OBESITY PREVENTION IN SCHOOLS: IMPLICATIONS FOR NURSING

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A manuscript submitted in partial fulfillment of the requirements for the degree of

MASTER OF NURSING

WASHINGTON STATE UNIVERSITY-VANCOUVER

College of Nursing

NOVEMBER 19th, 2010
To the Faculty of Washington State University:

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OBESITY PREVENTION IN SCHOOLS: IMPLICATIONS FOR NURSING

Abstract

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November 19th, 2010

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Obesity prevention in the schools poses a complex challenge. Evidence would suggest that it requires a complex multi-pronged approach to make an impact. Nutritional education, changes in food quality and macronutrient content, and physical activity, as well as community and family support programs, are all important pieces of a complex picture. For programs to succeed, evidence shows some very fundamental changes in nutritional content of food served in schools, and in physical activity requirements, could go a long way in making a positive difference in fighting childhood obesity. The purpose of this paper is to raise awareness among pediatric nurses and health care providers regarding the need for more rigorous nutrition standards for foods served in the National School Lunch Program; and to raise awareness of current standards for nutrition and physical activity in the public school system. Providing nurses with better tools to support community, family, and individuals in their quest for better health is important.
### TABLE OF CONTENTS:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSRACT</td>
<td>ii</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>LITERATURE SEARCH STRATEGIES</td>
<td>3</td>
</tr>
<tr>
<td>LITERATURE REVIEW</td>
<td>3</td>
</tr>
<tr>
<td>OBESITY PREVENTION AND EDUCATION IN PUBLIC SCHOOLS</td>
<td>3</td>
</tr>
<tr>
<td>FOOD QUALITY AND GUIDELINES IN THE NATIONAL SCHOOL LUNCH PROGRAM</td>
<td>7</td>
</tr>
<tr>
<td>MACRONUTRIENT QUALITY OF FOOD</td>
<td>8</td>
</tr>
<tr>
<td>COMPETITIVE FOOD SOURCES</td>
<td>9</td>
</tr>
<tr>
<td>GUIDELINES FOR NUTRITION IN SCHOOLS</td>
<td>10</td>
</tr>
<tr>
<td>RECOMMENDATIONS FOR CHANGES IN SCHOOL FOODS</td>
<td>11</td>
</tr>
<tr>
<td>PHYSICAL ACTIVITY PROGRAMS IN SCHOOLS</td>
<td>12</td>
</tr>
<tr>
<td>RECOMMENDATIONS FOR PHYSICAL ACTIVITY</td>
<td>14</td>
</tr>
<tr>
<td>CONCLUSION</td>
<td>15</td>
</tr>
<tr>
<td>IMPLICATIONS FOR PRACTICE</td>
<td>15</td>
</tr>
</tbody>
</table>
Introduction

Currently in the United States (U.S.), obesity is one of the top public health concerns. There are well-established statistical associations between obesity and a range of chronic health conditions and symptoms. The increasing prevalence of obesity in children and adults is rising despite the current focus on treatment and prevention. Based on data from the 2003–2004 U.S. National Health and Nutrition Examination Survey (U.S. Department of Health and Human Services, National Institute of Health, [NIH], 2010), approximately 66 million U.S. adults are obese and an additional 74 million are overweight. Among U.S. children six to eleven years of age, an estimated 4.2 million are overweight, and among adolescents twelve to nineteen years of age, 5.7 million are overweight (NIH, 2010). Assuming that the same trends continue, by 2015 two in every five adults and one in every four children in the U.S. will be obese. The prevalence of obesity, however, is not exclusive to the U.S.

Obesity prevalence is also rising in countries throughout the world. According to the World Health Organization (WHO), the number of overweight and obese people worldwide will increase to 1.5 billion by 2015 if current trends continue (World Health Organization Fact sheet N311, Obesity and Overweight, 2006). For the purposes of this paper, obesity is defined as an excessive amount of adipose tissue and a body mass index (BMI) of 30 or greater. Overweight is defined as an excessive amount of body weight that may come from muscles, bone, adipose tissue, and water and a BMI of 25-29.9 (NIH, 2010). For children and adolescents it is BMI-for-age ≥ 95th percentile for obese, and over the 85th percentile for overweight (NIH, 2010).

Children spend much of their day in school. Low income children who are at greater risk for obesity often eat most, if not all, of their meals at school. Schools are also swiftly becoming one of the few places in our society where children have the opportunity to exercise. Being
overweight or obese can affect a child’s academic performance in many ways. Overweight and obesity have been documented as risk factors or markers of poor academic performance (Chomitz et al., 2009). Additionally, health conditions related to obesity can affect school attendance and lead to social problems, such as being bullied. Other health issues related to weight may include depression, anxiety, and low self esteem (Barlow & Expert Committee, 2007).

While prevention would seem to be the best strategy in combating this epidemic, many preventative health programs seem to be falling short. Nurses and family practice providers are at the frontlines of this national concern. Schools can be an integral part in preventing childhood obesity. No other community institution has as much contact with children and their families, especially low income minority children who may not have access to health care anywhere else. Schools provide a unique and important opportunity for nursing to influence the health of the Nation’s children.

The population of interest in this paper is school children, from kindergarten to high school, who attend public schools in all U.S. communities. Narrowing the focus to a specific age or range or community population is problematic as the standards for nutrition established by the National School Lunch Program (NSLP) apply to all age ranges and U.S. school populations. Such a broad focus is beyond the scope of this paper. Instead this paper will focus on specific obesity prevention interventions used in schools. The interventions of interest are nutritional content of food, and guidelines regarding food services in the NSLP, and current physical education (PE) and/or activity guidelines in public schools.

The purpose of this paper is to raise awareness among pediatric nurses and health care providers regarding the need for more rigorous nutrition standards for foods served in NSLP, and
to raise awareness of current standards for nutrition and physical activity in the public school system. Providing nurses with better tools to support community, family, and individuals in their quest for better health is important.

**Literature Search Strategies**

Searches of the electronic online databases included Pro Quest, EBSCO, CINAHL, Lexis Nexis Academic, and Project Muse. Search parameters included, the key words public schools, school aged children, all grades, and school-based interventions for obesity or overweight children. Other terms utilized to refine the search included NCLB nutritional guidelines and physical activity guidelines for schools. Research studies and integrated reviews were included. Publications were between 2000 and 2010. Thirty two publications met the criteria for review.

**Literature Review**

The literature review is organized into three sections: obesity prevention and education programs in public schools, food quality and guidelines in the NSLP in public schools, and physical activity programs in public schools. Recommendations for changing school nutritional programs and physical exercise programs are provided. Each section is now reviewed:

**Obesity Prevention and Education Programs in Public Schools**

Despite the national attention to this epidemic, there are still very little evidenced-based interventions currently available to prevent or diminish overweight and obesity in school children and no consensus on recommended approaches exist. Recent reviews have revealed that the evidence on the effectiveness of prevention program interventions is limited. This review will focus on interventions that were identified as having a positive impact with the thought that these could be further analyzed and improved.
The three year Pathways study (Caballero et al., 2003) was a randomized trial involving 1704 children in 41 different schools conducted over a three year period. This trial had four components: diet modifications, physical activity, classroom nutritional education, and programs involving families. Data were gathered at the beginning and at the end of three school years. These data consisted of children’s body fat composition, nutrition knowledge and activity levels. Diet and food choices were monitored randomly through observation by Pathways staff at lunches. Menu data were collected from the schools for younger children; older children were given dietary recall questionnaires as well. The Pathways study was very successful in educating children and their families about healthy choices and nutrition; however, the authors acknowledge the limitations. While attempts were made to modify the food served in schools, there were multiple barriers. Fat content was reduced in some meals, but total calories consumed by children did not change. Body composition and BMI for the intervention groups did not change.

The study by Hollar et al. (2010b) was conducted over two school years. The sample was comprised of six elementary schools all having similar demographic and socioeconomic characteristics. Schools were randomly assigned into intervention and control groups. Interventions included modification of foods served at the school cafeteria including substituting whole grain flour for processed white flour; more whole foods, including fresh fruit and vegetables; more high-fiber items; fewer high-glycemic items, such as sugar-coated cereals and processed flour goods; and lower amounts of saturated and trans fats. Menus at the intervention schools were found to contain approximately double the fiber content and about 23% less fat than the food served at control schools (Hollar et al., 2010b). Education was aimed at not just children, but included parents, family, and school staff with the goals of improving nutrition,
physical activity, and the academic performance of the children. Monthly kits consisting of packets of lessons, information, posters, and the use of multimedia were all part of the education program. Fruit and vegetable gardens were introduced and used at the intervention schools as a way to teach and engage children regarding healthy choices. An increase in physical activities was introduced, but time constraints for increasing time spent in PE classes were a problem. Desk-side physical activities were introduced and used by teachers. Results were good; children in the intervention groups maintained normal BMI’s and a greater percentage of overweight children lowered their BMI’s in the intervention schools. Fewer intervention children overall gained weight. Academic scores improved as well for the intervention children; for the minority children the improvement was statistically significant.

The APPLE project (Taylor et al., 2007) was a 2-y community-based obesity prevention initiative in Otago, New Zealand. This project was done using four intervention and three control schools. The authors used education and community-based interventions for increasing activity in school children and promoting better nutrition. Due to time constraints in schools, they did not introduce activity into the school curriculum, but designed a program for after school activity. There were four intervention schools and three control schools that were randomly assigned. Height, weight, blood pressure, activity levels, and waist circumference were measured at baseline, at one year into the study, and at the end or two years from baseline. Activity coordinators were placed at intervention schools to educate and promote increased activity at recess, afterschool sports, and programs, as well as lifestyle interventions out of the school environment. Nutrition-based education targeted reducing the consumption of sugary drinks like soda and increasing the consumption of whole fruits and vegetables. BMI results after two years were lower overall in the intervention schools. Average waist circumference was
lower, as was blood pressure, but the prevalence of overweight children did not change. Intervention children reported a lower consumption of sugary drinks and a higher intake of fresh fruit and vegetables than the control children.

In the study by Wang et al. (2010), multiple interventions were used. This study used a prospective design. The authors hypothesized that students who had high levels of exposure to the interventions would display increased knowledge, increased changes in attitudes and behaviors towards healthy eating, and increased consumption of fresh fruits and vegetables in and out of the school environment. Interventions included school food being freshly prepared from school gardens grown by the students; changes to the dining area, like more chairs to encourage sitting while eating and removing of advertisements and media; school gardens; and cooking classes and nutrition education in the classroom. The findings were in line with the original hypothesis that hands on learning in cooking and gardening can facilitate better knowledge acquirement. Exposure to nutritional education, and changes in the foods offered, can have a positive impact, increasing children’s preferences for fresh fruits and vegetables and promoting better, healthier food choices (Wang et al., 2010).

Physical Activity Across the Curriculum (PAAC) was a three-year randomized controlled trial to promote physical activity, measure academic impact on increased physical activity, and to decrease prevalence in overweight and obesity in elementary school children (Donnelly et al., 2009). This trial was conducted using 24 schools that were randomly assigned to intervention (n=12) or control schools (n=12). Children were exposed to 90 minutes of weekly vigorous activity via physically active lessons in addition to the 60 minutes of PE classes to achieve a total of 150 minutes of physical activity a week. BMI and standardized tests were used to gauge the children’s progress. For the intervention group, there was a statistically significant lowering of
BMI as compared to the control group. PACC intervention children also had statistically significantly higher test scores in math and reading than those of the control (Donnelly et al., 2009) group.

Education aimed at modifying behavior has been shown to be useful in obesity prevention and treatment. Modifying target behaviors such as reducing sugar intake, increasing fruit and vegetable intake, and decreasing sedentary time are all interventions recommended to help prevent obesity (Barlow & Expert Committee, 2007). In the studies reviewed, education alone did not make a significant impact on children's weight or BMI status. Studies increasing physical activity alone seemed to improve BMI status and academic achievement. Many studies that combined education and physical activity had a small impact; while children did not lower their BMI’s, many did not gain weight either. Studies that changed the nutritional quality of foods offered, and/or encouraged physical activity combined with multi-pronged nutritional education programs, was shown to have the greatest impact on children overall. As noted by the author and recent obesity statistics, this evidence is not enough to help reverse this disturbing trend in the Nation’s children. While many of the interventions shown may have an impact, further examination is warranted. For the purpose of this paper, food quality, nutrition guidelines and NSLP program standards, and PE standards are highlighted and now reviewed.

**Food Quality and Guidelines in the NSLP in Public Schools**

The review of literature on food quality is organized into the following sections: macronutrient quality of foods, competitive foods and sources, current guidelines for school nutrition, and recommendations for changes in school foods. Good nutrition is essential for health and maintaining a healthy weight. Food quality in public schools has received significant attention, considering most children eat at least one meal a day at schools. The U.S. Department
of Agriculture's (USDA) NSLP feeds lunch up to 30 million children daily; and 10 million children eat breakfast at school (Clark & Fox, 2009).

Schools are a major influence in the nutritional quality of many children's diets. For minority, low income children who participate in the NSLP program and are at greater risk for obesity, meals eaten at school may be their main source of nutrition (Hollar et al., 2010a; Li & Hooker, 2010). In a 2009 U. S. Senate report, 16.7 million children were food-insecure, making the nutritional value of the meals they do consume vital for their growth and development (S. Rep. No. 111–178, 2010).

Data has been collected on the nutritional quality of the food available to U.S. school children for many years, most notably two large national studies: The Quality of American School-Age Children by School Lunch Participation Status and The Third School Nutrition Dietary Assessment study (SNDA-III). It is noted that the data from both major studies are at least five years old. The 2010 School Nutrition Dietary Assessment study is currently under way and should provide more up-to-date information at completion. Nutritional education for children on making healthy food choices will be useless if children are not supported by their school and home environment. Children cannot make healthy choices if those choices are not available.

**Macronutrient quality of foods.** While the macronutrient quality of food served in schools has improved over the years, there is still significant need for improvement. Overall, the majority of school age children consume enough calories. In fact, NSLP children consume a great deal more calories than children who do not participate in the NSLP. It is the type of calories and the source of these calories that is problematic. One of the principal shortfalls noted is children's intake of dark green vegetables, which is typically less than 20% of the recommended amount (Stallings, West-Suitor, & Taylor, 2010). While vegetables are offered
with meals, some of the most frequently offered vegetables are starches such as corn or potatoes, which are served in the form of French fries. Salad bars were noted as the next readily available source. Sandwiches, pasta dishes, and pizza are also counted as “mixed” vegetable sources (Stallings et al., 2010). Fruits are offered frequently, with canned fruit being more readily available. The most common fresh fruits offered are apples, oranges and bananas. Very few school menus offer any types of melon or berry. Fruit juice is also counted as a fruit source and is often the most consumed source of fruit at breakfast (Stallings et al., 2010). On a daily basis, 42% of schools have been found to not offer fresh fruits and vegetables as part of the government reimbursable NSLP meals. Whole grains offered separately are scarce and only five percent of grain products offered come from whole grains (Story, Nannary, & Schwartz, 2009). Most grain items offered at lunch are highly processed combination items in the form of pasta, sandwiches, or pizza. Corn or tortilla chips are credited as grain items in the NSLP, as is white rice (Condon, Crepinsek, & Fox, 2009). For breakfast, cereal, primarily sweetened, is the most available item. Pastry items, such as sweet rolls, doughnuts, and turnovers, are also frequently offered breakfast items (Gordon, Crepinsek, Briefel, & Clark, 2009).

Dietary fat intake is supposed to be less than 30% of an individual’s calories, though most children consume far more than the recommended amount (Gordon et al., 2009). While 1% milk is now offered more frequently than whole or 2% milk, the percentage of flavored 1% milk offered, such as chocolate, strawberry, or vanilla, has increased. Discretionary intake of fat far exceeds the recommended amount for all age groups. The largest contributors of fat are burgers, other fried foods, potatoes, chips, and pizza with meat, and are all staples of the standard school lunch menu (Stallings et al., 2010).
Competitive foods and sources. Competitive foods are foods offered in schools outside of the NSLP program, such as a la carte bars, vending machines, and school stores. Fund raisers including bake sales are another common source (Kakarala, Keast, & Hoerr, 2010). These foods are often low nutrition, energy dense foods such as cookies, cakes, chips, candy, high-sugar fruit drinks and soda (Story, Nannary, & Schwartz, 2009). High schools and middle schools are more likely to sell these foods than elementary schools. Per the USDA, these foods can not be sold in the cafeterias during meal times; however, they may be sold in any other area of the school at any time (Kakarala, Keast, & Hoerr, 2010). Vending machines are a particular problem. While the idea is rapidly becoming unpopular, some schools have contracted with fast food vendors, such as Taco Bell, and allowed them to sell their products on the school campus. This commercial fast food trend is being seen in many California high schools (Story, Nanney, & Schwartz, 2009). Competitive foods replace children’s already low intake of fruits and vegetables and increase fat and sugar consumption (Gordon et al., 2009).

Current guidelines for nutrition in schools. Currently, foods sold outside of the NSLP are not subject to USDA guidelines or regulations (S. Rep. No. 111-178, 2010). According to the regulations for the NSLP, program schools must meet minimal nutritional guidelines. Many states and school districts are implementing polices and standards that exceed the current NSLP guidelines for school meals, and competitive foods sold outside the school cafeteria and in vending machines (CDC Morbidity and Mortality Weekly Report [CDC, MMWR], 2009). Studies do show that if offered healthy food, such as fresh fruits and vegetables instead of low nutrition, energy-dense food, children will eat from the healthy food choices (Clark & Fox, 2009; Wang et al., 2010). The current NSLP nutrition standards are not even up to the USDA’s 2005 guidelines for nutrition as of 2010 (S. Rep. No. 111-178, 2010).
The problem of childhood obesity is severe and immediate action is needed. Rather than waiting for outcomes of ongoing studies to impact obesity, such as the 2010 SNDA it may be prudent to establish current interventions on best available evidence. The mechanisms for weight gain are well known, too much energy in versus too little energy expended. Nearly 40% of total calories consumed by children ages two to 18 years of age come in the form of empty calories (Committee on Progress in Preventing Childhood Obesity, 2007). About half of these empty calories are recognized to come from six main sources: soda, fruit drinks, dairy desserts, grain desserts, pizza, and whole milk; pizza, milk, grain desserts, and fruit drinks (Williams, 2010). For fat intake, the main contributors are, as previously noted, pizza, high-fat meats, dairy, fried food, fried potatoes; these are all items served frequently in school lunches (United States Department of Agriculture, 2010; Williams, 2010). Added sugar in meals comes in the form of soda, fruit juice, dairy desserts and sweetened cold cereal. These items are the number one source of added sugar for children ages two to eight years (Williams, 2010). Schools in the NSLP need to consider practices and guidelines for food offered on school campuses that are more in-line with the current evidence and the USDA’s 2010 Dietary Guidelines Report (DAG, 2010).

**Recommendations for Changes in School Foods**

Several recommendations are promoted in the literature. First, lower intake of sugar; remove added sugar to meals, fruit juice, and refined grain products, increase the amount of fresh fruit, not canned, and remove fruit juice as an alternative, as this is too easily consumed in large amounts and lacks the pulp for fiber (American Academy of Pediatrics: Committee on Nutrition, 2001). Second, increase consumption of green, orange and yellow vegetables. Third, a shift needs to be made to a more plant-based diet with whole grains, nuts, and seeds. Fourth, low-fat
milk and milk products, and moderate amounts of lean meats, poultry, and eggs; foods that combine sugar, solid fats, and refined grains, should be significantly reduced in schools (USDA, 2010). Currently the use of mixed sources, pasta, pizza, or starchy vegetables counting as servings of vegetables; fruit juice counting as servings of fruit; and tortilla chips, corn chips, white rice, sweetened cereal and pastries counting as serving of whole grains is problematic. This policy needs to be modified so these foods no longer count as servings of healthy food, and are not served in schools for meals, or snack items, either through the NSLP or other competitive sources (ADA, 2009). This alone would help schools follow the more current guidelines and dramatically decrease the consumption of sugar, solid fats and empty calories for children.

**Physical Activity Programs in Public Schools**

The benefits of regular physical activity are well known and documented. Exercise is considered a key factor in the treatment and prevention of obesity and overweight (Daley, Copeland, Wright, Roalfe, & Wales, 2006; Whitlock et al., 2010). Studies are also showing a positive link between increased vigorous physical activity and improved academic achievement (Donnelly et al., 2009). Yet, physical activity programs and participation rates for children remain low. According to the 2009 Youth Risk Behavior Surveillance (YRBS), only 34.7% of students across the age groups met the recommended levels of physical activity. The rates for participation in PE classes dropped as grade levels advanced, with 23% of children stating that they did not participate in any activity at all (CDC, National Center for Chronic Disease Prevention and Health Promotion, 2009). Many children report not attending PE classes offered (Zapata et al., 2008). This trend only increases with age. Yet, studies show that children who do participate tend to have lower BMIs (Zapata et al., 2008). The U.S. Department of Health and Human Services (2008) published guidelines for physical activity of children. They offered:
Children and adolescents should do 60 minutes or more of physical activity daily. Aerobic: Most of the 60 or more minutes a day should be either moderate or vigorous-intensity aerobic physical activity, and should include vigorous intensity physical activity at least 3 days a week. Muscle-strengthening: As part of their 60 or more minutes of daily physical activity, children and adolescents should include muscle-strengthening physical activity on at least 3 days of the week. Bone-strengthening: As part of their 60 or more minutes of daily physical activity, children and adolescents should include bone-strengthening physical activity on at least 3 days of the week. It is important to encourage young people to participate in physical activities that are appropriate for their age, that are enjoyable, and that offer variety (p.16).

Despite the extensive evidence and guidelines published, physical activity in public schools remains a low priority. There is no federal law requiring PE (Story et al., 2009). Additionally, many states are not required to offer recess to children. As with PE classes, recess becomes nonexistent as the grade levels advance (Barth, 2008; Peterson & Fox, 2009). Even when states do require PE classes, many permit substitution of other courses by students. The 2001 No Child Left Behind (NCLB) act has had a major impact on PE (Committee on Progress in Preventing Childhood Obesity, 2007). Schools that do not meet the NCLB test score standards are very likely to cut PE and recess time to focus on meeting the academic requirements. Low income urban schools, that serve the population most at risk, are more likely to eliminate PE and recess than rurally located schools (Barth, 2008). While the NCLB act insists on qualified teachers, PE teachers are exempt from this as PE is not a core subject (Story et al., 2009). This omission is vital as there is more to a PE program than simply encouraging children to perform exercises and run laps on a track (Burgerson, 2004). An integrated PE program will teach
children how to move safely and improve motor skills. It will create a safe, fun, and courteous environment for children to learn new skills, enjoy physical activity, and be challenged. A good quality program will enable children to be fit and provide the building blocks to maintain fitness for life (NASPPE & AHA, 2010). Physical education and the skills derived from this are just as important to successful academics as math and social studies. While there has been improvement in the number of states and districts mandating PE and recess for children, only 14 states require participation as part of a student’s grade point average (NASPPE & AHA, 2010). The percentage of children who engage in vigorous activity when they did participate in PE was found to be as low as nine percent (Peterson & Fox, 2007). Making PE a mandatory, graded part of school curriculum could substantially raise participation rates. The literature has identified that adding PE back to the curriculum does not negatively impact student academic performance. Similarly, taking away PE time and spending the additional time on academics does not improve academic performance (Story et al., 2009).

**Recommendations for Physical Activity**

It is essential that physical education be made a priority in schools if any impact is to be made in the current obesity epidemic. Studies have identified a link between academic achievement and fitness. Regular exercise may affect mood, help lift depression, decrease anxiety, and boost a child’s self esteem (Bagby & Adams, 2007; Burgeson, 2004; Chomitz et al., 2009). Education about the risks of obesity, discouraging sedentary behavior, and encouraging physical activity is wasted if children are not supported by their environment and given the opportunity to be physically active. It is suggested that schools attempt to have children meet the requirement of 60 minutes of physical activity daily. Meeting the requirement can be done in a multitude of ways, not just through PE classes. Desk-side activity, after school programs and
community sponsored programs may be utilized. One example of community programs may be an effort toward making neighborhoods safe for children to ride bikes to school. This is just one of the many ways activity can be integrated into children’s daily life (Bagby & Adams, 2007; Hollar et al., 2010b). PE class and participation should be weighted as part of a student’s grade point average like any other core subject. Qualifications for PE teachers should be held to the same standard as all other core subjects, with appropriate education and certifications. This will help improve the structure and the quality of PE classes (Bagby & Adams, 2007). Qualified instructors are necessary to make PE class time productive, safe, and fun for students (Burgeson, 2004). Time in PE class can be better utilized. Activities in PE class can be structured to include all students and have students participate according to their individual abilities, with a focus on vigorous activity rather than extended non active periods. Recess time for elementary students should be mandatory, and loss of recess time should not be part of discipline practices in the school (Barth, 2008).

Conclusion

Obesity prevention in school is a complex problem. Evidence suggests that it requires a complex multi-pronged approach to make an impact. Nutritional education, changes in food quality and macronutrient content, increased physical activity, as well as community and family support programs are all important pieces of a complex picture. For programs to succeed, however, evidence shows some very fundamental changes could go a long way in making a difference. Basic changes in nutritional guidelines and consistent offerings of quality, nutrient-dense foods, and no longer allowing “mixed sources” to count in nutritional guidelines, could make a big difference in obesity prevention. Bringing PE in schools up to the current recommendations, and making PE just as much a priority as math or other core subjects, has
been shown to not only improve physical fitness and BMI, but also has a positive impact on academic performance (Bagby & Adams, 2007; Burgeson, 2004; Caballero et al., 2003; Committee on Progress in Preventing Childhood Obesity, 2007; Daley et al., 2006). Community partnerships, such as having school children plant gardens and partnerships with local farmers, in addition to family support programs, also appear to be very valuable in this effort. These are interesting subjects for further exploration and research.

**Implications for Practice**

Nurses and health care providers have the opportunity to educate. Making parents and children aware of the current guidelines and laws regarding children’s nutrition and physical activity in schools can enable them to speak up, get involved, work for change, and be able to make informed decisions about health. It is essential that nurses and health care providers advocate for changes in nutritional guidelines and food quality served to children. Counseling families and advocating for physical activity in schools is vital. Furthermore, partnerships with organizations, communities, and school boards may help create sound policy. As leaders, nurses are in a position to advocate for change based on available current evidence. While not explored in this paper, there are many community programs and partnerships that may benefit from health care partnerships and more research.
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Position of the American Dietetic Association: Local Support for Nutrition Integrity in Schools


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