Part D. Chapter 4: Food Environment and Settings

INTRODUCTION

Few American children, adolescents or adults have dietary patterns that are consistent with the Dietary Guidelines for Americans. The reasons for this are numerous, as what people eat is influenced by many complex factors, as discussed in ***Part B. Chapter 2: 2015 DGAC Themes and Recommendations: Integrating the Evidence***. These factors span from individual levels of influence to dimensions of our environment. Improving dietary and lifestyle patterns and reducing diet-related chronic diseases, including obesity, will require actions at the individual behavioral and population and environmental levels. Behavioral strategies are needed to motivate and enhance the capacity of the individual to adopt and improve their lifestyle behaviors. Specific behavioral efforts related to eating and food[♦] and beverage choices include improving knowledge, attitudes, motivations, and food and cooking skills. Environmental change also is important because the environmental context and conditions affect what and how much people eat and what food choices are available. In addition, actions are needed to address the disparity gaps that currently exist in availability and access to healthy foods in low-income and rural communities.

Health and optimal nutrition and weight management cannot be achieved without a focus on the synergistic linkages and interactions between individuals and their environments, and understanding the different domains of food-related environmental influences. The social environment includes social networks and support systems, such as those provided by family, friends, and community cohesion. The physical environment includes the multiple settings where people obtain and consume food, such as their homes, work places, schools, restaurants, and grocery stores. The macro-environment operates within the broader society and includes food marketing, economic and price structures, food production and distribution systems, transportation, and agricultural practices and policies. Collectively, these environments influence what food choices we make, and where and how much we eat. Although personal responsibility is important, food choices are intertwined with and dependent on the community and environment context.

Interest is growing in the role of the environment in promoting or hindering healthy eating. Although it is up to individuals to decide what and how much they eat and drink, individual behavior to make healthy choices is enhanced when there is a supportive environment with accessible and affordable healthy choices. Thus, individual change is more likely to be facilitated and sustained if the environments within which food choices are made supports healthful options. As with other major public health issues, such as smoking reduction, injury prevention,

♦ Note: Throughout this chapter, references to "foods" should be taken to mean "foods and beverages."

and infectious disease prevention, greater success at the individual and population levels for reducing obesity and diet-related chronic diseases are not as likely to occur unless environmental influences are identified and modified.

Meaningful solutions to improve diet and health cannot only be focused just on individuals, or families but must take into account the need for environmental and policy change. Environmental and policy changes can have a sustaining effect on individual behavior change because they can become incorporated into organizational structures and systems, and lead to alterations in sociocultural and societal norms. Both policy and environmental changes also can help reduce disparities by improving access to and availability of healthy food in underserved neighborhoods and communities. Federal nutrition assistance programs, in particular, play a vital role in achieving this objective through access to affordable foods that help millions of Americans meet Dietary Guidelines recommendations.

The Nation's ultimate goal should be neighborhoods and communities where healthy, affordable food and beverages are available to everyone in the United States in multiple settings, where healthy foods rather than unhealthy foods are the likely choice (optimal default), where social norms embrace and support healthy eating, and where children grow up enjoying the taste of vegetables, fruits, whole grains, and nonfat or low-fat dairy products and water instead of energy-dense foods with low nutrient density and that are high in refined grains, saturated fats, sodium, and added sugars. So too, it is important that these behaviors can be sustained throughout the lifespan and in settings where adults and older adult populations work or are served and reside.

The questions asked and reviewed in this chapter address place-based environments that influence the foods that individuals, families and households obtain and consume, and on the community settings in which they spend much of their time. The DGAC considered several settings but prioritized four key settings to examine for this report: neighborhood and community food access; child care (early care and education); schools; and worksites. The Committee examined the relationship of these settings to diet quality and weight status. Because of the need to identify effective population-level strategies, the Committee focused specifically on reviewing the scientific literature to determine the impact of place-based obesity prevention and dietary interventions. Because of time demands, the Committee could not address other important settings, such as after-school settings, recreational settings, and faith-based institutions, as well as more macro-environmental influences such as food marketing and economic impacts. Despite the lack of time to examine these settings, the DGAC considers them to be very important environmental influencers on dietary intake.

LIST OF QUESTIONS

Food Access

1. What is the relationship between neighborhood and community access to food retail settings and individuals' dietary intake and quality?
2. What is the relationship between neighborhood and community access to food retail settings and weight status?

Early Care and Education

3. What is the impact of obesity prevention approaches in early care and education programs on the weight status of children ages 2 to 5 years?

Schools

4. What is the impact of school-based approaches on the dietary intake, quality, behaviors, and/or preference of school-aged children?
5. What is the impact of school-based policies on the dietary intake, quality, behaviors, and/or preferences of school-aged children?
6. What is the impact of school-based approaches on the weight status of school-aged children?
7. What is the impact of school-based policies on the weight status of school-aged children?

Worksite

8. What is the impact of worksite-based approaches on the dietary intake, quality, behaviors and/or preferences of employees?
9. What is the impact of worksite policies on the dietary intake, quality, behaviors and/or preferences of employees?
10. What is the impact of worksite-based approaches on the weight status of employees?
11. What is the impact of worksite policies on weight status of employees?

METHODOLOGY

Questions related to food access were answered using Nutrition Evidence Library (NEL) systematic reviews, while questions related to schools and worksites were answered using existing systematic reviews. The early care and education question was answered using an existing systematic review with a NEL systematic review update. Descriptions of the NEL process and the use of existing systematic reviews are provided in ***Part C: Methodology***. All NEL reviews were conducted in accordance with NEL methodology, and the DGAC made all substantive decisions required throughout the process to ensure that the most complete and relevant body of evidence was identified and evaluated to answer each question. All steps in the process were documented to ensure transparency and reproducibility. Specific information about individual systematic reviews can be found at www.NEL.gov, including the search strategy, inclusion and exclusion criteria, a complete list of included and excluded articles, and a detailed write-up describing the included studies and the body of evidence. Specific information about the use of existing systematic reviews, including the search strategy, inclusion and exclusion criteria, and a detailed write-up describing the included studies and the body of evidence can be found at www.DietaryGuidelines.gov. A link for each question is provided following each evidence review.

FOOD ACCESS

Understanding how access to nutritious and affordable food at various retail establishments--from convenience stores, to farmers markets, to large box stores--support individuals in their consumption of a high quality diet and ability to achieve a healthy body weight was the focus of the food access questions. Because the two food access questions are complementary, the DGAC choose to develop only one implication statement for both questions.

Question 1: What is the relationship between neighborhood and community access to food retail settings and individuals' dietary intake and quality?

Source of evidence: NEL systematic review

Conclusion

Emerging evidence suggests that the relationship between access to farmers' markets/produce stands and dietary intake and quality is favorable. The body of evidence regarding access to other food outlets, such as supermarkets, grocery stores, and convenience/corner stores, and dietary intake and quality is limited and inconsistent. **DGAC Grade: Grade not assignable**

Review of the Evidence

This systematic review included 18 studies published between 2007 and 2013, including 15 cross-sectional studies,[1-15] by independent investigators with sufficient sample sizes, 1 longitudinal study[16] and 2 controlled trials[17, 18] (one RCT and one non-randomized) examining the relationship between food access and dietary intake and/or quality.

The studies used multiple approaches to assess food access and dietary intake, quality, and variety. The majority of studies measured food access by the density of food outlets within a specified distance from a participant's residence and/or proximity to various food outlets. The majority of studies assessed dietary intake by focusing on vegetable and fruit consumption; diet quality and variety were predominantly determined by various validated diet indices including, but not limited to, the Healthy Eating Index (HEI).

Although food access was assessed across wide-ranging geographic, ethnic, racial, and income groups, due to the wide variation in methods used to determine food access, making comparisons across studies was challenging. Despite this variability, a consistent relationship was identified between farmers' markets/produce stands and dietary intake.[6, 15] Two cross-sectional studies found statistically significant, favorable associations between access to farmers' markets/produce stands and dietary intake (assessed by individual vegetable and fruit consumption) and diet variety and quality (both assessed by the HEI). Due to the variability of studies and paucity of data, no consistent associations regarding dietary outcomes and access to other food outlets were evident.

For additional details on this body of evidence, visit:
http://NEL.gov/conclusion.cfm?conclusion_statement_id=250425

Question 2: What is the relationship between neighborhood and community access to food retail settings and weight status?

Source of evidence: NEL systematic review

Conclusion

Limited but consistent evidence suggests that the relationship between access to convenience stores and weight status is unfavorable, with closer proximity and greater access being associated with significantly higher body mass index (BMI) and/or increased odds of overweight or obesity.
DGAC Grade: Limited

The body of evidence on access to other food outlets, such as supermarkets, grocery stores, and farmers' markets/produce stands, and weight status is limited and inconsistent. **DGAC Grade: Grade not assignable**

Review of the Evidence

This systematic review included 26 studies published between 2005 and 2013, including 19 cross-sectional studies[1, 6, 8, 14, 19-33] and 7 longitudinal studies[34-40] examining the relationship between food access and weight status.

The studies used multiple approaches to assess food access and measures of weight status. The majority of studies measured food access by the density of food outlets within a specified distance from a participant's residence and/or proximity to various food outlets. The primary weight status outcome was BMI, which was derived from height and weight.

Due to the wide variation in methods used to determine food access, making comparison across studies was challenging. Despite this variability, the relationship between convenience stores and weight status was consistent across the evidence. Seven studies[19, 23, 24, 26-28, 37] (six cross-sectional and one longitudinal) found statistically significant associations between access to convenience stores and BMI and/or increased odds of overweight or obesity. Five of these studies were completed in an adult sample; two assessed this relationship among children. Due to the variability of studies and paucity of data, no consistent associations regarding weight status and access to other food outlets were evident.

The evidence base included several studies of weaker design, mostly cross-sectional, by independent investigators with sufficient sample sizes. The findings across studies were inconsistent for all food outlet types, except for convenience stores, which were evaluated in only seven studies. Although food access was assessed across geographic, ethnic, racial and income groups, the variability in methodology made it difficult to compare studies.

For additional details on this body of evidence, visit:
http://NEL.gov/conclusion.cfm?conclusion_statement_id=250459

Implications for the Food Access Topic Area

For people to improve their diets and health, they need to have access to high quality and affordable healthy foods in environments where they live, work, learn, and/or play across the lifespan. Limited access to affordable and healthy food is a challenge, particularly for families living in rural areas and low-income communities. Innovative approaches to bring healthy food retail options into communities have proliferated, especially in underserved areas. These include creating financing programs to incentivize grocery store development; improving availability of

healthy food at corner stores and bodegas, farmers markets and mobile markets, shelters, food banks, community gardens/cooperatives, and youth-focused gardens; and creating new forms of wholesale distribution through food hubs. However, most of these approaches lack adequate evaluation. These and other promising equity-oriented efforts need to continue and be evaluated and then successfully scaled up to other communities.

To ensure healthy food access to everyone in the United States, action is needed across all levels—Federal, state, and local—to create private-public partnerships and business models, with the highest priority on those places with greatest need. Similar efforts are needed to reduce access to, and consumption of, calorie-dense, nutrient-poor foods and sugar-sweetened beverages in community settings. These efforts need to be seamlessly integrated with food assistance programs, such as food banks, soup kitchens, and Federal nutrition assistance programs, such as the Special Supplemental Program for Women, Infants and Children (WIC) and the Supplemental Nutrition Assistance Program (SNAP) and elder nutrition.

EARLY CARE AND EDUCATION

About one in five preschool children are overweight or obese,[41] and growing evidence indicates that preschoolers who are overweight or obese experience negative physical consequences, including cardio-metabolic abnormalities,[42] making evident the need for effective efforts to prevent excessive weight gain for this age group.

Question 3: What is the impact of obesity prevention approaches in early care and education programs on the weight status of children ages 2 to 5 years?

Source of evidence: Existing systematic review with a NEL systematic review update

Conclusion

Moderate evidence suggests that multi-component obesity prevention approaches implemented in child care settings improve weight-related outcomes in preschoolers. A combination of dietary and physical activity interventions is effective for preventing or slowing excess weight gain and reducing the proportion of young children ages 2 to 5 years who become overweight or obese.
DGAC Grade: Moderate

Implications

Existing evidence indicates that multi-component interventions that incorporate both nutrition and physical activity are effective in reducing excessive weight gain in preschool children. Successful strategies include: curricular enhancements of classroom education for children on

both nutrition education and physical activity, outreach engagement to parents about making positive changes in the home, improvements in the nutrition quality of meals and snacks served in the child care program, modifying food service practices, improving the mealtime environment, increasing physical activity play, reducing sedentary behaviors, and improving outdoor playground environments. Evidenced-based healthy eating and physical activity practices should be implemented in child care settings with training and technical assistance for staff. At the Federal, state, and local levels, policies are needed that create strong nutrition and physical activity standards and guidelines in child care settings. There is a need to strengthen policies at the Federal, state, and local levels for strong nutrition and physical activity standards and guidelines in child care settings.

It is important that child care facilities provide meals and snacks that are consistent with the meal patterns in the Federal Child and Adult Care Food Program (CACFP)[43] to ensure that young children have access to healthy meals and snacks and age-appropriate portions. Drinking water also needs to be readily available and accessible to children. Government agencies should ensure access to affordable, nutritious foods through CACFP and maximize participation in the program.

Review of the Evidence

This evidence portfolio included one existing systematic review from Zhou et al.[44] and a de novo NEL systematic review updating the evidence base. The Zhou et al. review included 15 controlled trials published between 2000 and 2012; the NEL review included seven studies[45-52] (eight publications) published between 2012 and 2014. Both reviews examined the impact of obesity prevention approaches on the weight status of children ages 2 to 5 years.

The studies used a variety of intervention strategies targeting behaviors that affect body weight. Most approaches were multi-component, with a combination of interventions targeting children, their parents, and/or staff of early care and education programs. The primary weight status outcomes of interest were BMI and BMI z-score.

The body of available evidence describes a large variation in excessive weight gain prevention approaches, making comparison across studies challenging. Despite this variability, multi-component interventions were effective in reducing BMI and preventing excess weight gain. Seven of 10 multi-component studies included in the Zhou et al. review demonstrated improvements in weight-related outcomes. Six of the seven interventions included in the NEL review demonstrated that multi-component interventions effectively reduce BMI or prevent excess weight gain in children ages 2 to 5 years.

The evidence base included several studies of strong design by independent investigators, specifically controlled trials, with sufficient sample sizes. Some inconsistency was evident across

studies and may be explained by differences in the populations sampled, outcome measures, duration or exposure of intervention, and follow-up periods. Although the majority of the studies included in the evidence portfolio effectively reduced BMI or prevented excess weight gain, the magnitude of the effect as well as the clinical and public health significance was difficult to assess because of the differences in measures and methodology.

For additional details on this body of evidence, visit: http://NEL.gov/topic.cfm?cat=3355

SCHOOLS

There are 49.6 million children aged 6-17 years in the United States, and the vast majority are educated in public or private school settings. School-based programs and policies at the local, state, and federal levels are cornerstones of food accessibility, availability, and consumption at schools, which underscore why this setting is a major determinant of nutritional intake and growth, development, and health of school-aged children. Because the schools questions are complementary, the DGAC choose to develop only one implication statement for the four questions.

Question 4: What is the impact of school-based approaches on the dietary intake, quality, behaviors, and/or preferences of school-aged children?

Source of evidence: Existing systematic reviews

Conclusion

Moderate evidence indicates that multi-component school-based approaches can increase daily vegetable and fruit consumption in children in grades kindergarten through 8th. Sufficient school-based studies have not been conducted with youth in grades 9 to 12. Vegetable and fruit consumption individually, as well as in combination, can be targeted with specific school-based approaches. **DGAC Grade: Moderate**

Review of the Evidence

This evidence portfolio included three systematic reviews;[53-55] two of which included meta-analyses,[53, 55] which collectively evaluated 75 studies published between 1985 and 2011. Forty-nine studies were conducted in the United States and the remaining studies were completed in other highly developed countries. The systematic reviews examined the impact of school-based approaches targeting the dietary intake, quality, behaviors and/or preferences of school-aged children.

The studies used a variety of intervention strategies. Some approaches were multi-component, with a combination of interventions targeting children, their parents, and/or the school environment. The primary dietary outcome of interest was vegetable and fruit intake.

In the body of available evidence, the school-based approaches were diverse, making comparison across studies challenging. Despite this variability, multi-component interventions, and in particular those that engaged both children and their families, were more effective than single-component interventions for eliciting significant dietary improvements. Broadly, school-based intervention programs moderately increased total daily vegetable and fruit intakes and fruit (with and without fruit juice) intake alone. Furthermore, results showed that school-based economic incentive programs can effectively increase vegetable and fruit consumption and reduce consumption of low-nutrient-dense foods while children are at school. Nutrition education programs that include gardening effectively increased the consumption of vegetables in school-aged children, along with small, but significant increases in fruit intake.

The evidence base included three reviews evaluating several studies by independent investigators with sufficient sample sizes. Some inconsistency was evident across studies and may be explained by differences in the populations sampled, outcome measures, duration or exposure of intervention and follow-up periods. Although findings indicated that school-based approaches effectively increased the combined intake of vegetable and fruit, the magnitude of the effect as well as the public health significance was difficult to assess because of differences in measures and methodology.

For additional details on this body of evidence, visit: Appendix E-2.29a and Appendix E-2.29b

Question 5: What is the impact of school-based policies on the dietary intake, quality, behaviors, and/or preferences of school-aged children?

Source of evidence: Existing systematic reviews

Conclusion

Strong evidence demonstrates that implementing school policies for nutrition standards to improve the availability, accessibility, and consumption of healthy foods and beverages sold outside the school meal programs (competitive foods and beverages) and (or) reducing or eliminating unhealthy foods and beverages are associated with improved purchasing behavior and result in higher quality dietary intake by children while at school. **DGAC Grade: Strong**

Review of the Evidence

This evidence portfolio includes two systematic reviews,[54, 56] which collectively evaluated 52 studies published between 1990 and 2013. Forty-one studies were conducted in the United States and the remaining studies were conducted in other highly-developed countries. The systematic reviews examined the impact of school policies, at the state and district levels, on dietary intake and behaviors.

The studies included a variety of policies, including economic incentives and both state and school-district policies, targeting behaviors related to dietary intake. The primary outcomes of interest were vegetable and fruit intakes and availability, purchasing, and consumption of competitive foods and beverages (CF&B).

In the body of available evidence, school policies were diverse, making comparison across studies challenging. Despite this variability, school-based policies targeting the availability of foods and beverages can positively influence the behaviors related to nutrition among children while they are at school. School-based economic incentive programs can effectively increase vegetable and fruit consumption and reduce consumption of low-nutrient-dense foods while children are at school. The implementation of school policies to change the availability and accessibility of healthier foods and beverages versus unhealthy CF&B is associated with the expected changes in consumption within the school setting. In addition, strong and consistent enforcement of more comprehensive policies to change the availability of healthier foods and beverages versus unhealthy CF&B at schools is associated with desired changes in consumption and purchasing within the school setting. Also, policies restricting the use of food as a reward for academic performance or as part of a fundraiser were associated with a reduction in using foods and beverages for these purposes.

The evidence base included two reviews evaluating several studies by independent investigators with sufficient sample sizes. Although findings indicated that school policies can effectively increase the combined intake of vegetables and fruits and/or decrease the availability, purchasing, and consumption of unhealthy CF&B, the magnitude of the effect as well as the public health significance is difficult to ascertain.

For additional details on this body of evidence, visit: Appendix E-2.30 and Appendix E-2.29b

Question 6: What is the impact of school-based approaches on the weight status of school-aged children?

Source of evidence: Existing systematic reviews

Conclusion

Moderate and generally consistent evidence indicates that multi-component school-based approaches have beneficial effects on weight status (BMI or BMI-z reduced on average by 0.15 kg/m2), especially for children ages 6 to 12 years. **DGAC Grade: Moderate**

The body of evidence regarding the impact of school-based approaches on weight status among adolescents is limited due to an insufficient number of studies. **DGAC Grade: Not Assignable**

Review of the Evidence

This evidence portfolio included two systematic reviews;[57, 58] one of which included a meta-analysis.[57] Collectively, 108 studies targeting children in school published before August 2012 were evaluated. Forty-nine studies were conducted in the United States and the remaining studies were completed in other highly developed countries. The systematic reviews examined the impact of school-based approaches targeting obesity prevention among school-aged children.

The studies used a variety of intervention strategies targeting behaviors related to dietary intake and/or physical activity. Some approaches were multi-component, with a combination of interventions targeting children, their parents, and/or the school environment. The primary outcomes of interest were BMI, changes in BMI, rate of weight gain, body fat percentage, waist circumference, skin fold thickness, and prevalence of overweight and obesity.

In the body of available evidence, the school-based approaches were diverse, making comparison across studies challenging. Despite this variability, school-based interventions significantly improved weight-related outcomes. Multi-component interventions, and in particular those implemented longer term (more than 6 months), were more effective than single-component and short-term (3 to 6 months) interventions. Evidence supporting the effectiveness of school-based interventions among children ages 6 to 12 years was robust, while findings among adolescents ages 13 to 18 years were weaker, but trended toward effectiveness.

The evidence base included two reviews evaluating several studies by independent investigators with sufficient sample sizes. Although findings indicated that school-based approaches effectively improve weight-related outcomes, in particular among children between the ages of 6 and 12 years, a high degree of heterogeneity means these findings should be interpreted cautiously. Although the magnitude of the effect was clinically meaningful, the public health significance was difficult to ascertain.

For additional details on this body of evidence, visit: Appendix E-2.31 and Appendix 2.29b

Question 7: What is the impact of school-based policies on the weight status of school-aged children?

Source of evidence: Existing systematic reviews

Conclusion

Although moderate evidence indicates that school policies improve dietary intake, limited evidence suggests that school policies targeting nutrition, alone and in combination with physical activity, may beneficially affect weight-related outcomes. **DGAC Grade: Limited**

Review of the Evidence

This evidence portfolio included two systematic reviews,[56, 59] which collectively evaluated 45 studies published between 2003 and 2013. Forty studies were conducted in the United States and the remaining studies were conducted in other highly developed countries. The systematic reviews examined the impact of school policies, at the state and district levels, on weight-related outcomes.

The studies included a variety of policies at the school, school-district, or state level, targeting behaviors related to dietary intake, alone and in combination with physical activity. The primary outcome of interest was BMI.

Limited research exists to systematically review and quantitatively evaluate the effect of school-based nutrition policies on the weight status of children. In addition, high heterogeneity among studies warrants caution when drawing conclusions from the results. In the body of available evidence, the findings related to the impact of school policies targeting nutrition and physical activity on weight outcomes were mixed. Even so, dietary policies related to the School Breakfast Program were associated with a lower BMI among students who participated in the program in comparison to students who did not participate. Overall, school-based, multi-component interventions including policy elements and policies and laws regarding the availability and accessibility of CF&B in schools warrant further research as ways to target childhood obesity.

The evidence base included two reviews evaluating several studies by independent investigators with sufficient sample sizes. However, most studies were of weaker design (i.e., cross-sectional) and findings were inconsistent.

For additional details on this body of evidence, visit: Appendix E-2.32 and Appendix E-2.29b

Implications for the Schools Topic Area

Existing evidence indicates that school-based programs designed to improve the food environment and support healthy behaviors may effectively promote improved dietary intake and weight status of school-aged children. Programs that emphasize multi-component, multi-dimensional approaches (including increased physical activity) are important to changing behavior and need to be reinforced within the home environment, as well as the community, including neighborhood food retail outlets that surround schools. Policies should strive to support effective programs that increase availability, accessibility, and consumption of healthy foods, while reducing less healthy CF&B. The combination of economic incentives along with specific policies can increase the likelihood that specific approaches will be effective.

The recently updated USDA nutrition standards for school meals, snacks, and beverages sold in schools will ensure that students throughout the United States will have healthier school meals and snack and beverage options, but schools need support and active engagement from students, parents, teachers, administrators, community members, and their districts and states to successfully implement and sustain them.

WORKSITES

Many workplaces are located in areas where food options are limited, which makes the workplace an important setting for approaches focused on dietary intake and environmental modifications. Because the worksite questions are complementary, the DGAC choose to develop only one implication statement for the four questions.

Question 8: What is the impact of worksite-based approaches on the dietary intake, quality, behaviors and/or preferences of employees?

Source of evidence: Existing systematic reviews

Conclusion

Moderate evidence indicates that multi-component worksite approaches can increase vegetable and fruit consumption of employees. **DGAC Grade: Moderate**

Review of the Evidence

This evidence portfolio includes two systematic reviews,[60, 61] which collectively evaluated 35 studies by independent investigators with sufficient sample sizes published before November 2012. The systematic reviews examined the impact of worksite-based approaches targeting the dietary intake, quality, behaviors, and/or preferences of employees.

The studies used a variety of intervention approaches targeting behaviors related to dietary intake; some were delivered in-person and others were delivered through the Internet. Some inconsistencies are evident across studies and may be explained by differences in the populations sampled and methodologies used, including the types and durations of intervention and follow-up periods. Some approaches were multi-component, with a combination of interventions targeting employees and/or the food environment at the worksite. The primary dietary outcome of interest was vegetable and fruit intake.

Among the body of evidence available, multi-component interventions, and in particular those that incorporated face-to-face contact and nutrition education, were more effective than single-component interventions for eliciting significant dietary improvements. Overall, worksite-based intervention programs moderately increase vegetable and fruit intakes, although the magnitude of the effect is difficult to assess. Nutrition education and internet-based programs appear to be promising approaches for eliciting desired dietary modifications when incorporated into multi-component interventions.

For additional details on this body of evidence, visit: Appendix E-2.33a and Appendix E-2.33b

Question 9: What is the impact of worksite-based policies on the dietary intake, quality, behaviors and/or preferences of employees?

Source of evidence: Existing systematic reviews

Conclusion

Moderate and consistent evidence indicates that worksite nutrition policies, alone and in combination with environmental changes and/or individual-level nutrition and health improvement strategies, can improve the dietary intake of employees. Multi-component interventions appear to be more effective than single-component interventions. **DGAC Grade: Moderate**

Review of the Evidence

This evidence portfolio includes one systematic review,[62] which evaluated 27 studies by independent investigators with sufficient sample sizes published between 1985 and 2010. The review examined the evidence for the effectiveness of a variety of worksite health promotion programs using environmental and/or policy changes either alone or in combination with health behavior change strategies focused on individual employees.

Some interventions were multi-component, with a combination of strategies targeting employees and/or the food environment at the worksite. Strategies included point-of-purchase labeling, increased availability of healthy food items, and/or educational programs and materials. The primary dietary outcome of interest was vegetable and fruit intake.

In the body of evidence available, the worksite-based policies were diverse, thus it was challenging to identify the most effective strategies. Despite this variability, multi-component interventions, and in particular those that targeted individual employees in addition to the environment, were more effective than single-component interventions for eliciting significant dietary improvements. Overall, worksite interventions moderately increased vegetable and fruit intakes.

Some inconsistency was evident across studies assessed for the systematic review in regards to scientific rigor and impact. The inconsistencies may be explained by differences in the populations sampled and methodologies used, including duration, exposure of the intervention, and follow-up periods. Although findings indicate that worksite policies increase consumption of vegetables and fruit, the magnitude of the effect was difficult to assess.

For additional details on this body of evidence, visit: Appendix E-2.34 and Appendix E-2.33b

Question 10: What is the impact of worksite-based approaches on the weight status of employees?

Source of evidence: Existing systematic reviews

Conclusion

Moderate and consistent evidence indicates that multi-component worksite approaches targeting physical activity and dietary behaviors favorably affect weight-related outcomes. **DGAC Grade: Moderate**

Review of the Evidence

This evidence portfolio includes two systematic reviews,[61, 63] one of which included meta-analyses.[63] The systematic reviews examined the impact of worksite-based approaches on the weight status of employees. Collectively, 70 studies published before November 2012 were evaluated.

The studies used a variety of intervention strategies targeting behaviors related to weight status; some were delivered in-person and others were delivered through the Internet. The primary outcomes of interest were body weight, BMI, and body fat percentage.

In the body of evidence available, multi-component interventions, and in particular those that incorporated face-to-face contact and targeted behaviors related to diet and physical activity, were more effective than single-component interventions for eliciting significant improvements in weight-related outcomes. Overall, worksite-based intervention programs significantly decreased body weight, BMI, and body fat percentage. Internet-based programs appeared to be promising approaches for eliciting behavior changes and improving related health outcomes.

The evidence base included two reviews evaluating several studies by independent investigators with sufficient sample sizes. Some inconsistencies were evident across studies and may be explained by differences in the populations sampled and methodologies, including duration or exposure of intervention and follow-up periods. Although findings indicated that worksite-based approaches effectively improve the weight status of employees, the magnitude of the effect was difficult to assess.

For additional details on this body of evidence, visit: Appendix E-2.35 and Appendix E-2.33b

Question 11: What is the impact of worksite-based policies on the weight status of employees?

Source of evidence: Existing systematic reviews

Conclusion

The body of evidence assessing the impact of worksite policies on the weight status of employees is very limited. **DGAC Grade: Not Assignable**

Review of the Evidence

This evidence portfolio included one systematic review,[62] which evaluated 27 studies published between 1985 and 2010. The review examined the evidence for the effectiveness of worksite health promotion programs using environmental and/or policy changes either alone or in combination with individually-focused health behavior change strategies.

The studies used a variety of policies targeting behaviors that can influence weight status. Some studies assessed the impact of policies (e.g., catering policies and company policies rewarding employees for healthy behaviors) combined with individual-level strategies. Some interventions were multi-component, with a combination of strategies targeting employees (e.g., point-of-choice messaging including nutrition information in cafeterias and reminders to use stairs) and/or the food environment at the worksite (e.g., increased availability of healthy food options). The health outcomes of interest included BMI, blood pressure, and cholesterol.

In the body of evidence available, worksite policies either alone or in combination with individually-focused health behavior change strategies did not affect the weight status of employees. However, interventions incorporating both environmental and individual strategies can lead to significant improvement in behaviors related to weight status (e.g., dietary intake). The lack of impact may be due to length of exposure or the duration of the follow-up period.

The evidence base included one review evaluating several studies by independent investigators with sufficient sample sizes. The studies were inconsistent in their scientific rigor. Due to the variability of studies and paucity of data, no consistent associations regarding worksite policies and the weight status of employees were evident.

For additional details on this body of evidence, visit: Appendix E-2.36 and Appendix E-2.33b

Implications for the Worksite Topic Area

Existing evidence indicates that worksite approaches focused on dietary intake can increase fruit and vegetable intakes of employees. Multi-component programs targeting nutrition education in combination with dietary modification interventions are found to be effective. Additionally, environmental modifications in conjunction with a variety of worksite policies targeting dietary modification, including point-of-purchase information, catering policies, and menu labeling are effective. Thus, these evidence-based strategies should be implemented in worksites through a variety of means, such as corporate wellness programs, food service policies, and health benefits programs. Programs should emphasize multi-component approaches targeting diet and physical activity while policies should support behavior changes associated with improving health outcomes such as increasing the availability of healthy foods within the workplace and encouraging more physical activity throughout the workday. Given that approximately 64 percent of adults are employed and spend an average of 34 hours per week at work, the workplace remains an important setting for environmental and behavioral interventions for health promotion and disease prevention.

CHAPTER SUMMARY

Environmental and policy approaches are needed to complement individual-based efforts to improve diet quality and reduce obesity and other diet-related chronic diseases. These approaches have the potential for broad and sustained impact at the population level. The DGAC focused on physical environments (settings) in which foods are available. Our aim was to better understand the impact of the food environment to promote or hinder diet quality healthy eating in these settings and to identify the most effective evidence-based diet-related approaches and policies to improve diet quality and weight status. The DGAC systematically reviewed and

graded the scientific evidence in these four settings, community food access, child care, schools and worksites, and their relationships to dietary quality and weight status.

The DGAC found moderate and promising evidence that multi-component obesity prevention approaches implemented in child care settings, schools, and worksites improve weight-related outcomes; strong to moderate evidence that school and worksite policies are associated with improved dietary intake; and moderate evidence that multi-component school-based and worksite approaches increase vegetable and fruit consumption. For the community food access questions addressing the relationship between food retail settings and dietary intake/quality and weight status the evidence was too limited or insufficient to assign grades. To reduce the disparity gaps that currently exist in low resource and underserved communities, more solution-oriented strategies need to be implemented and evaluated on ways to increase access to and procurement of healthy affordable foods, and also to reduce access to energy-dense, nutrient-poor foods.[64, 65] Although several innovative approaches are taking place now throughout the country, they generally lack adequate evaluation efforts.

One striking aspect of the Committee's findings was the power of multi-component interventions over single component interventions. For obesity prevention, effective multi-component interventions incorporated both nutrition and physical activity using a variety of strategies such as environmental policies to improve the availability and provision of healthy foods; increasing opportunities for physical activity, increased parent engagement; and educational approaches, such as a school nutrition curriculum. For multi-component dietary interventions (e.g., to increase consumption of vegetables and fruits) the most effective strategies included nutrition education, parent engagement, and environmental modifications (e.g., policies for nutrition standards, food service changes, point of purchase information).

The evidence reviewed in this chapter will inform and guide new multi-component individual and environmental and policy approaches in settings where people eat and procure their food to successfully target improvements in dietary intake and weight status. Collaborative partnerships and strategic efforts are needed to translate this evidence to action. Further work on restructuring the environment to facilitate healthy eating and physical activity, especially in high risk populations, is needed to advance evidence-based solutions that can be scaled up.

NEEDS FOR FUTURE RESEARCH

1. Develop more valid and reliable methods for measuring all aspects of the food environment, including the total food environment of communities. These methods can then be used to assess the impact of the food environment on community health as well as on economic development and growth.

Rationale: The food environment has become more complex, with more and more retail outlets selling food and beverages. Having valid and reliable methodologies for a variety of food environments and settings (tools and new analytical approaches) will allow more meaningful inquiry into the contributions of various settings in supporting or hindering nutritional health.

2. Identify, implement, evaluate, and scale up best practices (including private-public partnerships) for affordable and sustainable solutions to improving the food environment and increasing food access, especially in those environments of greatest need.

Rationale: The environments in which people live, work, learn, and play greatly influence their food intake. To best guide efforts to improve the food environment, research is needed to identify and evaluate best practices to direct available resources to new programs and scale up.

3. Identify, implement, accelerate, evaluate, and scale up programs that improve access to healthy food and that can be integrated seamlessly with Federal nutrition assistance programs, such as SNAP, WIC and elder nutrition.

Rationale: Federal nutrition assistance programs reach individuals and populations with the greatest health disparities. Identifying and evaluating initiatives that integrate improvements in the food environment with Federal programs will help ensure that Federal nutrition assistance programs have as great an impact as possible.

4. Conduct additional obesity prevention intervention research in child care settings (e.g., child-care centers, family child-care homes) to: 1) Identify the most potent components of the interventions and the optimal combinations for improving diet quality, physical activity, and weight outcomes; 2) Assess implementation and translation costs and benefits of the intervention, including impact, cost-effectiveness, generalizability and reach, sustainability and feasibility; 3) Develop and evaluate culturally appropriate and tailored interventions for preschool children in low-income and racial/ethnic communities, given the disproportionate impact of obesity in these groups; 4) Explore intervention strategies on how to use child care settings as access points to create linkages to parents, caretakers, and health care providers as partners in health promotion; 5) Evaluate the impact of Federal, state, and local policies, regulations, and support (e.g., provider training and technical assistance) for child care programs on the eating and physical activity practices and behaviors, and weight status of young children.

Rationale: Early care and education settings are an important venue for interventions targeting young children. A strong evidence base is essential to identify and support evidence-based practices and policies that can be implemented at Federal, state, and local levels and to mobilize efforts to improve healthy eating and physical activity, leading to

healthy weight development in these settings. Interventions found to effectively reduce risk of obesity in one setting need to be appropriately adapted for diverse groups and different settings.

5. Improve intervention research methods by the use of stronger study designs and the development of standardized assessments of body composition, weight status. Develop enhanced validated measures of diet quality, feeding and physical activity practices, and physical activity and eating behaviors and policies. Create standardized measures to assess the nutrition quality of meals and snacks in child care settings, as well as the food and physical activity environments. Create standardized methods for assessing the relationship of child care food, nutrition and physical activity-related measures to similar measures representing non-child care time are needed to provide greater consistency in determining the contributors to the development and progression of childhood overweight and obesity.

   Rationale: Although many of the studies included in these evidence reviews were methodologically strong and were controlled studies, some were limited by small sample size, lack of adequate control for confounding factors, and different outcome measures and different tools used to measure the outcome variables.

6. Examine the effect of the recommended Child and Adult Care Food Program (CACFP) through ongoing periodic evaluations and fill gaps in the knowledge regarding participation, demand, food procurement and practices, nutrient intake, and food security.

   Rationale: Improvements in school meals and the school food environment have been fostered by national data from periodic studies such as the USDA/FNS School Nutrition Dietary Assessment Studies (SNDA), the HHS/CDC School Health Policies and Practices Studies (SHPPS) and the HHS/NIH C.L.A.S.S. In contrast, considerably fewer periodic national studies are conducted of meals and dietary intake in child care settings and their relation to the child care food and physical activity environment.

7. Conduct new research to document the types and quantities of foods and beverages students consume both at school and daily outside of school, before, during, and after school-based healthy eating approaches and policies are implemented.

   Rationale: Effective school-based approaches and policies to improve the availability, accessibility, and consumption of healthy foods and beverages, and reduce competition from unhealthy offerings, are central to improving the weight status and health of children and adolescents. Accurate quantification of the types and quantities of foods and beverages the students consume before, during, and after approaches and policies are implemented is fundamental to assessing effectiveness. However, many of the studies included in the systematic reviews and meta-analyses used by the DGAC to address this issue did not comprehensively measure or report dietary information. Although the USDA/FNS-sponsored

School Nutrition Dietary Assessment (SNDA) series collects student dietary intake data every 10 years, the DGAC recommends more frequent and consistent data collection, especially before and periodically after implementation of school-based nutrition and physical activity policy and program changes.

8. Improve the quality of research studies designed to assess the effects of school-based approaches and policies on dietary behaviors and body weight control to reduce the risk of bias, with an emphasis on randomized controlled trials.

   Rationale: Although the methodological quality of the systematic reviews and meta-analyses used by the DGAC to evaluate school-based approaches and policies on dietary intake and body weight outcomes was high, the authors of these reviews commented that the scientific quality of individual studies was generally poor and the risk of bias high. Many of the studies were done using quasi-experimental (with or without control), pre-post intervention, or cross-sectional designs. Future research should prioritize using prospective, repeated measures, randomized controlled trial experimental designs, with randomization at the individual, classroom, school, or school district level. Pilot feasibility studies also may be helpful to quickly identify promising novel approaches to improve dietary intake and weight control outcomes.

9. Conduct post-program follow-up assessments lasting longer than 1 year to determine the long-term retention of the changed nutrition behaviors as well as the usefulness of continuing to offer the programs while children advance in school grade. Also, conduct research is needed in adolescents (grades 9-12).

   Rationale: Literature supports that eating and physical activity behaviors and body weight status of children predict changes over time as they progress into adolescence and adulthood. Ideally, improvements in dietary intake and weight status achieved due to a given school-based approach or policy would be sustained over time and progressive improvements would occur long-term. The vast majority of published research focuses on children in grades K-8, or ages 4-12 years, and new and improved data are needed on adolescents and the transition from childhood to adolescence.

10. Encourage a wider variety of school-based approaches and policies to develop and evaluate innovative approaches focused on increasing vegetable intakes.

    Rationale: Consumption of non-potato vegetables is below 2010 Dietary Guidelines for Americans recommendations in both children and adolescents. Published research indicates that school-based approaches and policies designed to increase vegetable and fruit intakes are generally more effective at increasing fruit intake, except for –school gardens and economic incentives, which increase vegetable intake among school-aged children. Some past public policies (e.g. the Basic 4) treated fruit and vegetables and as a single food group, which props

the need for new research that uses prospective, repeated measures, and randomized controlled trial experimental designs to specifically target increased consumption of healthy vegetables.

11. Conduct assessments of the effectiveness of worksite interventions that emphasize obesity prevention and weight control among workers across racially/ethnically diverse populations, blue and white collar employees, and at-risk populations. Scientifically rigorous studies (especially randomized controlled trials) addressing the long-term health impact of worksite-based approaches and policies that improve employee diet, physical activity, and body weight control would have public health relevance.

    Rationale: In light of the high rates of obesity and overweight, worksite interventions targeting obesity prevention and weight control through enhanced dietary behaviors and increased physical activity among workers is important. The majority of the studies to date have been conducted for relatively short periods of time, and the long-term impact of these approaches and policies may prove beneficial.

REFERENCES

1. Carroll-Scott A, Gilstad-Hayden K, Rosenthal L, Peters SM, McCaslin C, Joyce R, et al. Disentangling neighborhood contextual associations with child body mass index, diet, and physical activity: the role of built, socioeconomic, and social environments. Soc Sci Med. 2013;95:106-14. PMID: 23642646. http://www.ncbi.nlm.nih.gov/pubmed/23642646.
2. Caspi CE, Kawachi I, Subramanian SV, Adamkiewicz G, Sorensen G. The relationship between diet and perceived and objective access to supermarkets among low-income housing residents. Soc Sci Med. 2012;75(7):1254-62. PMID: 22727742. http://www.ncbi.nlm.nih.gov/pubmed/22727742.
3. Dean WR, Sharkey JR. Rural and urban differences in the associations between characteristics of the community food environment and fruit and vegetable intake. J Nutr Educ Behav. 2011;43(6):426-33. PMID: 21616721. http://www.ncbi.nlm.nih.gov/pubmed/21616721.
4. Ding D, Sallis JF, Norman GJ, Saelens BE, Harris SK, Kerr J, et al. Community food environment, home food environment, and fruit and vegetable intake of children and adolescents. J Nutr Educ Behav. 2012;44(6):634-8. PMID: 21531177. http://www.ncbi.nlm.nih.gov/pubmed/21531177.
5. Jago R, Baranowski T, Baranowski JC, Cullen KW, Thompson D. Distance to food stores & adolescent male fruit and vegetable consumption: mediation effects. Int J Behav Nutr Phys Act. 2007;4:35. PMID: 17850673. http://www.ncbi.nlm.nih.gov/pubmed/17850673.

6. Jilcott Pitts SB, Wu Q, McGuirt JT, Crawford TW, Keyserling TC, Ammerman AS. Associations between access to farmers' markets and supermarkets, shopping patterns, fruit and vegetable consumption and health indicators among women of reproductive age in eastern North Carolina, U.S.A. Public Health Nutr. 2013;16(11):1944-52. PMID: 23701901. http://www.ncbi.nlm.nih.gov/pubmed/23701901.
7. Sharkey JR, Johnson CM, Dean WR. Food access and perceptions of the community and household food environment as correlates of fruit and vegetable intake among rural seniors. BMC Geriatr. 2010;10:32. PMID: 20525208. http://www.ncbi.nlm.nih.gov/pubmed/20525208.
8. An R, Sturm R. School and residential neighborhood food environment and diet among California youth. Am J Prev Med. 2012;42(2):129-35. PMID: 22261208. http://www.ncbi.nlm.nih.gov/pubmed/22261208.
9. Jack D, Neckerman K, Schwartz-Soicher O, Lovasi GS, Quinn J, Richards C, et al. Socio-economic status, neighbourhood food environments and consumption of fruits and vegetables in New York City. Public Health Nutr. 2013;16:1197-205. PMID: 23388104. http://www.ncbi.nlm.nih.gov/pubmed/23388104.
10. Moore LV, Diez Roux AV, Nettleton JA, Jacobs DR, Jr. Associations of the local food environment with diet quality--a comparison of assessments based on surveys and geographic information systems: the multi-ethnic study of atherosclerosis. Am J Epidemiol. 2008;167(8):917-24. PMID: 18304960. http://www.ncbi.nlm.nih.gov/pubmed/18304960.
11. Ollberding NJ, Nigg CR, Geller KS, Horwath CC, Motl RW, Dishman RK. Food outlet accessibility and fruit and vegetable consumption. Am J Health Promot. 2012;26(6):366-70. PMID: 22747319. http://www.ncbi.nlm.nih.gov/pubmed/22747319.
12. Powell LM, Zhao Z, Wang Y. Food prices and fruit and vegetable consumption among young American adults. Health Place. 2009;15(4):1064-70. PMID: 19523869. http://www.ncbi.nlm.nih.gov/pubmed/19523869.
13. Zenk SN, Lachance LL, Schulz AJ, Mentz G, Kannan S, Ridella W. Neighborhood retail food environment and fruit and vegetable intake in a multiethnic urban population. Am J Health Promot. 2009;23(4):255-64. PMID: 19288847. http://www.ncbi.nlm.nih.gov/pubmed/19288847.
14. Laska MN, Hearst MO, Forsyth A, Pasch KE, Lytle L. Neighbourhood food environments: are they associated with adolescent dietary intake, food purchases and weight status? Public Health Nutr. 2010;13(11):1757-63. PMID: 20529405. http://www.ncbi.nlm.nih.gov/pubmed/20529405.
15. Gustafson A, Lewis S, Perkins S, Wilson C, Buckner E, Vail A. Neighbourhood and consumer food environment is associated with dietary intake among Supplemental Nutrition Assistance Program (SNAP) participants in Fayette County, Kentucky. Public Health Nutr. 2013;16(7):1229-37. PMID: 23462377. http://www.ncbi.nlm.nih.gov/pubmed/23462377.

16. Boone-Heinonen J, Gordon-Larsen P, Kiefe CI, Shikany JM, Lewis CE, Popkin BM. Fast food restaurants and food stores: longitudinal associations with diet in young to middle-aged adults: the CARDIA study. Arch Intern Med. 2011;171(13):1162-70. PMID: 21747011. http://www.ncbi.nlm.nih.gov/pubmed/21747011.
17. Gittelsohn J, Vijayadeva V, Davison N, Ramirez V, Cheung LW, Murphy S, et al. A food store intervention trial improves caregiver psychosocial factors and children's dietary intake in Hawaii. Obesity (Silver Spring). 2010;18 Suppl 1:S84-90. PMID: 20107467. http://www.ncbi.nlm.nih.gov/pubmed/20107467.
18. Gustafson AA, Sharkey J, Samuel-Hodge CD, Jones-Smith JC, Cai J, Ammerman AS. Food Store Environment Modifies Intervention Effect on Fruit and Vegetable Intake among Low-Income Women in North Carolina. J Nutr Metab. 2012;2012:932653. PMID: 22315676. http://www.ncbi.nlm.nih.gov/pubmed/22315676.
19. Morland K, Diez Roux AV, Wing S. Supermarkets, other food stores, and obesity: the atherosclerosis risk in communities study. Am J Prev Med. 2006;30(4):333-9. PMID: 16530621. http://www.ncbi.nlm.nih.gov/pubmed/16530621.
20. Drewnowski A, Aggarwal A, Hurvitz PM, Monsivais P, Moudon AV. Obesity and supermarket access: proximity or price? Am J Public Health. 2012;102(8):e74-80. PMID: 22698052. http://www.ncbi.nlm.nih.gov/pubmed/22698052.
21. Fiechtner L, Block J, Duncan DT, Gillman MW, Gortmaker SL, Melly SJ, et al. Proximity to supermarkets associated with higher body mass index among overweight and obese preschool-age children. Prev Med. 2013;56(3-4):218-21. PMID: 23219681. http://www.ncbi.nlm.nih.gov/pubmed/23219681.
22. Liu GC, Wilson JS, Qi R, Ying J. Green neighborhoods, food retail and childhood overweight: differences by population density. Am J Health Promot. 2007;21(4 Suppl):317-25. PMID: 17465177. http://www.ncbi.nlm.nih.gov/pubmed/17465177.
23. Ahern M, Brown C, Dukas S. A national study of the association between food environments and county-level health outcomes. J Rural Health. 2011;27(4):367-79. PMID: 21967380. http://www.ncbi.nlm.nih.gov/pubmed/21967380.
24. Bodor JN, Rice JC, Farley TA, Swalm CM, Rose D. The association between obesity and urban food environments. J Urban Health. 2010;87(5):771-81. PMID: 20458548. http://www.ncbi.nlm.nih.gov/pubmed/20458548.
25. Brown AF, Vargas RB, Ang A, Pebley AR. The neighborhood food resource environment and the health of residents with chronic conditions: the food resource environment and the health of residents. J Gen Intern Med. 2008;23(8):1137-44. PMID: 18483833. http://www.ncbi.nlm.nih.gov/pubmed/18483833
26. Ford PB, Dzewaltowski DA. Limited supermarket availability is not associated with obesity risk among participants in the Kansas WIC Program. Obesity (Silver Spring). 2010;18(10):1944-51. PMID: 20057363. http://www.ncbi.nlm.nih.gov/pubmed/20057363.

27. Galvez MP, Hong L, Choi E, Liao L, Godbold J, Brenner B. Childhood obesity and neighborhood food-store availability in an inner-city community. Acad Pediatr. 2009;9:339-43. PMID: 19560992. http://www.ncbi.nlm.nih.gov/pubmed/19560992.
28. Morland KB, Evenson KR. Obesity prevalence and the local food environment. Health Place. 2009;15(2):491-5. PMID: 19022700. http://www.ncbi.nlm.nih.gov/pubmed/19022700.
29. Rundle A, Neckerman KM, Freeman L, Lovasi GS, Purciel M, Quinn J, et al. Neighborhood food environment and walkability predict obesity in New York City. Environ Health Perspect. 2009;117(3):442-7. PMID: 19337520. http://www.ncbi.nlm.nih.gov/pubmed/19337520.
30. Salois MJ. Obesity and diabetes, the built environment, and the 'local' food economy in the United States, 2007. Econ Hum Biol. 2012;10(1):35-42. PMID: 21561816. http://www.ncbi.nlm.nih.gov/pubmed/21561816.
31. Stark JH, Neckerman K, Lovasi GS, Konty K, Quinn J, Arno P, et al. Neighbourhood food environments and body mass index among New York City adults. J Epidemiol Community Health. 2013;67(9):736-42. PMID: 23851151. http://www.ncbi.nlm.nih.gov/pubmed/23851151.
32. Viola D, Arno PS, Maroko AR, Schechter CB, Sohler N, Rundle A, et al. Overweight and obesity: can we reconcile evidence about supermarkets and fast food retailers for public health policy? J Public Health Policy. 2013;34(3):424-38. PMID: 23719294. http://www.ncbi.nlm.nih.gov/pubmed/23719294.
33. Wang MC, Kim S, Gonzalez AA, MacLeod KE, Winkleby MA. Socioeconomic and food-related physical characteristics of the neighbourhood environment are associated with body mass index. J Epidemiol Community Health. 2007;61:491-8. PMID: 17496257. http://www.ncbi.nlm.nih.gov/pubmed/17496257.
34. Block JP, Christakis NA, O'Malley AJ, Subramanian SV. Proximity to food establishments and body mass index in the Framingham Heart Study offspring cohort over 30 years. Am J Epidemiol. 2011;174(10):1108-14. PMID: 21965186. http://www.ncbi.nlm.nih.gov/pubmed/21965186.
35. Gibson DM. The neighborhood food environment and adult weight status: estimates from longitudinal data. Am J Public Health. 2011;101(1):71-8. PMID: 21088263. http://www.ncbi.nlm.nih.gov/pubmed/21088263.
36. Lee H. The role of local food availability in explaining obesity risk among young school-aged children. Soc Sci Med. 2012;74(8):1193-203. PMID: 22381683. http://www.ncbi.nlm.nih.gov/pubmed/22381683.
37. Leung CW, Laraia BA, Kelly M, Nickleach D, Adler NE, Kushi LH, et al. The influence of neighborhood food stores on change in young girls' body mass index. Am J Prev Med. 2011;41(1):43-51. PMID: 21665062. http://www.ncbi.nlm.nih.gov/pubmed/21665062.

38. Rossen LM, Curriero FC, Cooley-Strickland M, Pollack KM. Food availability en route to school and anthropometric change in urban children. J Urban Health. 2013;90(4):653-66. PMID: 23392564. http://www.ncbi.nlm.nih.gov/pubmed/23392564.
39. Shier V, An R, Sturm R. Is there a robust relationship between neighbourhood food environment and childhood obesity in the USA? Public Health. 2012;126(9):723-30. PMID: 22898435. http://www.ncbi.nlm.nih.gov/pubmed/22898435.
40. Sturm R, Datar A. Body mass index in elementary school children, metropolitan area food prices and food outlet density. Public Health. 2005;119(12):1059-68. PMID: 16140349. http://www.ncbi.nlm.nih.gov/pubmed/16140349.
41. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. JAMA. 2014;311(8):806-14. PMID: 24570244. http://www.ncbi.nlm.nih.gov/pubmed/24570244.
42. Shashaj B, Bedogni G, Graziani MP, Tozzi AE, DiCorpo ML, Morano D, et al. Origin of cardiovascular risk in overweight preschool children: a cohort study of cardiometabolic risk factors at the onset of obesity. JAMA Pediatr. 2014;168(10):917-24. PMID: 25111132. http://www.ncbi.nlm.nih.gov/pubmed/25111132.
43. Institute of Medicine. Child and Adult Care Food Program: Aligning Dietary Guidance for All. 2011. Washington, DC: National Academies Press. Available from: http://books.nap.edu/openbook.php?record_id=12959&page=R2.
44. Zhou YE, Emerson JS, Levine RS, Kihlberg CJ, Hull PC. Childhood obesity prevention interventions in childcare settings: systematic review of randomized and nonrandomized controlled trials. Am J Health Promot. 2014;28(4):e92-103. PMID: 24200332. http://www.ncbi.nlm.nih.gov/pubmed/24200332.
45. Alkon A, Crowley AA, Neelon SE, Hill S, Pan Y, Nguyen V, et al. Nutrition and physical activity randomized control trial in child care centers improves knowledge, policies, and children's body mass index. BMC Public Health. 2014;14(1):215. PMID: 24580983. http://www.ncbi.nlm.nih.gov/pubmed/24580983.
46. Cespedes J, Briceno G, Farkouh ME, Vedanthan R, Baxter J, Leal M, et al. Promotion of cardiovascular health in preschool children: 36-month cohort follow-up. Am J Med. 2013;126(12):1122-6. PMID: 24262725. http://www.ncbi.nlm.nih.gov/pubmed/24262725.
47. Cespedes J, Briceno G, Farkouh ME, Vedanthan R, Baxter J, Leal M, et al. Targeting preschool children to promote cardiovascular health: cluster randomized trial. Am J Med. 2013;126(1):27-35.e3. PMID: 23062403. http://www.ncbi.nlm.nih.gov/pubmed/23062403.
48. De Bock F, Breitenstein L, Fischer JE. Positive impact of a pre-school-based nutritional intervention on children's fruit and vegetable intake: results of a cluster-randomized trial. Public Health Nutr. 2012;15(3):466-75. PMID: 21859516. http://www.ncbi.nlm.nih.gov/pubmed/21859516.

49. De Coen V, De Bourdeaudhuij I, Vereecken C, Verbestel V, Haerens L, Huybrechts I, et al. Effects of a 2-year healthy eating and physical activity intervention for 3-6-year-olds in communities of high and low socio-economic status: the POP (Prevention of Overweight among Pre-school and school children) project. Public Health Nutr. 2012;15(9):1737-45. PMID: 22397833. http://www.ncbi.nlm.nih.gov/pubmed/22397833.
50. Herman A, Nelson BB, Teutsch C, Chung PJ. "Eat Healthy, Stay Active!": a coordinated intervention to improve nutrition and physical activity among Head Start parents, staff, and children. Am J Health Promot. 2012;27(1):e27-36. PMID: 22950932. http://www.ncbi.nlm.nih.gov/pubmed/22950932.
51. Natale RA, Lopez-Mitnik G, Uhlhorn SB, Asfour L, Messiah SE. Effect of a Child Care Center-Based Obesity Prevention Program on Body Mass Index and Nutrition Practices Among Preschool-Aged Children. Health Promot Pract. 2014. PMID: 24662896. http://www.ncbi.nlm.nih.gov/pubmed/24662896.
52. Yin Z, Parra-Medina D, Cordova A, He M, Trummer V, Sosa E, et al. Miranos! Look at us, we are healthy! An environmental approach to early childhood obesity prevention. Child Obes. 2012;8(5):429-39. PMID: 23061498. http://www.ncbi.nlm.nih.gov/pubmed/23061498http://online.liebertpub.com/doi/pdfplus/10.1089/chi.2011.0125.
53. Evans CE, Christian MS, Cleghorn CL, Greenwood DC, Cade JE. Systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5 to 12 y. Am J Clin Nutr. 2012;96(4):889-901. PMID: 22952187. http://www.ncbi.nlm.nih.gov/pubmed/22952187.
54. Jensen JD, Hartmann H, de Mul A, Schuit A, Brug J, Consortium E. Economic incentives and nutritional behavior of children in the school setting: a systematic review. Nutr Rev. 2011;69(11):660-74. PMID: 22029832. http://www.ncbi.nlm.nih.gov/pubmed/22029832.
55. Langellotto G GA. Gardening Increases Vegetable Consumption in School-aged Children: A Meta-analytical Synthesis. HortTechnology. 2012;22(4):430-45. http://horttech.ashspublications.org/content/22/4/430.abstract.
56. Chriqui JF, Pickel M, Story M. Influence of school competitive food and beverage policies on obesity, consumption, and availability: a systematic review. JAMA Pediatr. 2014;168(3):279-86. PMID: 24473632. http://www.ncbi.nlm.nih.gov/pubmed/24473632.
57. Waters E, de Silva-Sanigorski A, Hall BJ, Brown T, Campbell KJ, Gao Y, et al. Interventions for preventing obesity in children. Cochrane Database Syst Rev. 2011(12):CD001871. PMID: 22161367. http://www.ncbi.nlm.nih.gov/pubmed/22161367.
58. Wang Y WY, Wilson RF, Bleich S, Cheskin L, Weston C, Showell N, Fawole O, Lau B, Segal J, . Childhood obesity prevention programs: comparative effectiveness review and meta-analysis. Comparative effectiveness review No. 115. AHRQ Publication No. 13-EHC081-EF [Internet]. June 2013. Available from: http://www.ncbi.nlm.nih.gov/pubmedhealth/PMH0057623/pdf/TOC.pdf.

59. Williams AJ, Henley WE, Williams CA, Hurst AJ, Logan S, Wyatt KM. Systematic review and meta-analysis of the association between childhood overweight and obesity and primary school diet and physical activity policies. Int J Behav Nutr Phys Act. 2013;10:101. PMID: 23965018. http://www.ncbi.nlm.nih.gov/pubmed/23965018.
60. Geaney F, Kelly C, Greiner BA, Harrington JM, Perry IJ, Beirne P. The effectiveness of workplace dietary modification interventions: a systematic review. Prev Med. 2013;57(5):438-47. PMID: 23850518. http://www.ncbi.nlm.nih.gov/pubmed/23850518.
61. Aneni EC, Roberson LL, Maziak W, Agatston AS, Feldman T, Rouseff M, et al. A systematic review of internet-based worksite wellness approaches for cardiovascular disease risk management: outcomes, challenges & opportunities. PLoS One. 2014;9(1):e83594. PMID: 24421894. http://www.ncbi.nlm.nih.gov/pubmed/24421894.
62. Kahn-Marshall JL, Gallant MP. Making healthy behaviors the easy choice for employees: a review of the literature on environmental and policy changes in worksite health promotion. Health Educ Behav. 2012;39(6):752-76. PMID: 22872583. http://www.ncbi.nlm.nih.gov/pubmed/22872583.
63. Verweij LM, Coffeng J, van Mechelen W, Proper KI. Meta-analyses of workplace physical activity and dietary behaviour interventions on weight outcomes. Obes Rev. 2011;12(6):406-29. PMID: 20546142. http://www.ncbi.nlm.nih.gov/pubmed/20546142.
64. Bell J, Mora G, Hagan E, Rubin V, Karpyn A. Access to Healthy Food and Why It Matters: a Review of the Research. Oakland CA: PolicyLink. The Food Trust; 2013. Available from: http://thefoodtrust.org/uploads/media_items/access-to-healthy-food.original.pdf.
65. Treuhaft S, Karpyn A. The Grocery Gap: Who Has Access to Healthy Food and Why It Matters. Oakland, CA: PolicyLink. The Food Trust,; 2010. Available from: http://thefoodtrust.org/uploads/media_items/grocerygap.original.pdf.