1-12-2015

Evaluating Obesity Prevention Efforts: What Have We Learned? Highlights from a Conversation of Funders and Evaluators

Sumner M. Redstone Global Center for Prevention and Wellness

Evaluating Obesity Prevention Efforts: What Have We Learned?

Highlights From a Conversation of Funders and Evaluators

January 12, 2015

Oakland, CA

July 2015

Table of Contents

Executive Summary i

Introduction 1

State of the Obesity Epidemic 4

The Community Context for Interventions and Evaluations 5

Investments to Date: Where Is the Strongest Agreement About What Works? 7

- Early Care and Education Environments 10
- Schools/Learning Environments 12
- Parks, Trails, Open Spaces, and Recreation 14
- Land Use and Transportation 15

The Next Tier: Mixed or Promising Results for Healthy Food Retail Interventions 17

Implementing Interventions: The Crucial Role of "How" 18

Other Topics 19

Summary and Next Steps 22

Appendix A: Citations and Resources for Key Elements/Components 24

Preamble

On January 12, 2015 evaluators from the California Endowment, Kaiser Permanente, Nemours, the Robert Wood Johnson Foundation, and the W.K. Kellogg Foundation met in Oakland, California to discuss what was working with their initiatives to reduce the prevalence of childhood obesity. The discussion focused on a variety of interventions in early care and education, schools, communities, and food systems. The findings reported here are limited to the information that was shared at that meeting, and add to the evidence base for strategies for the prevention and control of childhood obesity. However, the Proceedings do not represent a consensus document, but are rather the beginning of a broader conversation among those individuals and groups interested in the prevention and control of childhood obesity.

Executive Summary

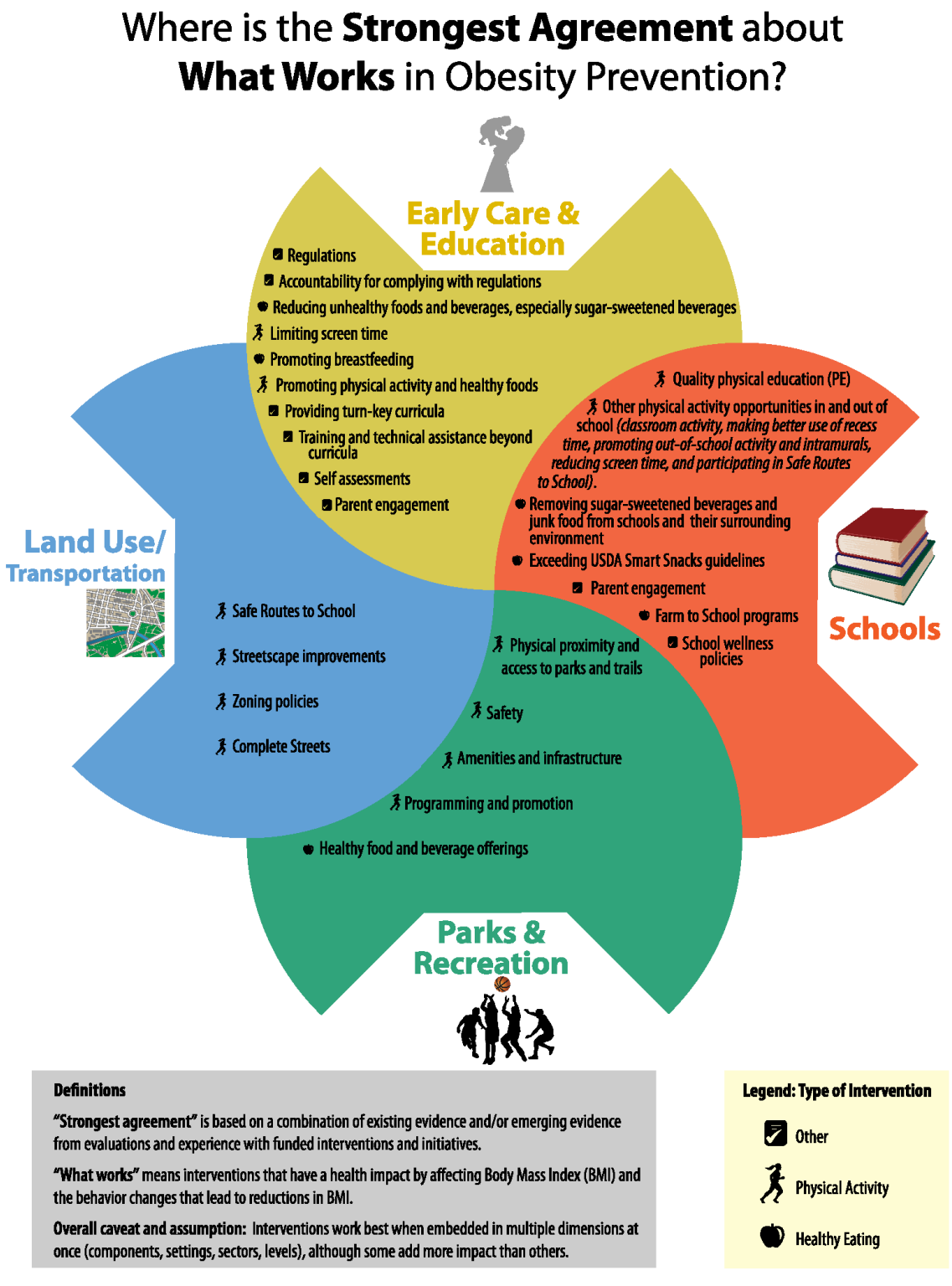
The alarm buzzes and a tired young mother hits the snooze button. She wants to set a healthy example for her children and take a walk with them before school, but life keeps getting in the way. The neighborhood streets outside her apartment don't feel very safe walking with her kids or a friend, much less alone. Her kids clamor for fast food, and she doesn't have the heart to deny them — especially when she enjoys it, too, and it's cheap, convenient after a long day serving other people their meals at the restaurant where she works, and there are so many fast food restaurants close-by in the neighborhood. After work, when her kids starting getting rowdy because they've been inside all day, she would love to push them out the door to the park, but the park is not a safe place for her children, and she doesn't get home until after dark. Next week, next month, when it's a little warmer and it gets light earlier — maybe that's when they'll start walking in the mornings before work and school, or hanging out in the evenings . . .

This scenario could describe millions of people whose New Year's resolutions to eat better and move more fizzle by mid-January. But for those with low incomes, who live in neglected neighborhoods, and whose communities offer few of the options that put healthier choices within reach, these obstacles are profound and feel almost insurmountable. They are not solely a function of willpower; instead, they reflect long-standing inequities and disparities that play out in social, economic, and health trends — and are particularly glaring in the obesity epidemic.

At a recent gathering of funders and evaluators to assess a decade's worth of obesity prevention initiatives, the question before them was, "What have we learned about what works — and what falls short?" If we consider the obesity epidemic through the lens of equity, we also have to ask, "What have we learned about what works in communities that are disproportionally affected by the epidemic— Latinos, African Americans, and Native Americans?" We also need to take into consideration that many communities with high rates of obesity and other chronic diseases see the obesity epidemic as an indicator of limited opportunities and related structural issues that require social change approaches. Work that addresses the underlying conditions must be included in framing and understanding the issue.

Meeting participants considered the broader question about what we have learned, while also noting its equity implications. Time didn't allow for comprehensive explorations of every topic, but the group was able to identify a set of interventions in different settings for which there is strong agreement about what works — albeit with many caveats. First and foremost among the many caveats is that no intervention works in isolation; effectiveness is a function of interventions that are multi-component, multi-setting, multi-sector, and multi-level (or multi-dimensional, for short). Place matters and approaches need to be relevant. The corollary is that solo interventions — such as school gardens, media campaigns, and educational programs — are likely to be less effective and less sustainable than comprehensive approaches. Another important caveat is that evaluation methods and results are evolving rapidly, offering the

tantalizing possibility that more definitive answers to the question of what works (and for whom) will be available soon.



Caveats notwithstanding, here's what we know at this moment in time about what works. We know that interventions geared to "captive" audiences — children in early care and education settings, students in elementary and middle schools (and, to some degree, high schools) have a higher likelihood of success because they have more control over food consumption and activity levels. They also reach kids over a protracted period — up to 15 years from preschool through high school — and they do this at a time when life habits are being formed. In the language of intervention dose, these interventions have the potential to increase the reach (number of lives touched) and strength (effect size) of interventions, compared to those more widely diffused into a community setting.

Compared to early childhood and school settings, communities present more formidable challenges to implementing, evaluating, and demonstrating population health impacts at a detectable scale. Still, communities play a crucial role in reinforcing the messages, desired behaviors, and norms that ultimately lead to changes in the prevalence of obesity. Other aspects of the community context — a community's capacity, how it can be strengthened, the degree of community empowerment, engagement and demand for interventions — influence the success of obesity prevention interventions and are important outcomes in their own right. The same is true of policy and environmental changes that support implementation and sustainability.

In addition to what works, the group considered interventions that are promising or for which there are mixed results. These interventions included the many efforts to influence retailing of healthier foods.

Finally, participants considered the crucial role of implementation in the success of interventions. Specific topics included the concept of dose or other ways to apply a systems perspective to the design of complementary intervention strategies, as well as the crucial role of tailored training and technical assistance in achieving effective implementation. Participants also discussed how to determine and gauge intermediate outcomes, building and tracking community capacity (among both residents and agencies/organizations), and identifying the role of sustainable sources of revenue in supporting and sustaining obesity prevention interventions.

For the funders represented at this January 2015 meeting, immediate next steps include trying to establish agreement on the best investments, using this particular conversation as a starting point for sharing, informing, and influencing future funding directions. These conversations reflect an alignment of effort and shared purpose that is replicated in partnerships across the country. Partnerships create cohesion and facilitate alignment among stakeholders and implementation strategies, which in turn helps mobilize support for policy and system changes that affect both implementation and sustainability.

This report reflects the group's commitment to capture these conversations as they unfold. We hope this guidance will be useful to others as we consider what has worked, which investments have demonstrated the biggest health impacts so far, and how we can best build on these successes to act on the most promising opportunities before us. By sharing what we've learned, we hope to stimulate even more creative, strategic thinking about where these investments can and should make a difference in our shared goal of all having an equal opportunity to live the healthiest life possible, in the healthiest community — regardless of where that may be.

Introduction

At a recent gathering of funders and their evaluation teams to consider a decade's worth of obesity prevention initiatives, the question before them was, "What have we learned about what works — and what doesn't?" Inspired in part by recent plateaus and decreases in the obesity epidemic, evaluators and funders have been asking themselves this question informally for some time, pondering what it might take to accelerate progress even more.

This document captures highlights from a day's worth of discussions exploring this question. Its main audience is the funders of obesity prevention initiatives — those whose initiatives and evaluations were highlighted during this particular conversation. We also hope the discussions and implications will be of interest to colleagues in the field, sparking similar discussions in many other venues.

This summary is not a complete proceedings document; instead, it provides highlights of discussions in several major categories. These are:

- the current state of the obesity epidemic;
- the community context for obesity prevention interventions and evaluations;
- interventions for which there is the strongest agreement about what works in terms of BMI reduction;
- the next tier — interventions with promising or mixed results;
- implementation issues; and
- other topics that the group believed were important, but did not have an opportunity to discuss in detail.

Caveats

The goal of sifting through a decade's worth of interventions and evaluation findings in one day of spirited conversation was ambitious, even with some advance preparation by presenters. The gathering provided a welcome and rare opportunity to share what has been learned and to try to make sense of many different strands of work and insight, but it was far from comprehensive. The highlights presented here are part of an ongoing conversation — one that we hope will continue while advancing this important work, on both the implementation and evaluation fronts.

Likewise, although citations are provided in Appendices for reference, they are not based on formal literature reviews or meta-analyses. Findings here are limited to the information shared and are in no way meant to be definitive.

Finally, to encourage candor in a discussion focused on what has (and has not) worked in terms of BMI reduction, participants were assured that their

observations during the meeting would not be shared in ways that could be attributed to individuals or organizations.

Charge to the Group

The question posed to funders and evaluators — "What have we learned about what works in obesity prevention initiatives, and what doesn't?" — is a surprisingly difficult question to answer, despite major investments in both conducting and evaluating a decade's worth of obesity prevention initiatives.

Some of the complexity stems from the nature of these initiatives, many of which try to achieve population-based scale by focusing on a particular geographic place, be it a neighborhood, census tract, state, or region. As obesity prevention and other initiatives have evolved, they have augmented programs targeting individual behavior change with efforts to shape the policies, environments and systems that have the potential to make the healthy choice the easy choice. All of these characteristics — changes in population health, place-based work, and shifts in policies, environments, and systems — make ambitious obesity prevention initiatives challenging to implement and assess.

The results of evaluations of obesity prevention initiatives gradually filter into the published research literature, research conference presentations, and compilations of carefully vetted recommendations such as the Guide to Community Preventive Services. However, funders have ongoing investments that require decisions now. While waiting for a fuller and more complete evidence base to emerge, what can we say to funders about the current level of evidence, informed by experience from the field, that complements the more in-depth reviews currently underway? The widely varying scope and forms of obesity prevention initiatives exemplify the iterative relationship between evolving practice and the evidence base that emanates from it. As Larry Green has asked in many evaluation and practice forums, "To advance our evidence-based practice, can you help us get more practice-based evidence?"[1]

To begin exploring the question of "What works?" more systematically and cohesively, a group of evaluators and funders of major place-based obesity prevention initiatives gathered in Oakland, California on January 12, 2015. They included representatives of these funders and their evaluation teams:

- The California Endowment (TCE)
- Centers for Disease Control and Prevention (CDC)
- Kaiser Permanente (KP)
- Nemours Children's Health System

[1] Green LW. Public Health Asks of Systems Science: To Advance Our Evidence-Based Practice, Can You Help Us Get More Practice-Based Evidence? *Am J Public Health.* 2006 March; 96(3): 406–409.

- Robert Wood Johnson Foundation (RWJF)
- W. K. Kellogg Foundation

Each of these funders brings to obesity prevention initiatives shared overall goals: to have an impact on health and wellbeing at the population health and systems levels, build equity, reduce disparities, and reverse and ultimately solve the obesity epidemic. Each funder also has different philosophies, approaches, and areas of emphasis, which add to the complexity and challenges facing evaluators. Philanthropy can play unique roles by responding to emergent needs with immediate direct impact, or by being strategic with long-term investments.

The group's charge was to listen to brief presentations highlighting the results of funded interventions and then combine these updates with their own research and experience to gauge where the evidence is strongest for continued investment: where funders have had the greatest impact on obesity prevention (and would want to invest more), where they have had promising results or a higher likelihood of success (and where more support could increase the likelihood of success), and where they appear to have fallen short.

A Range of Outcomes for Measuring Success

For the purposes of this discussion, the threshold for an "it worked" (and warrants further investment) intervention category was a **change in Body Mass Index (BMI)**. Relatively few interventions have met this threshold, but are worth noting.

The next category of success was a demonstrated **behavior change** that could but has not yet led to changes in BMI, such as increased purchases of healthier foods, reduced sugar-sweetened beverage consumption, or increased frequency of moderate to vigorous physical activity. Because caloric deficits take considerable time to register as changes in weight (and thus BMI), the behavior change intervention is likely to improve BMI over time.

Changes in the **policies, systems, and environments** that prompt and support healthier food and activity choices precede changes in behavior. Changes could include policies across a state, city, or school district that enable access to healthy whole foods, or remove unhealthy foods and beverages from cafeterias, vending machines, and school events and replace them with healthier options. These shifts may not immediately lead to behavior change and healthier weight, but promote supportive behaviors.

One of the many factors influencing the pace, scope, and success of place-based initiatives is the **extent to which communities already have or can build the capacity to shape policies, systems, and environments in healthier directions.** Broader community building, transformation, and ownership/engagement strategies influence the success of place-based obesity prevention initiatives, but also are important outcomes in their right. As a result,

the community context raises important issues for funders, evaluators, practitioners, and policy makers, as described in greater detail below.

These definitions of success are not intended to urge funders to limit investments in these areas. Innovation and testing of new ideas and approaches is crucial to expanding the range of options for communities and funders to consider as they join funders in obesity prevention efforts.

State of the Obesity Epidemic

Could the obesity epidemic finally be at a turning point? Encouraging signs include plateaus in the prevalence of obesity among boys and girls aged 2 to 19, and decreases in the prevalence of obesity among young preschool children aged 2 to 5.[2] In addition to these overall trends, decreases in obesity prevalence in some municipalities and states have been noted for children and adolescents — encouraging signs that modest changes in consumption and activity levels are having a cumulative effect. As reported by Wang et al., a daily caloric deficit[3] of 33 fewer calories per day, 2- to 5-year-olds would reach 1970s mean BMI levels (and an obesity prevalence of 5%) by 2020, just 5 years from now.[4] Modest changes in dietary intake of physical activity could achieve the caloric deficits required for older age groups: 149 calories per day for 6- to 11-year-olds and 177 calories per day for 12- to 19-year-olds.

Profound disparities persist, with increased prevalence among Hispanic and African-American boys and girls, compared to white children.[5] In 2007, children who were Hispanic, African-American, or Native American had odds of being obese or overweight that were 3.0-3.8 times higher than Asian children. These disturbing disparities and inequities require a concerted, intensive multi-sector and multi-level response, beyond the scope of any one family, school or neighborhood.[6]

---

[2] Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of Childhood and Adult Obesity in the United States, 2011-2012. *JAMA.* 2014;311(8):806-814. doi:10.1001/jama.2014.732.

[3] A caloric deficit is a measure of energy expenditure — i.e., more calories burned than consumed.

[4] Wang YC, Orleans CT, Gortmaker SL. Reaching the Healthy People Goals for Reducing Childhood Obesity Closing the Energy Gap. *Am J Prev Med*. May 2012;42(5):437-444.

[5] Ogden et al., op. cit.

[6] Sing GK, Siahpush M, Kogan MD. Rising social inequalities in US childhood obesity, 2003-2007. *Ann Epidemiol*. 2010 Jan;20(1):40-52.

The Community Context for Interventions and Evaluations

The obesity prevention interventions and evaluations reviewed at the meeting varied in scope and focus, but shared common community health roots. Most relied on multiple **components** (e.g., combining more than one approach to healthy eating and/or physical activity interventions); multiple **settings** (such as home, early care and education settings and school); multiple **sectors** (e.g., health, education, parks and recreation, urban planning, transportation), and/or multiple **levels** of influence, funding or government (e.g., child/family/school/organization; or local, state, regional, and federal).

The theme of "multiples" echoed throughout the day's discussions to such a degree that meeting participants quickly adopted a shorthand version — "multi-, multi- multi, multi-" — to save time and syllables when referring to multi-component, multi-sector, multi-setting and multi-level interventions. For this review, we will use the term "multi-dimensional" to refer to this perspective.

The complexity of interventions and evaluations in multiple dimensions reflects the socio-ecological model and **community context** for this work, with each dimension potentially reinforcing and sustaining the gains from any particular component, albeit to different degrees. We know from other complex epidemics, such as the decades-long and ongoing fight to prevent tobacco use, that equally complex, multi-dimensional interventions are required for obesity.

The complexity, multi-dimensional nature, and community context of these interventions raise several other issues that are relevant to gauging the relative success (or lack thereof) of these types of interventions. First, participants noted the importance of **equity** as both a frame and focus for obesity prevention work. As noted above, populations and communities of color experience higher obesity rates, with less access to affordable healthy food or safe places for physical activity. They also often live in communities where they have less political and economic clout to change the policies, systems, and environments that put them at greater risk for obesity and other adverse health outcomes.

One dimension of equity and inequity is overall community capacity — the product of either decades of investment, nurturing and support or their more common counterparts, disinvestment and neglect. **Community capacity** among residents and local agencies or organizations creates the conditions for everything from building grassroots and institutional leadership, engaging youth and community residents, securing grant funding to having the political leverage to change policies, and coaching staff of community-based organizations to gain new skills in business development and financing. For some meeting participants, a combination of community capacity and engagement could be the "secret sauce" that leads to community empowerment and sustainable policy/environmental changes interventions. While this sentiment was widely

shared, some noted that measures and evidence for the contributions of community capacity and engagement to intervention success are still a work in progress.

Equity and capacity, in turn, have important implications for how interventions are **implemented** and **sustained**. What levels of training and technical assistance are needed to increase the likelihood of an intervention's success? How does a community's history and capacity influence the level of multi-dimensional interventions required to see and sustain real change? What is the relationship between community capacity and the dose or intensity of interventions? These implementation issues are described in more detail in a subsequent section, but are noted here because they are such important considerations for the context in which interventions are designed, deployed and evaluated.

While meeting participants agreed that multi-dimensional interventions have the greatest track record and promise of successful outcomes, their multi-dimensional characteristics also make them difficult to evaluate, especially in terms of attributing specific outcomes to any particular component. If the packaging or combination of the multiple dimensions makes them effective, how can evaluators better understand the combined impact of strategies that reinforce each other, but are less effective on their own?

As more than one participant noted, obesity prevention interventions warrant the caution that "absence of evidence is not evidence of absence." For example, the *Guide for Community Preventive Services* finds insufficient evidence for the effectiveness of multicomponent school-based interventions to prevent or reduce overweight or obesity among children and adolescents because interventions varied and reported outcomes were not comparable.[7] However, this conclusion is based on data prior to 2003; like many physical activity and healthy food conclusions codified in the Guide, these are outdated and at odds with emerging evidence.

Meeting participants anticipate a surge of new research that should add considerably to the existing evidence base. For example, many of the federally funded Communities Putting Prevention to Work (CPPW) and Community Transformation Grants (CTG) conducted evaluations that are filling a pipeline of published and unpublished studies, as well as a review of Early Care and Education (ECE) obesity prevention interventions. One meeting participant described these emerging pieces as "scraps of evidence" yielding important insights on how interventions work together to shape obesity prevention trends.

[7] Guide to Community Preventive Services. *Obesity prevention and control: interventions in community settings.* www.thecommunityguide.org/obesity/communitysettings.html. Last updated: 01/16/2015.

Investments to Date: Where Is the Strongest Agreement About What Works?

Taken together, what do the existing bodies of evidence, emerging evidence, and the scraps of evidence and absence of evidence tell us?

For many reasons — including the multi-dimensional nature of interventions; the equity gaps contributing to differences in community capacity; the array of powerful market and societal forces undermining healthy choices; the long trajectory required to see any meaningful results — a considerable amount of persuasion was required to convince meeting participants to discuss interventions in these terms. The caveats are plentiful and valid.

Given these caveats, though, what *can* we say about key elements or components of a multi-component package of interventions for different settings and sectors? Where does the current and emerging evidence warrant further investments? Where are intermediate outcomes, short of changes in BMI, most promising? Where are the greatest opportunities for community, social and system changes that reinforce policy and environmental change — and thus the behavior change that leads to the prize of reductions in BMI?

Evidence-based interventions were a focus of this discussion, but that focus is in no way intended to suggest that *only* these interventions warrant funding and attention. As noted in the following section ("The Next Tier: What Has Shown Mixed and/or Promising Results?"), innovative approaches that are untested or for which evaluation strategies have yet to be devised may — and likely will — hold many answers to reversing the obesity epidemic in the future. Likewise, the current status of evidence prompted meeting participants to suggest topics for future research, which also are captured in the next section.

This section covers agreement about where the evidence is strongest based on a combination of existing evidence and/or emerging evidence from evaluations and experience with funded evaluations and initiatives. Key elements or components of a multi-pronged obesity prevention strategy are presented for four settings that have yielded the most evaluation research to date: early care and education settings, schools, parks and recreation, and land use and transportation. These elements and components are presented in the figure below. As discussed in the following section, healthy food retail interventions are considered promising, but not yet meeting the evidence threshold of the items listed in this section.

For each setting, we present the group's ideas about which components are most compelling, as well as caveats or gaps related to each setting. Evidence cited by participants in selecting these particular settings and components and

resources describing interventions in more detail are provided in Appendix A. Although presented as specific components to distinguish them and their supporting evidence base from others, none of these is recommended in isolation. **The evidence to date strongly supports continued or expanded investment in these components, especially as part of a multi-dimensional approach.**

Where is the **Strongest Agreement** about **What Works** in Obesity Prevention?

Definitions

"Strongest agreement" is based on a combination of existing evidence and/or emerging evidence from evaluations and experience with funded interventions and initiatives.

"What works" means interventions that have a health impact by affecting Body Mass Index (BMI) and the behavior changes that lead to reductions in BMI.

Overall caveat and assumption: Interventions work best when embedded in multiple dimensions at once (components, settings, sectors, levels), although some add more impact than others.

Legend: Type of Intervention

- Other
- Physical Activity
- Healthy Eating

Early Care and Education Environments

ECE environments are natural settings for obesity prevention interventions. As noted above, children ages 2 and 5 years have made the greatest progress in the obesity epidemic overall. Interventions early in life have the potential to shape lifelong eating and activity habits, and to reach others — siblings, parents, guardians, and early education teachers — in a child's life. Early care environments also represent a setting in which healthy food, beverage, breastfeeding, and activity policies meet a captive audience of infants, toddlers, and preschoolers.

Like all the multi-dimensional strategies, these benefit from combining environmental change (e.g., purchasing playground equipment) and policy changes (such as regulatory requirements and implementing food procurement policies), program changes (e.g., conducting self-assessments; training teachers and implementing a curriculum); and engaging families to reinforce these changes at home.

Key Elements/Components for Which Evidence is Strongest

Key elements contributing to successful outcomes in ECE environments, as part of a multi-dimensional approach, include:

- **Regulations**, such as state licensing or local regulations, that require physical activity throughout the day, limit screen time, set standards for healthy foods and beverages (including access to water), and provide lactation support. New York City's regulations for early childcare centers, enacted in 2007, are one example;[8] California's Healthy Beverages in Child Care are another. These approaches are also the Let's Move! Child Care goals.
- **Accountability** for complying with regulations, such as incorporating nutrition and physical activity standards into Quality Rating and Improvement Systems (QRIS).
- **Serving fruits and vegetables at every meal and implementing standards for healthy foods and beverages**, especially sugar-sweetened beverages. In the New York City example, the regulations called for restricting sugar-sweetened beverages for all children, restricting whole milk for those older than 2 years and replacing it with unsweetened/unflavored 1% or nonfat milk, restricting juice to beverages that are 100% juice and limiting servings of juice to 6 ounces per day, and

[8] Nonas C, Silver LD, Kettel Khan L, Leviton L. Rationale for New York City's Regulations on Nutrition, Physical Activity, and Screen Time in Early Child Care Centers. *Prev Chronic Dis* 2014;11:130435. DOI: Accessed 1/23/15 from http://dx.doi.org/10.5888/pcd11.130435.

making water available and accessible at all times.[9] Other recommendations include serving fruits and vegetables at every meal, family-style, and avoiding fried foods.

- **Limiting screen time.** No screen time is recommended for children under 2; at a childcare facility, limits of 30 minutes per week are recommended in the child care setting itself, while working with parents to limit daily screen time at home as well.[10]
- **Promoting breastfeeding** and welcoming nursing mothers during the day.
- **Promoting physical activity** — ideally, 1 to 2 hours throughout the day, including outside play whenever possible.
- **Providing turn-key (ready-to-use) curricula** for teachers in early care and education settings, because turnover is high.
- **Training and technical assistance** beyond curricula for both teachers and center directors who are likely to provide more continuity in a particular setting and incorporation into professional development systems.
- **Self assessments** such as the Nutrition and Physical Activity Self Assessment for Child Care — NAP-SACC.
- **Parent engagement** to reinforce healthy food and physical activity habits at home.

Caveats and Concerns

To date, the evidence base has been predominantly derived from licensed group care facilities, leaving out family day care and unregulated arrangements that affect large numbers of children and families, especially in low-income communities.

The high turnover among low-wage early care workers presents a challenge for implementing policies as well as for improving implementation through training and technical assistance.

In early care environments, increasing physical activity for children can be a particular challenge; specificity in requirements is helpful e.g., a total of 60 minutes of moderate-vigorous activity outside, even if it is unstructured, or 30 minutes strengthening/balance activity inside.

---

[9] Ritchie L, Sharma S, Gildengorin G, Yoshida S, Braff-Guajardo E, and Crawford P. Policy improves what beverages are served to young children in child care. *J Acad Nutr Diet*. 2014

[10] Let's Move! Child Care — https://www.healthykidshealthyfuture.org/welcome.html

Schools/Learning Environments

Like early care and education environments, schools offer relatively controlled environments for implementing obesity prevention interventions more intensively than in the community at large. An infrastructure for consistent policy implementation and accountability, control over a significant proportion of daily calories students consume from cafeterias and vending machines, opportunities to reach parents and caregivers as well as students — all of these make schools strong candidates for interventions and for a stronger role as "hubs for health." One example of a promising comprehensive approach currently being evaluated is the Healthy Schools program.[11]

Meeting participants see additional opportunities to frame healthy eating and physical activity in ways that make these interventions more appealing and urgent for school leaders, beyond the health and obesity prevention benefits for students. Connecting these interventions to academic achievement — and specifically to closing achievement gaps for students who are not performing well academically — could be a more compelling argument than reductions in BMI. Other suggestions included making the case that schools have a responsibility to protect their students from chronic disease like obesity, in the same way that they feel obligated to respond to potential outbreaks of infectious disease.

For school administrators and teachers who resist changing these policies by citing the constraints of the school day and other demands such as testing requirements, one suggestion was to identify schools, preferably in the same district, that have successfully changed practices, to persuade reluctant administrators that implementation is not only possible but helpful to educational goals.

Key Elements/Components for Evidence is Strongest

Key elements contributing to successful outcomes in schools, as part of a multi-dimensional approach, include:

- **Quality physical education (PE)** as a way to promote physical activity. The 2013 national physical activity guidelines midcourse report found multi-component school programs and physical education the only strategy with a sufficient level of evidence.[12] Evidence-based PE programs include Coordinated Approach to School Health (CATCH) and Sports, Play, and Recreation for Kids (SPARK) in elementary schools,

[11] For more about the Healthy Schools program and its evaluation, see http://www.rwjf.org/en/about-rwjf/newsroom/features-and-articles/healthy-schools-program-shows-impact.html

[12] Physical Activity Guidelines for Americans Midcourse Report Subcommittee of the President's Council on Fitness, Sports & Nutrition. *Physical Activity Guidelines for Americans Midcourse Report: Strategies to Increase Physical Activity Among Youth*. Washington, DC: U.S. Department of Health and Human Services, 2012.

SPARK in middle schools and Lifestyle Education for Activity Program (LEAP) in high schools.

- In addition to PE itself, **other physical activity opportunities in and out of school** include classroom activities making better use of recess time (e.g., with trained supervisors, more appealing playgrounds, activity zones, equipment), promoting out-of-school activity and intramurals, reducing screen time, and participating in Safe Routes to School.

- **Removing sugar-sweetened beverages and junk food from schools and their surrounding environment** is one of the strongest interventions related to healthy eating. These items should not be offered in cafeterias, vending machines, school stores, or fundraising venues. **Competitive food policies** cover food and beverages available outside the federally reimbursed school lunch program. The USDA's recent Dietary Guidelines Advisory Committee recommendations on Food Environments and Settings, the first time food environments had been considered in the Committee's work, concluded that there is "strong evidence that school nutrition policies to change competitive foods and beverages available is associated with improved dietary intake."

- In addition to more comprehensive competitive food policies, schools can choose to exceed USDA **Smart Snacks** guidelines, which set minimum standards, adhere to national school lunch program guidelines, and/or boost students' participation in healthy school meals (versus leaving campus or bringing unhealthy foods from home).

- Interventions are recommended to **engage parents** and get them more actively involved in both physical activity and healthy eating changes in schools, to reinforce these changes at home, build support for these policies over time, and possibly influence adult/family behaviors as well.

- **Farm to School programs** are most effective at changing eating behaviors when they fully integrate all three elements of **school gardens**, **nutrition education, procurement**, and changes in the overall food environment. Farm to school interventions also have the potential to enhance overall academic achievement, engage parents and teachers in creating a healthier school food environment, and engage other community partners.[13] Farm to early care (including procurement changes, educations, and gardens) are an emerging strategy that needs further exploration. The farm to early care components also have the

[13] For an extensive outline of relevant literature on Farm to School, see National Farm to School Network. *The Benefits of Farm to School.* 2014. National Farm to School Network. http://www.farmtoschool.org/Resources/BenefitsFactSheet.pdf.

potential to engage parents and teachers in creating a healthier food environment.[14,15]

- **School wellness policies** are opportunities to accomplish many of these goals simultaneously: assessing current policies and identifying opportunities for improvement to meet evidence-based standards, engaging school staff and parents, supporting student advocates (as well as parents and community members), and becoming a more effective partner to other sectors and organizations that share these goals.

Caveats and Concerns

Meeting participants noted that at the federal level, there is no champion to make this case within the Department of Education.

Participants also expressed concern and discouragement about the potential for losing hard-fought gains in school nutrition.

Few examples and studies have focused on adolescents in high schools; the challenges of promoting healthy eating and physical activity among this age group differ from those of younger students.

Finally, participants expressed concern and caution about inadvertently exacerbating labeling and stigma issues related to children being overweight or obese. Experiencing such labels or societal stigma is painful and difficult at any age, but especially in the socially pressured arenas of middle and high school.

Parks, Trails, Open Spaces, and Recreation

Physical activity in and near parks and other open spaces provides "co-benefits" that few other venues offer — enjoying nature and the outdoors, interacting with neighbors and people of all ages, learning new skills or dusting off old ones. Yet many neighborhoods — particularly low-income ones — don't offer this setting for social and physical activity to their residents

Key Elements/Components for Which Evidence is Strongest

Key components of outdoor parks and recreation venues, as well as indoor facilities, as part of a multi-dimensional approach, include:

[14] Hoffman JA, Agrawal T, Wirth C, Watts C, Adeduntan G, Myles L, Castaneda-Sceppa C. Farm to Family: Increasing Access to Affordable Fruits and Vegetables Among Urban Head Start Families. *Journal of Hunger & Environmental Nutrition* 2012; 7:2-3, 165-177.

[15] Izumi BT, Peden AM, Hallman JA, Barberis D, Stott B, NImz S, Ries WR, Cappello A. (2013). A Community-Based Participatory Research Approach to Developing the Harvest for Healthy Kids Curriculum. Progress in Community Health Partnerships, 7(4), 379-384.

- **Physical proximity and access** to parks and trails, close enough to make them viable options for those who live within a certain radius (by foot or public transit). If a park is accessible by bicycle, 16 times as many people can reach it in the same time required to walk there from a mile away.[16]
- **Safety** — parks should be open and well-lit, comfortable for people of all ages, and intentionally promote safety through the timing and scope of organized group activities, transit, and programming.
- **Amenities and infrastructure** — these include fitness zones that draw people to parks or facilities at all hours; clean and well-maintained restrooms; clear signage; bike stations or bus stops that make parks more like transit hubs.
- **Programming and promotion.** Sports leagues and classes are traditional, but many parks are expanding their programming to meet unique interests and needs, or draw new generations (e.g., with culturally relevant programming, ecology workshops, arts and music festivals) and groups (e.g., with meeting spaces). Programming must be promoted to draw people to parks and activities, especially if a park is new or has recently changed from a dangerous, unappealing space to a safer and more appealing one.
- **Healthy food and beverage offerings**. Parks often have vending carts or kiosks, vending machines, concession stands, and food trucks — all of which could offer healthier fare.[17]

Caveats and Concerns

Like so many other social determinants of obesity, access to parks and recreational venues raises important equity issues that are excellent candidates for multi-dimensional interventions.

Land Use and Transportation

This set of interventions includes community designs that make it safer and easier for children and adolescents to walk or bicycle to school, such as Safe Routes to School, and for people of all ages to use modes of active transport

[16] The Trust for Public Land. *From Fitness Zones to the Medical Mile: How Urban Park Systems Can Best Promote Health and Wellness.* 2011. Washington, DC: The Trust for Public Land.

[17] For example, see the new CDC publication: *Smart Food Choices: How to Implement Food Service Guidelines in Public Facilities*, designed to help government work sites and public facilities increase the availability of healthier choices at food service venues.

other than their cars. Active transport can be fostered by complete streets or other streetscape changes that make walking safer and more appealing.[18]

Key Elements/Components

Key components of land use and transportation intervention, as part of a multi-dimensional approach, include:

- **Safe Routes to School** — a comprehensive, multi-dimensional intervention.10 years of implementation data yields evidence of success. For example, an analysis of SRTS projects in five states found increases in both walking and cycling to school after SRTS was implemented, with particularly dramatic increases for walking.[19]
- **Streetscape improvements** — building or repairing sidewalks, making crossings safer and more visible, improving the aesthetics of walking routes.
- **Zoning policies** that lead to built environment changes in land use and transportation (such as complete streets).
- **Complete Streets —** transportation planning and design that makes streets safe and accessible to everyone.

Caveats and Concerns

Meeting participants did not think there was sufficient evidence to include shared use agreements with schools among the key elements/components. However, a new study showed that specific provisions of these agreements, such as the times facilities are available, and prioritizing school vs. other organizations' use, were related to student physical activity.[20] Shared use was less common in North Carolina schools with more low-income or African-American students. Although 89% of North Carolina schools allowed community use through either formal or informal agreements, the biggest barrier was that no outside organization had asked to use school facilities.[21]

---

[18] For more details about Complete Streets, see the National Complete Streets Coalition website: http://www.smartgrowthamerica.org/complete-streets

[19] Stewart O, Vernez Moudon A, and Claybrooke C. Multistate Evaluation of Safe Routes to School Programs. *American Journal of Health Promotion*: January/February 2014, Vol. 28, No. sp3, pp. S89-S96..

[20] Slater S, Chriqui JF, Chaloupka FJ, Johnston L. Joint use policies: are they related to adolescent behavior? *Prev Med.* 2014; 69:37-43.

[21] Kanters MA, Bocarro JN, Filardo M, Edwards MB, McKenzie TL, Floyd MF. Shared use of school facilities with community organizations and afterschool physical activity program participation: A cost-benefit assessment. *Journal of School Health*. 2014 84(5);302-309.

The Next Tier: Mixed or Promising Results for Healthy Food Retail Interventions

The path our food takes from farm to mouth — from production through processing, packaging, distribution, marketing, access, and consumption — represents a vast and interconnected global system. Influencing this "system of systems" is a complicated undertaking, generating both intended and unintended consequences.[22]

With some important exceptions, funders of obesity prevention initiatives have focused primarily on healthy food retailing, particularly on access to healthy food through grocery stores, increase in farmers markets, and other alternative delivery systems. Healthy food incentives have been implemented in farmers markets and now being piloted in grocery stores. Some communities have taken on a redesign of their food system across the value chain.

In addition to the health benefits, these investments have the potential to yield economic development benefits as production, retail, transit, and even job patterns shift. In some areas, the new or expanded grocery stores are serving as anchors for neighborhood revitalization efforts. Meeting participants were not surprised that there are fewer successes for this set of interventions; it is still too early to expect positive outcomes, given the years of disinvestments in many communities. Furthermore, powerful industry and economic forces make unhealthy options cheap and ubiquitous. The role of food marketing was called out in particular.

Much more work is needed, and much is underway, on both the intervention and evaluation fronts. For example, a natural experiment of sorts is underway in Berkeley, CA, in the wake of the city's successful passage of a soda tax (and is currently being evaluated). Increasing outlets and incentives such as Double Up Food Bucks rebates for fruit and vegetable purchases for healthier foods in low-income communities clearly has led to some increases in sales of fruits and vegetables. Preliminary results provide some promise of positive impacts on fruit and vegetable consumption as well,[23,24,25,26] but comprehensive research is still

[22] Institute of Medicine and National Research Council of the National Academies. 2015. A framework for assessing effects of the food system. [Report Brief] Washington, DC: National Academy Press. Retrieved from http://www.iom.edu/~/media/Files/Report%20Files/2015/FoodSystem/FoodSystemReportBrief.pdf

[23] Bartlett, Susan, Jacob Klerman, Lauren Olsho, et al. *Evaluation of the Healthy Incentives Pilot (HIP): Final Report*. Prepared by Abt Associates for the U.S. Department of Agriculture, Food and Nutrition Service, September 2014.

needed. Other interventions and strategies, such as menu labeling and Healthy Food Financing Initiatives across the country, are not yet showing results, but some appear promising. New capital to increase access to grocery stores and support food entrepreneurs in underserved communities is now becoming available. Evaluation will be critical to learn how capital can be best deployed to shift the food environment.

Implementing Interventions: The Crucial Role of "How"

Peter Drucker often gets credit for the observation that in corporate America, "Culture eats strategy for lunch." The obesity prevention version is "Implementation trumps strategy." The variations in capacity and other resources devoted to interventions, settings, levels of synergy, commitment, and champions influence whether an effective intervention works at all, what policy and system change efforts have occurred to sustain the effort, or whether one that works in a particular community can be replicated elsewhere.

Meeting participants highlighted several aspects of implementation that have implications for evaluation methods and strategies.

- **The concept of dose.** By taking into account an intervention's reach (the number of lives touched) and *strength* (effect size), the concept of dose can play a strategic role in planning and quality improvement to strengthen. If an intervention's dose is low or its reach is limited, it is unlikely to have an impact at the population level.
- **The role of tailored training and technical assistance (TA).** A recent evaluation of the Healthy Schools Program found that more TA was associated with greater decreases in BMI. Areas to explore include different models of providing TA, such as coordinating a learning community of different TA providers; few have expertise in all areas. State and local public health agencies may include subject matter experts who can provide guidance and technical assistance.
- **Focusing on intermediate outcomes,** and what can be tracked when, to capture changes in conditions, attributes of systems, social norms or

[24] Dimitri, C., Obehroltzer, L, Zive, M. & C. Sandolo. Enhancing food security of low-income consumers: An investigation of financial incentives for use at farmers markets. Food Policy (2014), http://dx.doi.org/10.1016/j.foodpol.2014.06.002

[25] Young, C. R., Aquilante, J. L., Solomon, S., Colby, L., Kawinzi, M. A., Uy, N., & Mallya, G. (2013). Improving fruit and vegetable consumption among low-income customers at farmers markets: Philly food bucks, Philadelphia, Pennsylvania, 2011. *Preventing Chronic Disease*, 10, 1-8. Retrieved from http://dx.doi.org/10.5888/pcd10.120356

[26] Dimitri, C., Oberholtzer, L , & Nischan, M. Reducing the Geographic and Financial Barriers to Food Access: Perceived Benefits of Farmers' Markets and Monetary Incentives. *Journal of Hunger & Environmental Nutrition* Vol. 8, Iss. 4, 2013

other cultural shifts that affect obesity prevention, or important dimensions of constituency building and engagement in communities.

- **Tracking community capacity** (among residents as well as agencies/organizations), changes in capacity, and sustainability of such change more explicitly, including community ownership and engagement.
- **Identification and use of revenue sources** such as Medicaid/Medicare reimbursements; the Affordable Care Act and the health care sector overall in supporting and sustaining obesity prevention interventions.

Other Topics

Because of time limitations, participants were not able to fully explore the range of evaluations of settings and interventions. For example, worksite settings could not be considered.

In addition to building the evidence base for the "what works" categories listed above, meeting participants identified a number of areas that deserved further research, tracking, and/or exploration.

These included:

Food and Nutrition

- **Healthy food retail (as indicated above)**
- The effects of the recent Farm Bill's funding for healthy food incentives
- Food hub financing and sustainability
- Fast food outlets and access to them; zoning policies that restrict them
- How changes in federal food assistance programs affect purchases/consumption — e.g., food and beverage offerings through the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) changed purchases and presumably consumption of more healthy food and less unhealthy food
- Augmenting parent involvement to include nutrition education for parents and children
- Strategies for addressing the imbalance between healthy and unhealthy food marketing to children
- Food service and procurement in public institutions (e.g., prisons, municipalities, libraries, government workplaces)
- How/whether healthy food sales affect consumption
- Increasing nutrition in food banks or other outlets within the emergency food system
- Parental perceptions of overweight/obesity as normal

Physical Activity

- Effectiveness of shared use agreements with schools
- Policies supporting intramural sports
- Effectiveness of after-school policies
- Physical activity and educational achievement (two randomized experiments are currently underway)
- Communication strategies that make physical activity a higher priority for school officials
- Improving existing interventions (e.g., classroom activity breaks; preschool interventions; after-school; youth sports; dance; parks)
- The role of zoning policies

Health Sector and Financing

- The role of the Affordable Care Act, Medicaid, Medicare, and the Center for Medicare and Medicaid Innovation in funding evidence-based interventions and/or innovative and promising approaches
- Well child visits as opportunities to raise parenting issues related to obesity prevention
- Using Children's Health Insurance Program Reauthorization Act (CHIPRA) reauthorization to fund programs such as the use of Community Health Workers for obesity prevention and control
- Use of Local Control Financing Formulas (LCFF) to promote obesity prevention.
- Encouraging the connections/leveraging of financial resources in communities from both private and public funding streams

Metrics

- Supporting/encouraging private and public funders to agree on common process and outcome measurements

Summary and Next Steps

What have we learned about what works? Interventions geared to "captive" audiences — preschool children, students in elementary and middle schools (and, to some degree, high schools) — have a higher likelihood of success because these environments offer more control over food consumption and activity levels. They also reach children over a protracted period, at a time when lifelong health habits are being formed. In the language of intervention dose, these interventions have substantial reach (number of lives touched) and strength (effect size) of interventions, compared to those more widely diffused into a community setting.

Compared to early childhood and school settings, communities present more formidable challenges in creating opportunities and implementing, evaluating, and demonstrating population health impacts at a detectable scale. Still, communities play a crucial role in reinforcing the messages, desired behaviors, and norms that ultimately lead to changes in the prevalence of obesity. Other aspects of the community context — the capacity of residents and local agencies/organizations, how capacity and empowerment can be strengthened, the degree of community engagement, their sense of agency and demand for interventions — influence the success of obesity prevention interventions and are important outcomes in their own right.

In addition to what works, the group considered interventions that are promising or for which there are mixed results. These included the many efforts to influence retailing of healthier foods, where important lessons are now being learned that can inform future efforts.

Finally, participants considered the crucial role of implementation in the success of interventions. Specific topics included the concept of dose or other ways to apply a systems perspective to the design of complementary intervention strategies, the crucial role of tailored training and technical assistance in achieving effective implementation, how to determine and gauge intermediate outcomes, building and tracking community capacity, and identifying the role of sustainable revenue sources in supporting and sustaining obesity prevention interventions. And while individual specific interventions, strategies or tactics were called out, the initial premise of a multi- component comprehensive approach continues as an underlying foundation to the proceedings.

For the funders represented at this January 2015 meeting, immediate next steps include trying to establish agreement on the best investments, using this particular conversation as a starting point for sharing, informing, and influencing future funding directions. These conversations reflect an alignment of effort and shared purpose that is replicated in partnerships across the country. Partnerships create cohesion and facilitate alignment among stakeholders and implementation strategies, which in turn helps mobilize support for policy and system changes that affect both implementation and sustainability.

This report reflects the group's commitment to capture these conversations as they unfold. We hope this guidance will be useful to others as we consider what has worked, which investments have demonstrated the biggest health impacts so far, and how we can best build on these successes to act on the most promising opportunities before us. By sharing what we've learned, we hope to stimulate even more creative, strategic thinking about where these investments can and should make a difference in our shared goal of all having an equal opportunity to live the healthiest life possible, in the healthiest community — regardless of where that may be.

Appendix A: Citations and Resources for Key Elements/Components

Early Care and Education (ECE)

- Let's Move! Child Care — https://www.healthykidshealthyfuture.org/welcome.html
- Center for Training and Research Translation (Center TRT) — www.centertrt.org
- Story M, Kaphingst KM, French S. The role of child care settings in obesity prevention. *Future Child* 2006;16(1):143-68.
- Ammerman AS, Ward DS, Benjamin SE, Ball SC, Sommers JK, Molloy M, et al. An intervention to promote healthy weight: Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) theory and design. *Prev Chronic Dis* [serial online] 2007 Jul. Available from: http://www.cdc.gov/pcd/issues/2007/jul/06_0115.htm.
- Nonas C, Silver LD, Kettel Khan L, Leviton L. Rationale for New York City's Regulations on Nutrition, Physical Activity, and Screen Time in Early Child Care Centers. *Prev Chronic Dis* 2014;11:130435. DOI: http://dx.doi.org/10.5888/pcd11.130435.
- Centers for Disease Control and Prevention. *Spectrum of Opportunities for Obesity Prevention in the Early Care and Education (ECE) Setting.* CDC Technical Assistance Briefing Document. Available from: http://www.cdc.gov/obesity/downloads/Spectrum-of-Opportunities-for-Obesity-Prevention-in-Early-Care-and-Education-Setting_TAbriefing.pdf
- Institute of Medicine. *Early Childhood Obesity Prevention* (2011).
- Caring for our Children. *National Health and Safety Performance Standards; Guidelines for ECE Programs*. 3rd Edition (2011).
- Reynolds, M. A., Jackson Cotwright, C., Polhamus, B., Gertel-Rosenberg, A. and Chang, D. (2013), Obesity Prevention in the Early Care and Education Setting: Successful Initiatives across a Spectrum of Opportunities. *The Journal of Law, Medicine & Ethics*, 41: 8–18.
- Lumeng, J. C., Kaciroti, N., Sturza, J., Krusky, A. M., Miller, A. L., Peterson, K. E., ... & Reischl, T. M. (2015). Changes in Body Mass Index Associated With Head Start Participation. *Pediatrics*, peds-2014.
- Izumi BT, Peden AM, Hallman JA, Barberis D, Stott B, NImz S, Ries WR, Cappello A. (2013). A Community-Based Participatory Research Approach to Developing the Harvest for Healthy Kids Curriculum. *Progress in Community Health Partnerships*, 7(4), 379-384

- http://www.ourcommunityourkids.org/media/55563/preventing_obesity.pdf

- Carroll JD, Demmenta MM, Stilesa SB, Devinea CM, Dollahitea JS, Sobala J, Olsona CM.Overcoming Barriers to Vegetable Consumption by Preschool Children: A Childcare Center Buying Club. *Journal of Hunger & Environmental Nutrition* 2011; 6:153-165.

- Castro DC, Samuels M, Harman AE. Growing Healthy Kids, A Community Garden–Based Obesity Prevention Program. *Am J Prev Med* 2013;44(3S3):S193–S199.

- Farfan-Ramirez L, Diemoz L, Gong EJ, Langura MA. Curriculum Intervention in Preschool Children:Nutrition Matters! *J Nutr Educ Behav.* 2011; 43 (4S2): S162-S165.

- Hoffman JA, Agrawal T, Wirth C, Watts C, Adeduntan G, Myles L, Castaneda-Sceppa C. Farm to Family: Increasing Access to Affordable Fruits and Vegetables Among Urban Head Start Families. *Journal of Hunger & Environmental Nutrition* 2012; 7:2-3, 165-177.

- Hughes LJ. Creating a Farm and Food Learning Box Curriculum for Preschool-aged Children and Their Families. *J Nutr Educ Behav.* 2007;39:171-172.

- Namenek Brouwer RJ, Benjamin Neelon S E. Watch Me Grow: A garden-based pilot intervention to increase vegetable and fruit intake in preschoolers. *BMC Public Health* 2013; 13:363.

Schools

- USDA 2015 Dietary Guidelines Advisory Committee (DGAC): Food Environment and Settings.
- Institute of Medicine. *Nutrition Standards for Foods in Schools: Leading the Way toward Healthier Youth.* IOM/CDC recommendations "serve as the gold standard for the availability and content of competitive foods in schools."
- USDA *Smart Snacks in Schools* — note that these are minimum standards for competitive foods.
- Children who did not meet recommended levels of PE or recess have higher predicted BMI percentile than those who do (but the difference is only statistically significant for boys): Fernandes M. and Sturm R. The Role of School Physical Activity Programs in Child Body Mass Trajectory. *Journal of Physical Activity and Health* 2011; 8(2):174-181.
- Ready for Recess: A multi-component school-based intervention involving staff training, activity zones, and playground equipment led to

increases in both moderate and vigorous physical activity. Huberty J. et al. Ready for recess: a pilot study to increase physical activity in elementary school children. *J Sch Health* 2011 May;81(5)251-7.

- *Physical Activity Guidelines for Americans Midcourse Report: Strategies to Increase Physical Activity Among Youth*.

- Joshi A, Azuma AM, Feenstra G. Do Farm-to-School Programs Make a Difference? Findings and Future Research Needs. *J Hunger Environ Nutr*. 2008;3(2/3):229–46.

- *Connecting Classrooms, Cafeterias & Communities: Promising Practices of Farm to School Education: Summary of Evaluation Findings – 2011.* Available from http://www.vtfeed.org/sites/default/files/staff-files/site-downloads/Farm%20to%20School%20evaluation%202011.pdf

- Schneider L, Chriqui J, Nicholson L, Turner L, Gourdet C, Chaloupka F. Are farm-to-school programs more common in states with farm-to-school-related laws? Journal of School Health 2012;82(5). 210-216. Available from http://web.extension.illinois.edu/farmtoschool/newsletter/Prevalence.pdf

- Ratcliffe MM, Merrigan KA, Rogers BL, Goldberg JP. The effects of school garden experiences on middle school-aged students' knowledge, attitudes, and behaviors associated with vegetable consumption. 2011;12(1):36–43.

- Knai C, Pomerleau J, Lock K, McKee M. Getting children to eat more fruit and vegetables: A systematic review. Prev Med. 2006;42(2):85–95.

- Blair D. The Child in the Garden: An Evaluative review of the Benefits of School Gardens. J Environ Educ. 2009;40(2):15–38.

Parks, Trails, Open Space and Recreation

- Guide to Community Preventive Services. *Obesity prevention and control: interventions in community settings.* www.thecommunityguide.org/obesity/communitysettings.html. Last updated: 01/15/2016.

- Cohen DA, Han B, Isacoff J, Shulaker B, Williamson S, Marsh T, McKenzie TL, Weir M, Bhatia R. Impact of park renovations on park use and park-based physical activity. *J Phys Act Health*. 2014 Jun 20.

- Nemours. *Healthy Vending Guide*. http://www.nemours.org/content/dam/nemours/www/filebox/service/preventive/nhps/resource/healthyvending.pdf

Land Use and Transportation

- Ding D, Sallis JF, Kerr J, Lee S, Rosenberg DE. Neighborhood environment and physical activity among youth: a review. *Am J Prev Med*. 2011 Oct;41(4):442-55. Ding et al. summarized 103 primary papers on built environment correlates of physical activity for children and adolescents, finding that the most robust correlates for children were walkability, traffic speed and volume, land use mix (proximity of homes and destinations), residential density, and access to recreation facilities. For adolescents, land-use mix and residential density were the most robust.
- Guide to Community Preventive Services. *Obesity prevention and control: interventions in community settings.* www.thecommunityguide.org/obesity/communitysettings.html. Last updated: 01/15/2016.
- Taber DR, Chriqui JF, Perna FM, Powell LM Slater SJ, Chaloupka FJ. Association between state physical education (PE) requirements and PE participation, physical activity, and Body Mass Index change. *Preventive Medicine*. 2013, Vol. 57(5):629-633.