 schools found a strong relationship between elementary school children's risk of obesity and the frequency with which their school served desserts, french fries and similar potato products. Children served dessert more than once a week were 1.8 times more likely to be obese. Children served french fries and similar potato products more than once a week were 2.7 times more likely to be obese.¹⁶ Based on the data reported in that study, it can be estimated that serving desserts more than once a week is associated with a 9 percentage-point increase in children's obesity rate and serving french fries and similar potato products more than once a week is associated with an 18 percentage-point increase in children's obesity rate.¹⁷

The link between childhood obesity and education outcomes

According to the World Health Organization, obesity and educational outcomes are correlated through multiple channels.¹⁸ For example, obesity can interfere with a child's education by reducing his or her ability to attend school, pay attention and speak up in class, or participate in extracurricular school activities.¹⁹ Many academic studies have quantified aspects of the impact obesity can have on a student's education. Students who are obese during elementary school have, on average, 1-2 additional absences per school year compared to their healthy weight peers.²⁰ Other research has found that students with obesity have less-advanced verbal skills and complete fewer years of schooling than students who are a healthy weight.²¹ Still others have found that children with obesity tend to have lower math and reading test scores, though results can be sensitive to the inclusion of other factors.²² Furthermore, students with obesity have lower perceptions of their academic ability. A survey of over 10,000 high school students found that girls with obesity are twice as likely as girls at a healthy weight to consider themselves poor students.²³

Figure 3. Rising childhood obesity



Source: Centers for Disease Control and Prevention, National Health and Nutrition Examination Survey.

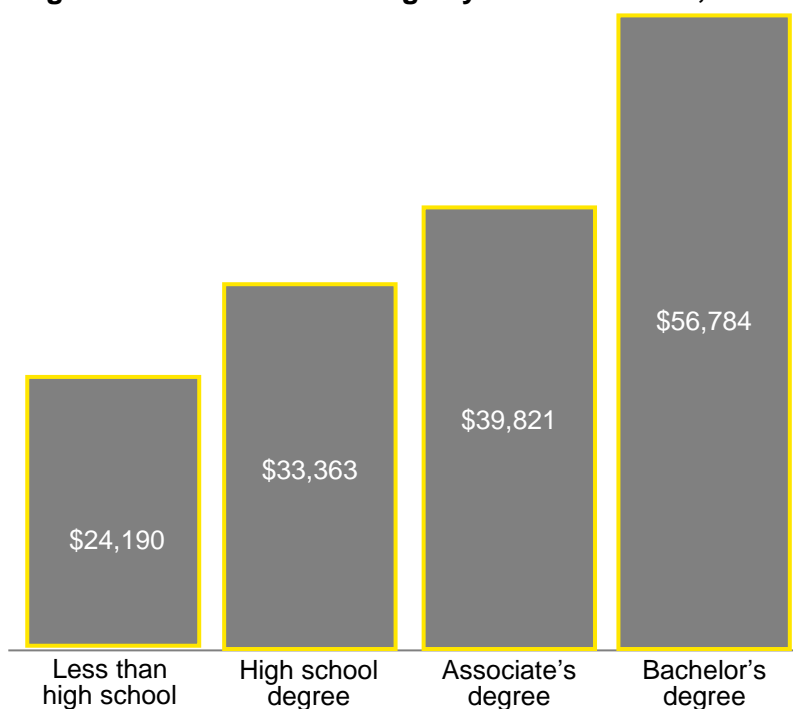
The same survey also found that boys with obesity are 50% more likely than their healthy-weight male peers to consider themselves poor students and twice as likely to expect to quit school altogether.²⁴

Research that estimates the impact of obesity on high school graduation rates has mixed findings.²⁵ Many studies find that children with obesity graduate at lower rates and complete fewer grades than children who are a healthy weight. However, those results can be influenced by other socioeconomic factors such as household income or parent education levels.²⁶ In some cases, studies that control for socioeconomic factors find that obesity does have a significant effect on graduation rates. For example, one study that uses data from the National Longitudinal Survey of Youth finds that high-school students with obesity graduate at rates between 8 and 30 percentage points lower than healthy-weight students.^{27,28}

The link between education and economic outcomes

Education level can play a significant role in determining a person's income and employment status.²⁹ Educational attainment is a way to develop the skills required to be successful in the labor market and employers often consider education in their hiring process. Beginning early in childhood, educational attainment has been found to be a reliable predictor of wage differences in adulthood.³⁰ As a result, efforts to improve a child's ability to perform well in school are likely to yield economic benefits throughout his or her life.

Figure 4. Median annual wage by education level, 2012



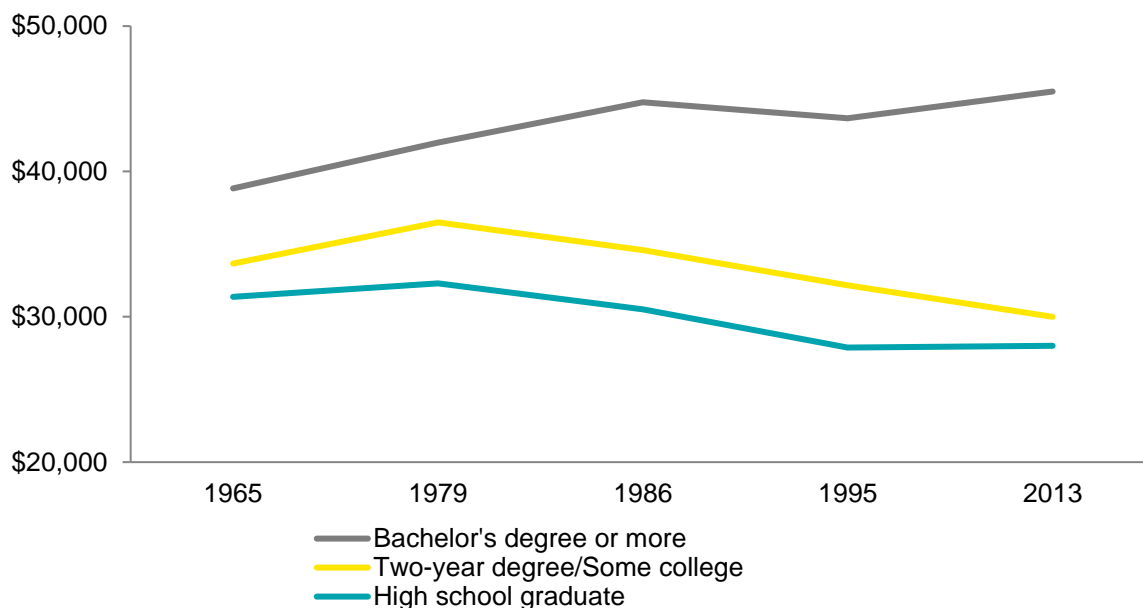
Source: Current Population Survey, US Bureau of Labor Statistics.

In 2012, according to the Bureau of Labor Statistics, the median annual wage for a 4-year college graduate was more than twice that of someone who did not graduate from high school.³¹ Over a

40-year career, a 4-year college graduate would enjoy an additional \$1.3 million in earnings. Figure 4 shows how wages tend to rise with education level.

In addition to higher wages, adults with higher education levels face lower unemployment rates than adults with less education.³² Both the wage and employment premium have grown over time, suggesting that the value of education may be growing.³³ Figure 5 shows how earnings by education level have changed over time.³⁴

Figure 5. Median annual earnings by education level



Source: Pew Research Center tabulations of the 2013, 1995, 1986, 1979 and 1965 March Current Population Survey (CPS) Integrated Public Use Micro Samples.

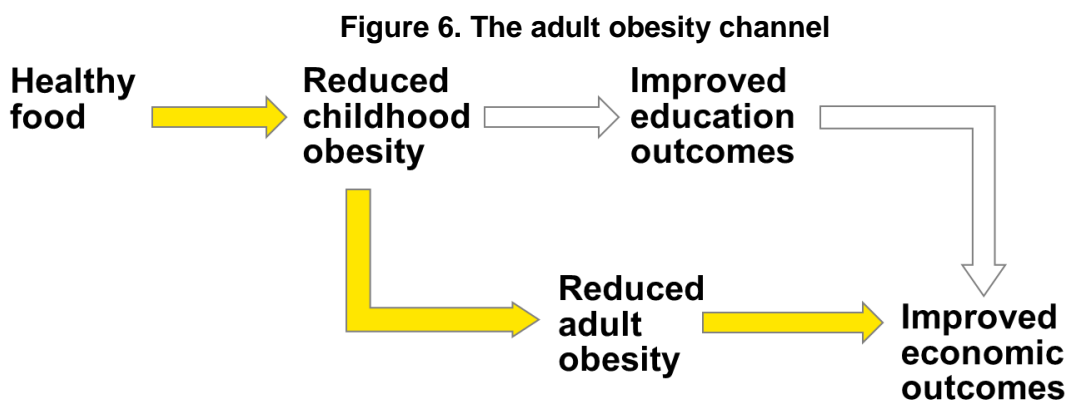
Efforts to reduce childhood obesity may provide the additional benefit of improving educational outcomes that, in turn, boost economic opportunity. Because educational attainment and economic outcomes are related, children who excel in school can expect to have higher incomes and greater job opportunities. Obesity can impair a student's ability to perform as well at school.

"A striking result is that among men, early test scores are better predictors of both wages and employment at age 33 than at age 23...[t]hese results are consistent with a model in which deficits accumulate. For instance those with low test scores may be more likely to end up in 'dead-end' jobs with flatter wage growth." [emphasis added]

- National Bureau of Economic Research
(1999)

III. The adult obesity channel

The adult obesity channel contains three links. The first link, which is shared with the education outcomes channel described earlier, is the relationship between healthy food and childhood obesity. The second link looks at how children with obesity are more likely to become adults with obesity than children who are a healthy weight. The last link considers the evidence that healthy-weight adults experience economic advantages. Figure 6 illustrates the links in the adult obesity channel.



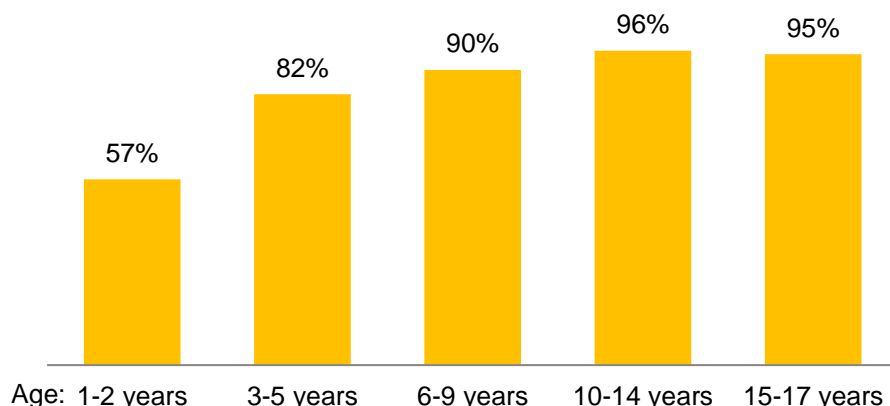
Source: EY analysis.

The link between childhood obesity and adult obesity

Children with obesity are more likely to become adults with obesity than children who are a healthy weight. Research shows that elementary-age students with obesity are between 75% and 90% more likely to become adults with obesity than children at a healthy weight.³⁵ Not only is there a strong relationship between childhood and adult obesity, but the likelihood that children with obesity become adults with obesity increases with age. Figure 7 shows how, according to one study, the probability that a child with obesity will become an adult with obesity increases as a child progresses through his or her school-age years.

Research indicates that, by the time young people graduate from high school, the probability that a student with obesity will become an adult with obesity is as high as 95%.³⁶ Preventing children from becoming obese by ensuring access to healthy food, could be an important part of reducing these probabilities.

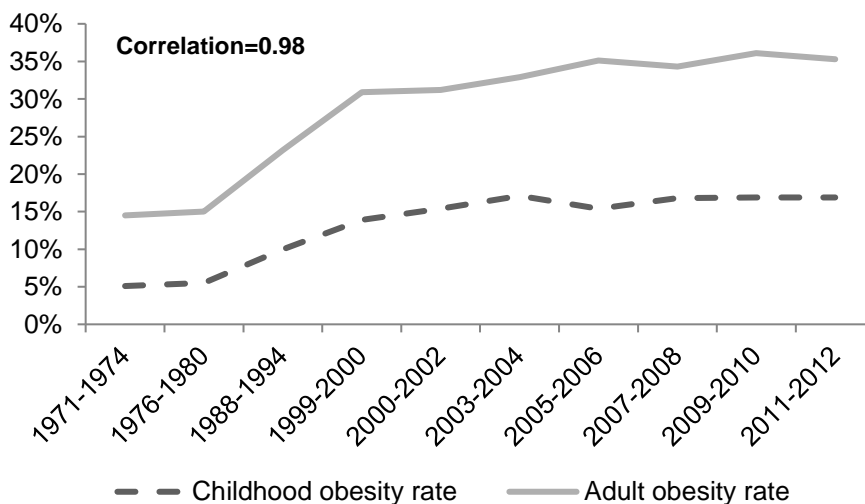
Figure 7. The probability a child with obesity will become an adult with obesity



Source: Engeland et al (2004).

The finding that childhood obesity rates and adult obesity rates are related is substantiated by a large body of academic literature. Studies that track children over time – referred to as prospective studies – consistently find that the relationship between childhood and adult overweight status and obesity increases as children age.³⁷ As a result, reducing childhood obesity is likely to lead to future declines in adult obesity rates. In addition, studies find that childhood obesity is related to adult comorbidities (i.e., the presence of two or more chronic diseases).³⁸ In the context of the link between adult obesity and economics, comorbidities are often a source of increased medical spending that can begin during childhood and continue throughout life.

Figure 8. Childhood and adult obesity rates



Source: Centers for Disease Control and Prevention, National Health and Nutrition Examination Survey.

Both the childhood and adult obesity rates in the United States have increased over time. Though rates have increased more slowly in recent years, the childhood obesity rate has more than tripled over the last three decades.³⁹ As shown in Figure 8, increases in the childhood obesity rate correspond to increases in the adult obesity rate. According to one study, between 1971 and 2012

the correlation between childhood and adult obesity rates was 0.98, indicating that they almost always rise and fall together.⁴⁰ While a high correlation alone does not imply causality, it does indicate that the adult obesity rate has increased in-step with the childhood obesity rate over the last 30 years. The data suggest that preventing children from becoming obese could be an effective way to lower the adult obesity rate.

The link between adult obesity and economic outcomes

Increased health costs and reduced productivity are the two primary economic consequences of adult obesity. Adults who are a healthy weight earn higher wages, have increased employment opportunities, experience lower medical costs, and participate in the labor force at higher rates. Conversely, obesity and related diseases often require additional medical spending. The consequences of adult obesity can reduce productivity at work and affect overall economic opportunity.

Many of the excess medical costs associated with obesity come from the increased risk for other serious health conditions.⁴¹ Table 1 lists several conditions found to be related to obesity, though the link between obesity and certain conditions is stronger for some than for others.⁴²

Table 1. Some serious health conditions linked to obesity

Arthritis
Asthma
Cancer*
Breast
Esophagus
Kidney
Pancreas
Prostate
Coronary heart disease
High cholesterol
Hypertension
Insulin resistance
Type 2 diabetes

*Obesity has been linked to some types of cancers.⁴³

Source: American Institute for Cancer Research, US Centers for Disease Control and Prevention, Guh et al (2009).

As a result of obesity and obesity-related conditions, adults with obesity routinely face higher medical bills than healthy-weight adults. Adults who are obese are estimated to spend between 36% and 100% more on medical expenses than healthy-weight adults.⁴⁴ Current estimates for the United States show that excess obesity-related medical spending could be as high as \$316 billion annually, in 2010 dollars.⁴⁵ Medical costs related to obesity are not confined to adulthood. The estimated lifetime savings in obesity-related medical costs per child is \$19,000 (in 2012

dollars), and children with obesity may begin to incur additional medical expenses during childhood.^{46, 47}

Obesity-related costs are incurred through a mix of public and private spending. Public obesity-related spending can take the form of disability payments or Medicare or Medicaid expenditures. Adults with obesity are more likely to receive disability payments than healthy-weight adults.⁴⁸ Private obesity-related medical costs are generally paid through a combination of private insurance and out-of-pocket sources. Employers pay a large share of private costs through employer-sponsored health insurance while families and individuals typically are responsible for the remaining out-of-pocket costs.

Apart from direct costs, obesity-related comorbidities can result in diminished workplace productivity. Productivity losses include absenteeism and so-called presenteeism. Absenteeism – missed work due to obesity-related comorbidities – results in lost employee output. One study found that healthy-weight employees missed nearly four fewer days of work each year than their peers with obesity.⁴⁹ Absenteeism related to obesity alone accounts for over \$5 billion (in 2012 dollars) in lost productivity annually.⁵⁰

Presenteeism is a measure of lost productivity for workers still attending their jobs. Obesity-related side effects may limit workplace productivity and lead to lost output or production even though employees remain on the job. Presenteeism is estimated to account for two-thirds of total productivity losses associated with obesity.⁵¹

Differences in worker productivity can lead to a healthy-weight wage premium.⁵² On average, workers who are a healthy weight earn more than workers with obesity.⁵³ The size of the premium can vary between men and women, but in general, research has found that healthy weight workers are more productive and earn higher wages than workers with obesity. In addition to enjoying a wage premium, healthy-weight workers also have expanded employment opportunities.⁵⁴ Healthy-weight adults are more likely to work than adults with obesity, possibly due to obesity-related side effects that make it more difficult for adults with obesity to remain employed.

IV. Quantitative case studies

This report uses results from the academic literature to project the likely long-term impact of a fully phased-in healthier school lunch program in two representative elementary schools. Both case studies assume that each generation of students has access to healthier school lunches beginning in kindergarten through the completion of high school. Case study results are calibrated to the 2012 US economy. Recognizing the uncertainty around the impact of changes to school lunches on childhood obesity, Appendix B reports sensitivity tests on the assumptions used in these case studies.

The first case study is designed to be a nationally representative elementary school, while the second is representative of an elementary school located in a low-income community. Students who attend schools in low-income communities typically face higher rates of obesity and are more likely to receive lunches at free or reduced price as part of the National School Lunch Program.⁵⁵ Each elementary school is assumed to have 500 students, roughly equivalent to the US average.⁵⁶ Students who qualify for free or reduced-price lunch are assumed to eat lunches provided at school. On average, 51% of students nationwide qualify for free or reduced-price lunch.⁵⁷ The US Department of Education classifies schools as low-income if 75% or more of the student body qualifies for free or reduced-price lunch.⁵⁸ Table 2 describes the student population in each of the elementary schools used in the case studies.

Table 2. Case study: school characteristics

	National average	Low-income
Student population	500	500
Share of student population receiving free or reduced-price lunch	51%	75%
Obesity rate	16.9%	27.0%

Source: US Department of Education, National Health and Nutrition Examination Survey, National Center for Education Statistics, Singh (2010), EY analysis.

Access to healthier school lunches may be expected to lower the childhood obesity rate for students who eat school lunches by increasing the amount of fresh fruits, vegetables, and whole grains in their diet, while also reducing fat and calorie intake. Some academic research suggests that the composition of school lunches could account for anywhere from a 1.7 percentage-point difference to a 19 percentage-point difference in childhood obesity rates.⁵⁹ Based on these findings, both case studies show the impact of a 6-percentage-point reduction in the obesity rate of students who eat school lunches – approximately equivalent to a 100-calorie reduction in daily consumption for an elementary school student.⁶⁰ This reduction represents the six-year impact of a fully phased-in program that provides healthier school lunches. Appendix B reports sensitivity analyses that assume a lower estimate of a 1.7 percentage-point decrease in obesity and an upper estimate of a 7.2 percentage-point decrease in obesity.

Table 3 shows the number of students with obesity before and after healthier school lunches have been fully phased in over six years, with students benefiting in every year of their elementary school career.

Table 3. Projected reduction in the number of students with obesity from healthier school lunches, per school

	National average	Low-income
Student population	500	500
Students with obesity (pre-healthier lunches)	84	135
Students with obesity (post-healthier lunches)	69	112
Fewer students with obesity	15	23

Source: Schanzenbach (2009), EY analysis.

Introducing healthier school lunches is estimated to reduce the number of students with obesity in both schools. When healthier school lunches are introduced, the school located in the low-income community experiences a larger reduction in the number of students with obesity because – on average – more students participate in school lunch programs and a greater number of students were obese before healthier lunches. Using \$19,000 as the estimate of lifetime savings in obesity-related medical costs per child, the 15 fewer students with obesity in the nationally representative school could reduce lifetime medical expenses by \$285,000 (in 2012 dollars) per school.⁶¹ The 23 fewer students with obesity in the low-income school could reduce lifetime medical spending by \$437,000 (in 2012 dollars) per school.

If all public elementary schools in the United States increase access to healthier school lunches, the childhood obesity rate is projected to decline by 3.3 percentage points over a six-year phase-in period.⁶² If all students participated in the school lunch program the decline in the obesity rate would reach 6 percentage points. Figure 9 shows the impact on the projected childhood obesity rate after the implementation of healthier school lunches. In 2018, when

the program is completely implemented all elementary school students will have had the opportunity to benefit from it for their entire elementary school career, and barring other unpredicted environmental changes, the childhood obesity rate is estimated to equal the 2006/2007 level. Figure 9 may underestimate the achievable reduction in the childhood obesity rate since it only considers changes to school lunches and not to the broader food environment at schools, such as breakfast and other foods and beverages sold outside the lunch program.

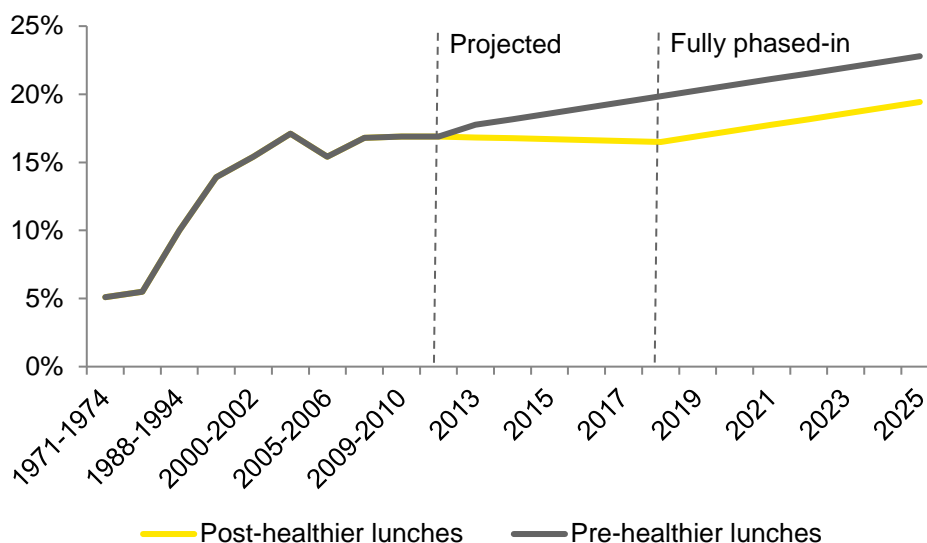
Because reductions in the childhood obesity rate phase in over time, a return to less healthy school lunch standards could quickly reverse any gains. Figure 10 shows that if healthier school lunch standards, introduced in 2012, were repealed in 2015, the projected childhood obesity rate would increase to nearly 20 percent in 2018 – an increase of approximately 1.2 million children with obesity. In contrast, if healthier school lunch standards were kept in place, the projected childhood obesity rate would be 16.5 percent. See Appendix A for the obesity rates used to calculate Figures 9 and 10.

Box 1: Economic impact of reduced obesity rates during childhood

Fewer students with obesity could result in lifetime medical cost savings of:

- \$285,000 per elementary school
- \$437,000 per low-income elementary school

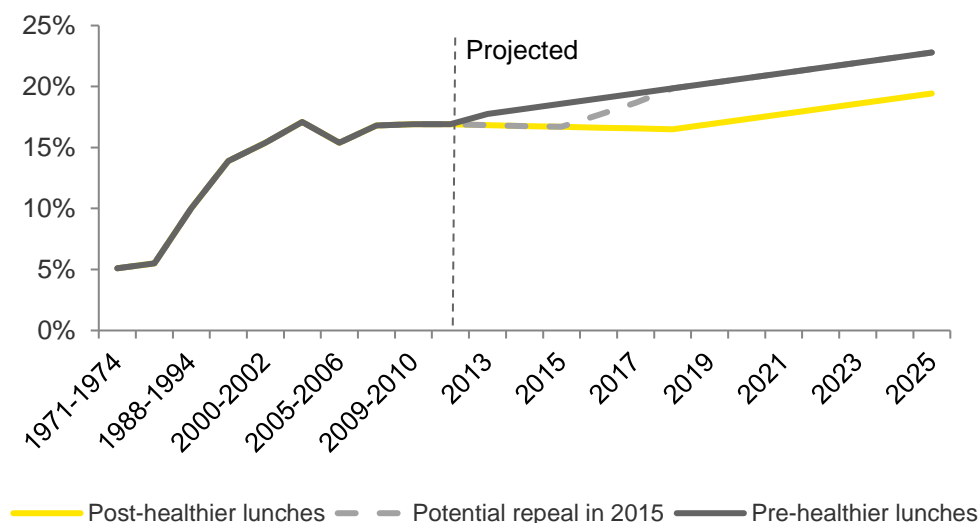
Figure 9. Projected impact of healthier school lunches on the childhood obesity rate



Note: The figure shows the projected impact of a nationally implemented program to provide healthier school lunches beginning in 2012. Healthier school lunches are assumed to reduce the childhood obesity rate for students who participate in school lunch programs by 6 percentage points over a six-year period. Existing research does not allow prediction of how school lunches may change the rate of growth in obesity, only the level, so current trends are assumed to continue after phase-in of healthier lunches.

Source: Centers for Disease Control and Prevention, National Health and Nutrition Examination Survey, EY analysis.

Figure 10. Projected impact of repealing healthier school lunches



Note: The figure shows the projected impact of a nationally implemented program to provide healthier school lunches beginning in 2012 and repealed in 2015. Healthier school lunches are assumed to reduce the childhood obesity rate for students who participate in school lunch programs by 6 percentage points over a six-year period.

Source: Centers for Disease Control and Prevention, National Health and Nutrition Examination Survey, EY analysis.

The education outcomes channel

Higher levels of educational attainment can lead to increased wages and greater work opportunities for students. Providing healthier school lunches is estimated to reduce the number of students with obesity in the nationally representative school by 15 and the number of students with obesity in the low-income school by 23. In the nationally representative school, 15 fewer students with obesity results in three additional high school graduates. In the low-income school, 23 fewer students with obesity results in an estimated five additional high school graduates.

Studies that control for socioeconomic factors find, in some cases, that high school freshmen who suffer from obesity throughout high school could have graduation rates between 10 and 41 percentage points lower than students who are a healthy weight.⁶³ Based on these findings, the case studies show the impact of a 20-percentage-point improvement in the freshmen graduation rate for nationally representative students without obesity and 23-percentage-point improvement in the freshmen graduation rate of low-income students without obesity.

Figure 11 shows the estimated improvement in educational attainment in each school as a result of fewer students with obesity. Healthier school lunches are estimated to increase the number of high school graduates by three in the nationally representative school and five in the low-income school. Some of those new high school graduates are estimated to obtain some college education (one and two, respectively) and some are estimated to go on to become college graduates (one and one, respectively). The remaining students (not shown in Figure 11) are estimated to stop at high school graduation. Students that improved their educational attainment would likely earn additional wage income.⁶⁴

Figure 11. Additional graduates due to fewer students with obesity, per school (Nationally representative, low-income)

	Do not graduate HS	Graduate HS	Some college	Graduate college
Without obesity		3,5	1,2	1,1
With obesity	3,5			

Note: Reducing the childhood obesity rate is estimated to increase the number of high school graduates by three in the nationally representative school and five in the low-income school. Some of those new high school graduates are estimated to gain some college education (one and two, respectively) and some are estimated to become college graduates (one and one, respectively). The remaining students (not shown) are estimated to stop at a high school graduation.

Source: Kaestner, Grossman and Yarnoff (2011), Department of Education, National Center for Education Statistics, EY analysis.

Box 2: Increased economic opportunity from reducing childhood obesity

Greater educational attainment could result in increased annual wage income of:

- \$52,000 per elementary school
- \$86,000 per low-income elementary school

The reduction in the childhood obesity rate is estimated to increase the number of college graduates from each school by one student. While the number of new college graduates per school is small, on a national scale the effect is significant. The low-income school experiences a larger increase in the number of high-school graduates, but those students are less likely to attend a 4-year college than students from the nationally representative school.⁶⁵

Based on the distribution of increased educational attainment shown in Figure 11 and data from the

Bureau of Labor Statistics, reducing the number of students with obesity is estimated to increase annual wage income by \$52,000 and \$86,000 (in 2012 dollars) per nationally representative and low-income school, respectively.⁶⁶ Students with improved educational outcomes from the nationally representative school could see an average increase of \$17,200 in annual wages, while affected students from the low-income elementary school could see an average increase of \$17,300 in annual wages. An increase in the number of high school and college graduates is also estimated to lower unemployment rates among workers with higher education levels, contributing to overall wage gains.

The adult obesity channel

Children with obesity are more likely to become adults with obesity.⁶⁷ Reducing the number of children with obesity is likely to decrease the number of adults with obesity in the future. Academic research reports probabilities ranging from 75% to 90% that elementary-age children with obesity will become adults with obesity.⁶⁸ The case studies show the impact of providing healthier school lunches on the adult obesity rate by using an 82% probability that a child with obesity will become an adult with obesity based on research that focuses on children at the age at which they generally begin school in the United States (See Figure 7).⁶⁹

Table 4 shows the estimated number of students with obesity, from each school, as they reach adulthood. The number of adults with obesity pre-healthier school lunches is based on data from the National Health and Nutrition Examination Survey. Healthier school lunches are estimated to reduce the number of children with obesity and subsequently lower the adult obesity rate. The estimated increase in the number of adults without obesity accounts for the probability that students with and without obesity may become adults with obesity.⁷⁰

Box 3: Increased economic opportunity from reducing adult obesity

Fewer adults with obesity could result in increased annual wage income of:

- \$35,000 per nationally-representative elementary school
- \$51,000 per low-income elementary school

Table 4. Projected reduction in the number of students with obesity in adulthood, per school

	National average	Low-income
Fewer students with obesity	15	23
Adults with obesity (pre-healthier lunches)	177	205
Adults with obesity (post-healthier lunches)	168	192
Fewer adults with obesity	9	13
Projected adult obesity rate (pre-healthier lunches)	35%	41%
Projected adult obesity rate (post-healthier lunches)	34%	38%

Source: Engeland et al (2004), EY analysis.

Reducing the number of adults with obesity is likely to result in increased economic opportunity. The case studies show the impact of a 5% wage premium based on the average effect found between men and women.⁷¹ On average, healthy-weight workers earn \$2,300 more annually (in 2012 dollars) than those with obesity. A reduction in the number of adults with obesity is estimated to generate a small increase in the number of adults who participate in the work force.

The wage premium and increased labor force participation is estimated to increase annual wage income for adults originally from the nationally representative school by an aggregate of \$35,000. Adults originally from the low-income school are estimated to receive an additional \$51,000 in aggregate annual wage income. Not every adult participates in the work force, so the increase in wage income is distributed among working adults.

V. Total economic impact of healthier school lunches

There are 67,086 public elementary schools in the United States.⁷² In 2012, 19% of public schools were classified as low-income by the US Department of Education.⁷³ Extrapolating the results for the two school-level case studies to the United States, this section of the report calculates the US-wide impact of a healthier school lunch program implemented in every public elementary school. Because the exact impact of healthier school lunches is uncertain, Appendix B contains alternative US-wide estimates based on different sets of assumptions to demonstrate the range of possible outcomes.

Table 5 shows the aggregate, annual impact of introducing healthier school lunches in every public elementary school in the United States once the program has been fully phased in over six years, with students benefiting in every year of their elementary school career. A fully phased in healthier school lunch program could contribute to sizable reductions in the number of children and adults with obesity in the United States. In addition to the health benefits, there are likely to be additional positive outcomes, such as an increase in the number of high school and college graduates and higher employment.

Table 5. Annual US-wide long-term impact of healthier school lunches

	National average	Low-income	Total
Fewer children with obesity	139,000	48,000	187,000
Additional high school graduates	28,000	11,000	39,000
Additional college graduates	7,000	3,000	10,000
Fewer adults with obesity	79,000	27,000	106,000
Additional employment	6,000	2,000	8,000

Note: The values in this table represent the estimated school-level results presented earlier in this report multiplied by the total number of elementary schools in the United States. Results for the national average case study are applied to all non-low-income elementary schools (54,340 schools). Results for the low-income case study are applied to 12,746 elementary schools.

Source: EY analysis.

Table 6. Annual US-wide long-term impact of healthier school lunches, in millions of 2012 dollars

	National average	Low-income	Total
Annual increase in wages – Education outcomes channel	\$500	\$200	\$700
Annual increase in wages – Adult obesity channel	\$300	\$100	\$400
Lifetime direct medical savings	\$2,600	\$900	\$3,500
Lifetime disability savings	\$100	\$200	\$300

Note: The values in this table represent the estimated school-level results presented earlier in this report multiplied by the total number of elementary schools in the United States. Results for the national average case study are applied to all non-low-income elementary schools (54,340 schools). Results for the low-income case study are applied to 12,746 elementary schools. Lifetime medical and disability savings are discounted to account for the fact that portions of the costs occur in different time periods.

Source: EY analysis.

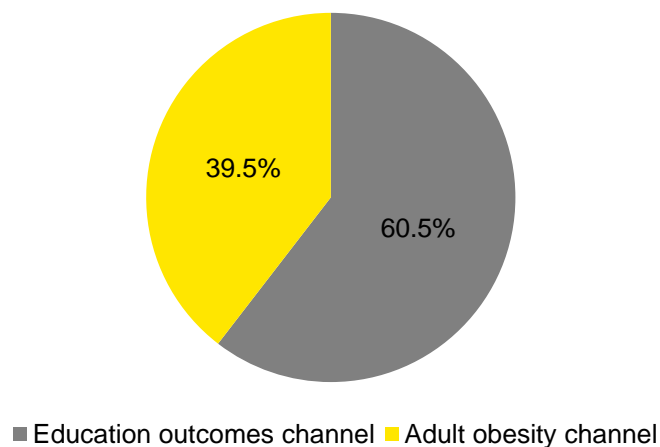
Illustrative case studies indicate that the economic opportunities created by lowering the childhood and adult obesity rates could also be notable. Lower obesity rates could decrease medical spending, lower disability payments, and increase wages. Table 6 shows the annual aggregate, long-term economic impacts of introducing healthier school lunches in every public elementary school in the United States.

As shown in Table 6, total wage income is estimated to increase by \$1.1 billion annually each year the program is in place. Over the course of a 40-year work life that increase is equal to \$44 billion per class over their working lives. Higher incomes, estimated in the case studies, are the result of improved educational attainment and employment opportunities for children and adults who are no longer be obese. In addition to higher incomes, approximately 200,000 children and 100,000 adults would avoid obesity each year, resulting in reduced obesity-related medical expenses. After accounting for timing differences, total lifetime cost savings are estimated to be \$3.8 billion per annual student class that receives healthier school lunches.⁷⁴

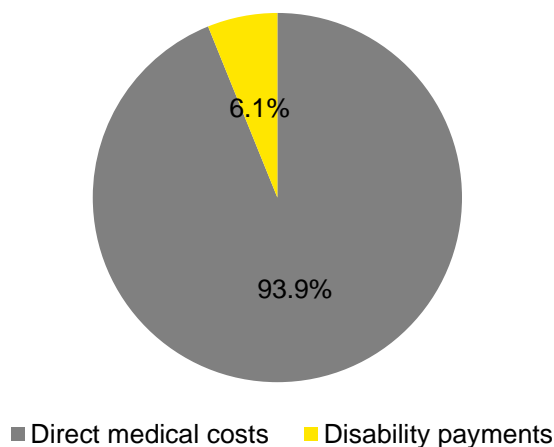
Figure 12 shows the distribution of wage increases and cost savings related to the implementation of healthier school lunches. Approximately two-thirds of estimated wage increases are due to increased educational attainment. The benefits of improved educational attainment would not be realized by obesity prevention targeted solely at adults. However, reducing obesity during childhood enables the educational outcomes channel to act as a second source of improved economic opportunity.

On the cost savings side, over 90% of the total cost savings from reducing childhood and adult obesity rates is due to direct medical costs. Children and adults with obesity and obesity-related disease can face up to 100% higher medical costs than a healthy-weight person. The remaining cost savings are due to a decline in the number of Social Security disability recipients. Adults with obesity are more likely to receive disability payments, and decreasing the number of adults with obesity by 100,000 each year is estimated to reduce the number of disability recipients by 7,000 annually.

Figure 12. Estimated total economic benefit of healthier school lunches for each annual student class, in 2012 dollars
Annual increase in wages: \$1.1 billion



Lifetime cost savings: \$3.8 billion



Source: EY analysis.

VI. Limitations and caveats

The discussion of the impact of healthier school lunches on obesity rates and economic outcomes in this report is based on published academic research and publically available data. However, there are certain limitations with respect to the analysis:

- ▶ This report uses estimates based on results from published academic research, and is therefore subject to the limitations of the underlying studies.
- ▶ Both case studies in this report are used to illustrate the likely impact of healthier school lunches and do not reflect an evaluation of any particular nutritional program or elementary school.
- ▶ Estimates in this report are based on a combination of results from different academic studies, which may differ in their methodology or approach.
- ▶ This report relies on publicly available data sources, including the US Bureau of Labor Statistics, the Census Bureau's Current Population Survey, Social Security Administration, and US Department of Education.
- ▶ The values taken from published research represent standard point estimates generated by statistical models. Standard errors have been omitted for ease of presentation but do not alter the findings presented. A description of the range of key variables is presented in Appendix B.
- ▶ Where possible, the case studies rely on estimates from research that controls for socio-economic factors. However, no model is able to perfectly isolate the impact of one variable, like childhood obesity. Therefore it is likely that other factors besides childhood obesity contribute to the estimated results.
- ▶ Except where noted dollar amounts in this report are undiscounted in present value terms. Many of the benefits of reducing childhood obesity are realized over time as children age. If economic benefits, such as wages or cost savings, are estimated to grow over time, discounting may have little impact, depending on the discount rate.
- ▶ The results of the modeling used in this report are simplified and subject to the limitations of the assumptions.

VI. Summary

In the last three decades, the childhood obesity rate has tripled. Healthier school lunches, such as those now required by the U.S. Department of Agriculture for schools participating in the National School Lunch Program may be one way to slow or reverse the trend. These changes are estimated to contribute to lowering the childhood obesity rate, in addition to increasing academic performance and economic opportunity.

Access to healthy food is estimated to help students perform better in subjects like math and reading, which could lead to greater educational attainment. Later in life, that educational attainment could lead to higher wages and greater job opportunities. Reducing childhood obesity is estimated to enhance economic opportunity, as well as lower medical costs.

Obesity and obesity-related diseases are costly. Recent estimates of the additional lifetime medical costs associated with each child who is obese total \$19,000 in 2012 dollars. Reducing the childhood obesity rate by introducing healthier school lunches, could result in lower medical spending.

This report finds that healthier school lunches could lead to approximately 200,000 fewer children with obesity each year. In addition to children, it is estimated that healthier school lunches would lower the number of adults with obesity by over 100,000 each year. If, however, healthier school lunch standards were repealed, it is estimated that any reductions in the childhood obesity rate would quickly reverse.

A decrease in children and adults with obesity is estimated to produce \$3.8 billion, in 2012 dollars, in obesity-related lifetime cost savings for each annual student class that receives healthier school lunches. As each annual student class reaches adulthood, the adults who would have had obesity without healthier school lunches are estimated to receive \$1.1 billion more, in 2012 dollars, in annual wages as a result of having a healthy weight (\$44 billion in lifetime income). Approximately two-thirds of the estimated increase in wages is due to greater educational attainment. Taken together, each annual class of students receiving healthier school lunches throughout their elementary school career would generate \$47.8 billion of lifetime benefits for themselves and the US economy.

Healthier school lunches have the potential to contribute to lower childhood obesity rates in the United States. Obesity rates are currently at historically high levels among both children and adults. Efforts to reduce obesity in children may produce additional benefits by increasing educational attainment and improving health outcomes.

Appendix A

Table A1. Estimated childhood obesity rates under different healthy school lunch scenarios

Year	Childhood obesity rate without healthier school lunches	Childhood obesity rate with healthier school lunches	Childhood obesity rate with repeal of healthier school lunches in 2015
1971-1974	5.1%	5.1%	5.1%
1976-1980	5.5%	5.5%	5.5%
1988-1994	10.0%	10.0%	10.0%
1999-2000	13.9%	13.9%	13.9%
2000-2002	15.4%	15.4%	15.4%
2003-2004	17.1%	17.1%	17.1%
2005-2006	15.4%	15.4%	15.4%
2007-2008	16.8%	16.8%	16.8%
2009-2010	16.9%	16.9%	16.9%
2011-2012	16.9%	16.9%	16.9%
2013	17.8%	16.8%	16.8%
2014	18.2%	16.8%	16.8%
2015	18.6%	16.7%	16.7%
2016	19.0%	16.6%	17.7%
2017	19.4%	16.6%	18.7%
2018	19.9%	16.5%	19.9%
2019	20.3%	16.9%	20.3%
2020	20.7%	17.4%	20.7%
2021	21.1%	17.8%	21.1%
2022	21.5%	18.2%	21.5%
2023	22.0%	18.6%	22.0%
2024	22.4%	19.0%	22.4%
2025	22.8%	19.5%	22.8%

Note: Projected obesity rates are highlighted in gray. Obesity rates from 2013-2025 are projected based on rates from 1999-2012. Healthy school lunches are assumed to reduce the childhood obesity rate for students who participate in school lunch programs by 6 percentage points and phase in over six years. Existing research does not allow prediction of how school lunches may change the rate of growth in obesity, only the level, so current trends are assumed to continue after phase-in of healthier lunches.

Source: Centers for Disease Control and Prevention, National Health and Nutrition Examination Survey Schanzenbach (2009), Engeland et al (2004), EY analysis.

Appendix B

The exact impact of a healthier school lunch program is uncertain. This appendix contains additional US-wide estimates of the impact of healthier school lunches in order to demonstrate the range of possible outcomes. To estimate the results in this appendix, three key parameter values were changed: obesity rate decline, high school freshmen graduation rate, and probability that a child with obesity becomes an adult with obesity.

Upper estimate. First, the decrease in the obesity rate of children who eat school lunch is assumed to fall by 7.2 percentage points (versus 6 percentage points in the base case). Second, the high school freshmen graduation rate is assumed to improve by 41 percentage points in the nationally representative school (versus 20 percentage points in the base case), and by 36 percentage points in the low-income school (versus 23 percentage points in the base case). Lastly, the probability a child with obesity will become an adult with obesity is assumed to be 90% (versus 82% in the base case). Taken together, these assumptions represent an ambitious estimate of the impact of healthier school lunches. Estimates based on these parameter values are shown in Tables B1 and B2.

Table B1. Annual US-wide long-term impact of healthier school lunches, upper bound

	National average	Low-income	Total
Fewer children with obesity	166,000	57,000	223,000
Additional high school graduates	60,000	24,000	74,000
Additional college graduates	14,000	5,000	19,000
Fewer adults with obesity	109,000	38,000	147,000
Additional employment	10,000	4,000	14,000

Source: EY analysis.

Table B2. Annual US-wide long-term impact of healthier school lunches, in millions of 2012 dollars, upper bound

	National average	Low-income	Total
Annual increase in wages – Education outcomes channel	\$992	\$390	\$1,392
Annual increase in wages – Adult obesity channel	\$440	\$152	\$592
Lifetime direct medical savings	\$3,159	\$1,090	\$4,249
Lifetime disability savings	\$100	\$240	\$340

Note: Lifetime medical and disability savings are discounted to account for the fact that portions of the costs occur in different time periods.

Source: EY analysis.

Lower estimate. To estimate the lower estimate, three key parameter values were changed. First, the decrease in the obesity rate of children who eat school lunch is assumed to fall by 1.7 percentage points (versus 6 percentage points in the base case). Second, the freshmen graduation rate is assumed to improve by 10 percentage points in the nationally representative school (versus 20 percentage points in the base case), and by 11 percentage points in the low-income school (versus 23 percentage points in the base case). Lastly, the probability a child with

obesity will become an adult with obesity is assumed to be 75% (versus 82% in the base case). Taken together, these assumptions represent a conservative estimate of the impact of healthier school lunches. Estimates based on these parameter values are shown in Tables B3 and B4.

Table B3. Annual US-wide long-term impact of healthier school lunches, lower bound

	National average	Low-income	Total
Fewer children with obesity	40,000	14,000	54,000
Additional high school graduates	4,000	2,000	6,000
Additional college graduates	1,000	500	1,500
Fewer adults with obesity	19,000	6,000	25,000
Additional employment	1,400	400	1,800

Source: EY analysis.

Table B4. Annual US-wide long-term impact of healthier school lunches, in millions of 2012 dollars, lower bound

	National average	Low-income	Total
Annual increase in wages – Education outcomes channel	\$64	\$25	\$89
Annual increase in wages – Adult obesity channel	\$75	\$26	\$101
Lifetime direct medical savings	\$746	\$257	\$1,003
Lifetime disability savings	\$14	\$41	\$55

Source: EY analysis.

The total increase in wage income under the ambitious set of assumptions is 180% of the base case. Total cost savings under the ambitious set of assumptions is 121% of the base case. The total increase in wage income under the conservative set of assumptions is 17% of the base case. Total cost savings under the conservative set of assumptions is 28% of the base case.

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² Recent changes to school nutrition standards are too new for a body of peer-reviewed research to be available specifically on the effects of those standards. Instead, this report uses research on the effects of cross-school variation in school lunch contents under prior nutrition standards, on differences between children who eat school lunch versus those who do not, and on the effect of increased consumption of healthier foods at home or brought to school from home. See pages 3-4 for citations to this research.

³ The economic benefits of each channel are cumulative for those children who, otherwise, would have had obesity. Children who receive healthier school lunches may realize benefits during childhood in the form of increased educational outcomes and reduced excess medical spending. As those children – now without obesity – reach adulthood the economic benefits of being a healthy weight continue to accrue. As adults, research finds that they have better opportunities in the labor market, earn higher wages, and are less likely to generate excess medical spending. The impact of each channel is additive because this report relies on estimates from research that carefully controls for the effects of other channels, which negates – to the extent possible – double-counting. In general, magnitudes reported in each case study represent the isolated impact of the particular link under investigation. Relying on estimates that control for other the other channels, as well as other factors that may be related to obesity, allows for the type of aggregation found in Section V of this report.

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