



FACTS AT A GLANCE

School-Based Interventions for Childhood Obesity

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Obesity is a serious problem in the United States, particularly among children. The percentage of overweight children and adolescents has increased from just over four percent in the 1960s to about 17 or 18 percent in 2003-2004.¹ The increase in obesity has implications for morbidity and mortality, as well as for health care costs. Recent decades have witnessed an increased incidence of adult onset (Type II) diabetes in children, thereby increasing their risk of suffering from a host of maladies, including premature death.² Scientific evidence also links childhood obesity to a range of social problems, including lower self-reported quality of life³ and social marginalization from peers.⁴ Furthermore, obese children are more likely to become obese adults,^{5,6} and adolescent obesity may increase the risk of adult morbidity and mortality.⁷ The increasing prevalence of obesity and its harmful consequences have led some researchers to speculate that future life expectancies may be lower than current expectancies, a trend not witnessed in recent history.²

The prevalence of overweight children is higher in Texas than in the nation as a whole.⁸ In addition, Texas boys are more likely to be overweight than girls, and African American and Hispanic children are more likely to be overweight than other children.⁸ To address this concern, the 79th Texas Legislature enacted Senate Bill 42, which requires school districts to emphasize the importance of nutrition and exercise in the health curriculum, authorizes the State Board of Education to expand participation in physical education, requires school districts to report certain health and activity data to the Texas Education Agency, and establishes the School Health Advisory Committee to assist the State Health Services Council with school health programs and services. Legislation relating to body-mass index (BMI) reporting was considered but not enacted.⁹

The purpose of this report is to summarize scientific research on the effectiveness of school-based obesity interventions for the prevention and treatment of childhood obesity. Interventions that changed at least one aspect of the school environment, such as the food provided, opportunities for physical activity, or the curriculum, are included. A number of interventions met this criterion even though they were designed to target aspects of health other than obesity, and these studies also are included. Interventions targeting obese children only and interventions targeting all children are examined separately. In addition, this report summarizes the findings on how related school policies, such as participation in school meal programs, the presence of additional food sources other than school meals, and the amount of physical education, may affect obesity.

Summary of Findings

- School-based obesity interventions can reduce obesity in overweight children.
- The intervention components that are crucial to the success of the intervention cannot be determined from current research.
- School-based interventions can improve the fitness, nutritional intake, and self-esteem of obese children.
- School-based interventions can improve the health-related knowledge, fitness, and nutrition of the student population.
- School-based interventions do not prevent obesity or other physiological risk factors in the student population.
- Research is inconclusive about the effects of school-based interventions on activity level and self-esteem in the student population or on activity level and health- and nutrition-related knowledge in obese children.
- The relationship between school lunch program participation and being overweight is unclear. The presence of snack machines and other food sources, but not beverage machines, may decrease fruit and vegetable intake and increase fat intake. Lowering the price of healthy food may increase sales of these items.

School-Based Interventions and Obesity Treatment

Do school-based interventions reduce the severity of obesity in obese children? Yes. Sixteen studies^{10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25} examined the effects of school-based interventions on obese children, and all studies but one found that treatment reduced at least some measure of obesity.²³ This finding is consistent with previous reviews of the literature.^{26,27,28} A few additional interventions targeted all children, regardless of obesity status, but their results were examined separately for obese children. Of these, one intervention was effective for girls but not for boys;²⁹ the other two interventions had no effect on body fat or body mass index (BMI).^{30,31}

Do school-based interventions affect the activity level of obese children? The research results are mixed. Some research suggests that intervention can increase activity²⁰ while other research does not.¹⁷ A third study suggests that intervention may not affect activity level, but may decrease television viewing among boys.¹²

Do school-based interventions affect the nutritional intake of obese children? Yes. Intervention improved at least some aspects of children's nutritional intake,^{12,16} including decreases in the consumption of high sodium food and increases in the consumption of fruits, although success in promoting a low-fat diet is less clear.¹⁷

Do school-based interventions affect obese children's knowledge about healthy behaviors? The research results are mixed. Some research failed to find effects of the intervention on obese children's knowledge of nutrition.²³ However, other research found improved health knowledge among students who participated in the intervention compared to students who did not.¹⁷

Do school-based interventions have other effects on obese children?

- Physiological effects besides reducing obesity or body fat—One study found that intervention was not consistently related to blood pressure,^{12,15,17,20} and did not have an impact on cholesterol.¹⁵ However, a second study found that intervention reduced cholesterol in boys and high-risk girls,¹² and a third study found that intervention reduced cholesterol in all children in the study.¹⁷
- Effects on fitness—Intervention can improve obese children’s level of fitness.^{12,13}
- Psychological effects—Intervention appears to improve the self-esteem of obese children.^{16,23}

Factors That May Influence the Effectiveness of Interventions

Length of the intervention program. Intervention lengths among the studies reviewed ranged from nine weeks to three years, and interventions of all lengths successfully reduced obesity in overweight or obese children. Some evidence suggests that shorter treatment periods may be associated with larger treatment effects.²⁶

Age of the targeted children. Reductions in obesity were found in kindergarteners through high school seniors. This finding is consistent with one previous review of the literature,²⁶ although another review suggests that interventions with adolescents may be less successful than interventions with younger children.²⁷ Voluntary activity programs may be most successful when implemented with students in the middle elementary grades.³²

Involvement of other family members in the intervention. The research results are mixed. Some research suggests that parental involvement improves outcome,^{19,33} but other studies find mixed effects²⁸ or a lack of effect.^{16,26} Parental involvement may increase participation in voluntary activity programs.³²

Length of time after treatment the effects may be measured. Effects are generally more likely to be short-term rather than long-term,^{12,16} although research is limited. However, in one intervention, participants had lost additional weight at a longer-term follow-up.²⁵ Therefore, further research with follow-up studies can be useful in examining the long-term effects of intervention on obesity.^{26,27}

Components used in the intervention. Research has not systematically examined whether the number of intervention components affects the outcome, and the available literature does not allow us to answer this question. Some have suggested that a combination of components appears to be more effective than any component alone.^{26,27,33}

Most intervention programs involve multiple components, and research has not systematically examined which component(s) contribute most to the effectiveness of an intervention. In a recent survey, experts stated that increasing physical activity is the most important intervention component.³⁴ Other researchers believe that including a behavioral treatment component in school-based interventions may increase effectiveness.^{26,35}

Qualifications of treatment leaders. Successful interventions were led by trained outside professionals, such as physicians and nutritionists,^{13,15,22,25} school faculty,^{10,11,12,14,17,24,25} and peer counselors.¹⁶

School-Based Interventions and Obesity in the Student Population

Do school-based interventions reduce obesity in the student population? No. The majority of research studies found no effect of school-based interventions on reducing obesity in the student population as a whole.^{30,31,36,37,38,39,40,41} The remainder found intervention effects for some obesity measures but not others,^{42,43,44} or for girls but not boys.^{29,42,45,46} This pattern of results is consistent with previous reviews of the literature.^{28,47}

Do school-based interventions affect activity level? The research results are mixed. Some studies find increased activity as a result of intervention,^{48,49,50,51} while others do not.³¹ Two studies found increased activity levels in school, but decreased activity³⁰ or no effects on activity³⁹ outside of school. One study found no differences in total time spent in daily physical activity, but more time spent in vigorous activity in the intervention group than in the control group.³⁷ Two studies found a reduction in TV viewing hours in the intervention group as compared to the control group, but no differences in the amount of time spent in vigorous activity.^{29,52} Some parents and physical education teachers report that voluntary activity programs increase children's activity levels, but others report no effects of such programs.³² This uncertainty is consistent with findings of previous review articles.⁵³

Do school-based interventions affect nutritional intake? Yes. All but one⁵⁴ of sixteen studies found that intervention improved some aspect of children's diets,^{29,30,31,36,37,38,42,48,49,50,51,52,55,56,57} such as reduced fat intake and an increase in the consumption of fruit and vegetables.

Do school-based interventions affect knowledge about healthy behaviors? Yes. All available research found some improvement in children's knowledge of nutrition or exercise-related behaviors.^{30,36,38,48,49,51,52,55,56,57,58} This finding is consistent with previous reviews of the literature.^{35,53}

Do school-based interventions have other effects?

- Physiological effects besides reducing obesity or body fat—Four studies did not find that school-based interventions had an impact on overall cholesterol.^{30,37,40,42} One study found that such interventions lowered blood pressure for girls,⁴² while two others did not find an impact on blood pressure.^{37,40} One study found that intervention increased exercise heart rates;⁵⁹ another found that interventions decreased resting heart rates for girls but not for boys;⁴⁵ and two studies found that interventions did not have an impact on resting heart rates.^{37,40} Intervention did not affect insulin, iron, glucose levels, or aerobic capacity.³⁰ This pattern is consistent with previous reviews of the literature.⁴⁷
- Effects on fitness—All available research found some improvement in fitness following intervention.^{30,36,39,42,45,59} This finding is consistent with previous reviews of the literature.⁶⁰
- Psychological effects—In one available study, treatment improved overall self-worth slightly but had no significant effect on measures of dietary restraint or perceptions of body shape.³¹

School Characteristics and Obesity in the Student Population

What are the effects of participation in school meal programs? Research on the nutritional benefits of school lunches is mixed. School lunches may have higher-than-recommended percentages of calories from fat and saturated fat, yet meet recommendations regarding cholesterol.⁶¹ Participants in the program have higher fat intake,^{62,63} lower added sugar intake,⁶² and increased intake of certain vitamins^{62,63} and fiber⁶² than nonparticipants, both at lunch and over 24 hours. However, school lunches may be lower in fats and sugars than other types of lunches,⁶⁴ and National School Lunch Program (NSLP) participants eat more fruits and vegetables at lunch than students who eat lunch at school snack bars.⁶⁵

Research concerning the association between participation in school lunch programs and being overweight is also inconclusive. Two studies suggest that participation in the NSLP was not associated with being overweight in school-aged children in 2nd and 5th grades.^{66,67} Three other studies, however, found that students who ate school lunches were more likely to be overweight than students who did not,^{68,69,70} although other factors such as ethnicity and family demographics were stronger predictors of weight and body fat.⁶⁹

What are the effects of the amount and type of physical education taught in schools? Limited research evidence suggests that increasing the amount of physical education taught in schools may be associated with a reduced risk of being overweight.^{70,71,72}

What are the effects of the presence of other food sources and vending machines? Vending machines are located in most middle and high schools in the U.S., and generally dispense unhealthy, competitive food products (foods served in school that are not part of the NSLP).^{73,74} No studies evaluating the relationship between obesity and school vending machines were available. However, the presence of other food sources is negatively associated with consumption of fruits and vegetables and positively associated with a higher percentage of daily calories obtained from fat.⁷⁴ The presence of snack and vending machines at school may be associated with decreased intake of fruits and vegetables, but not with fat intake.⁷⁴ The presence of school beverage machines may not affect fruit or vegetable consumption or fat intake.⁷⁴ Promoting and lowering the price of fruits, vegetables, and low-fat snacks available in school may increase sales of these items.^{75,76,77}

What are the effects of other school-related characteristics? Participation in extracurricular sports may improve cardiovascular health in obese male teens.⁷⁸ Moreover, modifying school playground facilities to stimulate physical activity and providing supervision during play periods may increase activity levels of elementary school children.^{79,80}

Other school-related characteristics that may be promising avenues of intervention include recess, intramural programs, access to facilities outside of school hours, and support for healthy eating and physical activity.⁸¹ A number of schools have successfully integrated third-party activity programs into their physical education curriculums or after-school activities.³²

Limitations of the Literature Review

Limited ability to generalize the findings. Five characteristics of the research reviewed here limit the degree to which the findings may be generalized to all children. First, interventions were often applied to very small numbers of students, who were sometimes members of specific ethnic groups, and thus may not be representative of students as a whole. Second, the students in the interventions were often volunteers, and findings may not apply to students who are not interested in participating in such an intervention. Third, intervention effects often differed across ethnicity, gender, age group, or other characteristics of the students. Fourth, intervention effects were not always apparent for all outcome measures. Finally, sometimes multiple studies were performed on the same interventions with the same group of children; thus the results are based on a smaller number of children than is indicated by the number of studies.

Limited ability to determine causality. Three main characteristics of current research limit our ability to determine the true causes of observed intervention effects. First, because many studies lacked an appropriate control group, the conclusion that observed effects are due to the intervention, and not to some other unmeasured factor, cannot be drawn with certainty. Second, the lack of a systematic examination of intervention components limits the ability to determine which intervention components are responsible for observed effects. Finally, uncertainty about the causal mechanism relating knowledge, attitudes, behavior, and physiology prevents determination of whether changes in factors such as activity level or knowledge of nutrition will produce improvements in reducing obesity.

Difficulty determining the strength, durability, and accuracy of the effects. The lack of research on long-term effects means that the results often do not allow us to determine the size of the effect, and the actual amount of weight lost may be small. Outcomes are often based on self-reported activity levels and eating behaviors, and thus may not be accurate. Finally, experts disagree about the most appropriate outcome measure to use in assessing changes in childhood obesity.

Notes

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