

Expert and Stakeholder Consensus on Priorities for Obesity Prevention Research in Early Care and Education Settings

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Abstract

Background: Early childhood is a formative period for many weight-related behaviors (diet and activity), but little obesity prevention research targeting this age group has been conducted. Early care and education settings are a useful avenue for interventions targeting young children, but the limited research provides insufficient evidence upon which to base policy decisions, practice guidelines, or mobilized efforts to improve healthy eating and physical activity, and ultimately healthy weight development in these settings.

Methods: In September of 2011, prominent researchers, young investigators, and leaders in early care and education came together to examine past research and to explore challenges and priorities for future research on healthy weight development in children aged 2–5 years. During this meeting, experts presented and attendees discussed key issues around measurement of diet and physical activity, policy and environment measurement, intervention approaches, policy research, and capacity development. Following the meeting, attendees were invited to participate in an online voting exercise to select top research priorities.

Results: A total of 64 research issues were identified, and voting narrowed this list to 24 issues. Highest-rated issues included: Assessment of the quality of children's meals and snacks, use of financial incentives, interventions that include healthcare providers, the role of screen time, and need for multilevel interventions.

Conclusions: The presentations within this meeting highlighted the importance of research to address the unique challenges for those working in early care and education settings. Expert and stakeholder consensus of priorities identified significant and innovative areas where future obesity prevention research efforts should be focused.

Introduction

Recent national data (National Health and Nutrition Examination Survey 2009–2010) indicate that one in four children aged 2–5 years are overweight or obese,¹ thus increasing their risk of becoming overweight and obese adolescents and adults and incurring long-term health problems.² Early childhood is a critical period in obesity development,^{3,4} and therefore, an important target for healthy eating and physical activity interventions to establish healthy weight gain trajectories.

Early care and education (ECE) programs are important settings for obesity prevention.⁵ Child care centers and family child care homes account for a large portion of early care and education programs in the US, providing care for an estimated 30–40% of children under the age of 6 years.^{6,7} Children spend, on average, 30 hours per week

in these settings.⁶ Thus, ECE programs and their staff play a central role in developing children's health behaviors and reducing their risk for obesity by shaping the physical and social environment in which they eat, sleep, and play.

Nationwide, public and private organizations are working to encourage adoption of policies for ECE programs that promote healthy eating and physical activity. Two of the most significant examples of recent authoritative reports are *Caring for Our Children's Preventing Childhood Obesity in Early Child Care and Education Programs*⁸ and the Institute of Medicine's (IOM) *Early Childhood Obesity Prevention Policies*.⁹ *Caring for Our Children* focuses on best practices in nutrition, physical activity, and screen time for all types of ECE settings, whereas the IOM report examines the evidence and provides guidance on obesity prevention policies for children up to 5 years of age.

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Growing support from the public health sector for ECE-based obesity prevention efforts has highlighted the need for more research in this area. A 2011 systematic review of obesity prevention studies in child care settings found only 18 intervention studies, all of which had been published since 2003.⁵ Reviews by Hesketh and Campbell of obesity prevention studies in children 0–5 years old have documented the rapid increase in published intervention studies in both the United States and other developed countries in recent years. Although their 2006 literature search identified only two ECE-based intervention studies, 4 years later an additional seven studies had been published.^{10,11} Despite increased interest, these recent reviews highlight both the nascency and dearth of obesity prevention research in ECE settings. Clearly, more studies are needed because a strong research foundation is essential to identify and support evidence-based practices and policies that can be implemented at federal, state, and local levels.

In the fall of 2011, a multidisciplinary group of experts met to identify and prioritize research directions for obesity prevention in ECE settings that would: (1) Identify policy, environmental, and behavioral measures related to food, nutrition, and physical activity, as well as media use at ECE settings; (2) suggest promising study designs for intervention and policy research that would enhance the quality of the nutrition and physical activity environments in ECE settings; and (3) enhance the development of early career researchers and researchers from diverse racial and ethnic backgrounds. Conference funding was obtained largely through the NIH's National Heart, Lung and Blood Institute (NHLBI) and Office of Behavioral and Social Sciences Research (OBSSR), with additional support from the Robert Wood Johnson Foundation's (RWJF) Healthy Eating Research and Active Living Research programs, the Nemours Foundation, and the Altarum Institute. The purpose of this article is to report the research issues and priorities identified during this meeting.

Methods

A planning committee, made up of individuals with extensive knowledge of obesity prevention, nutrition, physical activity, and child care, was formed under the guidance of authors (D.W. and M.S.) to help to identify potential topics, speakers, and invitees. The meeting was held in Arlington, Virginia on September 26–27, 2011, with 43 participants, including faculty from a variety of universities, representatives from multiple foundations interested in child obesity prevention, delegates from multiple branches of the NIH and the United States Department of Health and Human Services, and other key leaders in ECE (available upon request). The program was organized into four sessions: Introduction and overview, measurement-related issues, intervention approaches, and policy. Following these four sessions, attendees divided themselves into roundtables to discuss research gaps related to the following five areas: Diet and physical activity

measurement, policy and environmental measures, intervention design, policy research, and capacity building. Each roundtable was responsible for generating a list of important research issues deserving further work and investigation within their specified topic area. Project staff members were present during all sessions, including roundtable discussions, to take notes and capture details around the issues raised. Presenters' PowerPoint slides and staff notes were compiled to create a summary of the current knowledge and key issues in each session. Summaries were reviewed by authors (D.W., M.S., and A.V.) who had attended all sessions. The list of research priorities drafted by each roundtable was compared against staff notes to ensure that each recommendation had been clearly captured (available upon request). After the meeting, an anonymous survey with this compiled list of priorities was distributed by email to all attendees. This list of priority research areas was subdivided into five categories (11 subcategories): Diet and physical activity measurement (general measurement issues, diet specific issues, and physical activity specific issues), environment and policy measurement, interventions (general intervention strategies, community-level strategies, organizational-level strategies, interpersonal-level strategies, and individual-level strategies), policy research, and capacity building. Within each category (or subcategory), participants were asked to choose the three to five recommendations that they felt were the "highest priority," and to rank each one selected on importance (high to low). A weighted score was created within each of the five areas (frequency of selection and level of importance), and a priority score was calculated as the percentage of the maximum score possible (*e.g.*, weighted score/maximum score).

Results

Current Knowledge and Key Issues for Future Research

Measurement of Child Diet and Physical Activity Behaviors. Speakers reviewed the best available methods for assessing child diet and physical activity in ECE settings, including the strengths and weaknesses of each method and issues for future research (summarized in Table 1).

Weighed or measured intakes, meal observations, and plate waste were presented as methods that provide a reasonable estimate of child food intake. Generally, methods with greater precision are also more susceptible to subject reactivity and are more expensive to implement. Therefore, researchers must balance the very practical issues associated with data collection and cost with the research needs and goals. Future research would benefit from the development of technology that would allow for an objective assessment of child diet (similar to how accelerometers provide an objective measure of physical activity). To facilitate comparison of findings across studies, researchers also need to build consensus around use of a

Table 1. Measuring Child Diet and Physical Activity and ECE Programs' Policies, Practices, and Environment

Measurement method and description	Strengths	Weaknesses
Assessment of Child Diet		
Weighed/ measured intakes: Trained data collectors measure all foods served to or taken by each child throughout the meal.	<ul style="list-style-type: none"> • Most precise assessment of child's intake 	<ul style="list-style-type: none"> • Most intrusive method and greatest chance for subject reactivity • Particularly challenging for meals served family style • Staffing requirements make this one of the most costly methods
Meal observation: Calculation of foods eaten by each child is based on visual estimates by trained observers.	<ul style="list-style-type: none"> • Reasonably precise method • Trained observers can assess up to 3 children at a time, thus reducing cost 	<ul style="list-style-type: none"> • Some subject reactivity, but less than weighed intakes
Plate waste: Foods provided to classroom are measured before and after meal to calculate average child consumption.	<ul style="list-style-type: none"> • Least subject reactivity • Least expensive method for diet assessment 	<ul style="list-style-type: none"> • Does not provide individual estimate of intake
Assessment of Child Physical Activity		
Proxy reports: Parent or child care provider is asked to estimate a child's past physical activity.	<ul style="list-style-type: none"> • Inexpensive • Low participant burden 	<ul style="list-style-type: none"> • Cruder method, less precision
Direct observation: Trained observers rate and record children's physical activity during a designated period of time.	<ul style="list-style-type: none"> • Good reliability and adequate validity • Also able to capture contextual information 	<ul style="list-style-type: none"> • Observation period is generally limited, therefore not able to capture habitual activity
Accelerometers	<ul style="list-style-type: none"> • Objective measure of physical activity • Considered to have good reliability and validity • Low subject burden • Able to assess habitual physical activity 	<ul style="list-style-type: none"> • Captures large amount of data which must be reduced • Disagreements about cut points and interpretation of data • More costly than other methods
Measurement of ECE Policies and Environment		
Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC): The NAP SACC self-assessment is a brief instrument that child care providers can use to evaluate their environment, policies, and practices.	<ul style="list-style-type: none"> • Quick and easy to use • Minimal participant burden • Inexpensive 	<ul style="list-style-type: none"> • Designed as part of the NAP SACC program, intended primarily as a process measure not for evaluation of effectiveness.
Environment and Policy Assessment and Observation (EPAO): The EPAO protocol is a comprehensive measure of the child care environment, policies, and practices, and includes a document review (90 items) and onsite observation (102 items).	<ul style="list-style-type: none"> • This protocol was developed as an outcome measure to assess the impact of the NAP SACC intervention but has been used by other researchers. • It is the most comprehensive measure of its kind available. • It has demonstrated reliability and validity as a measure of nutrition and physical activity policies and environmental characteristics at child care. 	<ul style="list-style-type: none"> • Expensive to implement • Requires special training and certification of data collectors
The Wellness Child Care Assessment Tool (WellCCAT): The WellCCAT focuses on assessing strength and comprehensiveness of policies using 65 items from a document review.	<ul style="list-style-type: none"> • It has demonstrated reliability and validity as a measure of nutrition and physical activity policies and environmental characteristics at child care. • Less expensive to implement 	<ul style="list-style-type: none"> • It is less comprehensive compared to the EPAO

standard and valid measure of child diet that evaluates both quantity and quality of intake.

Accelerometers, direct observation, and proxy reports are commonly used methods for assessing child physical activity. Accelerometers are often viewed as the gold standard because they provide an objective assessment; however,

there remain issues around data reduction and interpretation. Before the field has even reached consensus regarding appropriate cut points for preschool age children, new analytic approaches (*e.g.*, pattern recognition) are being proposed that have yet to be applied to data from preschool age children. Although there are many issues around how to

measure physical activity, another critical subject for future research is to determine the most appropriate physical activity behavior to measure in young children. Children have different activity patterns compared to adults, which may make adult-oriented outcomes of moderate-to-vigorous intensity physical activity less suitable as a primary outcome for studies involving preschool-age children. Inclusion of all nonsedentary intensity levels (light, moderate, and vigorous) may be more appropriate for this age group.

Attendees underscored the need for best-practice guidelines and enhanced assessment methods. Best-practice guidelines for diet and physical activity assessment in ECE settings should provide clearly defined behavior targets to measure, guidance for selecting appropriate tools/methods, advice for data reduction and interpretation, expected intraclass correlations in diet and activity of children within a center, and the number of children needed for reliable assessment of diet and activity. Desired enhancements for diet and physical activity assessment methods included integrating measures of diet and physical activity behavior with environment; adding assessments of the sociocultural environment, provider behaviors, and knowledge; and developing methods appropriate for use with children 0–2 years old.

Measurement of Child Care Policies and Environment. Speakers reviewed the few existing assessments of ECE food and physical activity environments and policies, highlighting just how new this area of research is and the many issues that still need to be addressed (summarized in Table 1). As with the assessment of child diet and physical activity, selecting an instrument is often a balance between data quality, cost, and feasibility.

Instruments like the Environment and Policy Assessment and Observation (EPAO)¹² and the Wellness Child Care Assessment Tool (WellCCAT)¹³ have published evidence of reliability and validity, but they require intensive training and access to instruments and training protocols that are not freely available. This restricted access is due in part to the desire to maintain the quality with which these protocols are implemented. Attendees expressed the need for both enhancements to and simplification of existing instruments. Those promoting enhancement wanted refinement of items assessing complex constructs (*e.g.*, pressuring children to eat, using responsive feeding practices, serving meals family style) to add clarification and more concrete examples of what these behaviors look like, so those reporting or collecting data can accurately assess them. Additionally, those using instruments to evaluate the impact of a new policy or program wanted to be able to evaluate possible moderating variables, such as effectiveness of training efforts, caregivers' willingness to adopt new practices, and perceived barriers to adopting new policies. There was also a call for these intensive and costly assessment methods to be translated and simplified to facilitate use by others. As part of this translation process, researchers need to explore how well these instru-

ments evaluate compliance of child care programs with best-practice guidelines for nutrition and physical activity.

Child Care–Based Interventions and Policy Research. Additional child care–based obesity prevention interventions are needed to build a research base that will support creation and adoption of evidence-based policies. However, the child care–based intervention studies conducted to date provide many lessons to guide future research efforts (summarized in Table 2). A 2011 systematic literature review identified only 18 child care–based interventions that targeted nutrition, physical activity, and/or obesity prevention.⁵ While many were able to demonstrate intervention effects on behaviors, only two of the five assessing weight outcomes showed positive effects. Future interventions should employ multilevel strategies and explore how to use child care programs as access points to help create linkages to families, pediatricians, and other sources of support. Minority populations (African Americans, American Indians, Hispanics), which suffer disproportionately high rates of obesity, are important targets for future interventions; however, such efforts must be culturally tailored to meet the needs of these populations. New frameworks and behavior change theories, such as the Behavior Change Wheel,¹⁴ should be used to inform intervention development, and researchers may need to look beyond their immediate field for potential frameworks and behavior change theories to employ. Future intervention and policy research would also benefit from consensus that traditional study designs and outcome measures may not be appropriate for this age group and setting. In intervention studies, high turnover rates of children make the traditional cohort design impractical. And, policy research often requires the use of natural experiments. Traditional weight outcomes (*e.g.*, BMI) are more difficult to interpret given children's natural growth and adiposity rebound at this age, yet there is no agreement on an alternative strategy. Future studies would also benefit from inclusion of measures of cost effectiveness and monitoring for unintended consequences to guide adoption of the most efficient policies and programs.

Research Priorities

Sixty-four research issues were identified during roundtable discussions across five areas—diet and physical activity measurement, policy and environment measurement, interventions, policy research, and capacity building. Among the 43 conference participants, 44% completed the follow-up on-line survey to identify research priorities. Twenty-four of the research issues received a priority score of 40% or greater (listed in Table 3). Research areas receiving the highest scores within each of the categories were as follows:

- Measurement of child diet and physical activity. Assessment of the quality of children's meals and snacks received the highest score across all categories, at 74%. In addition, enhancement of measures for children 0–2 years old, development of reliable and valid measures of

Table 2. Issues for ECE-Based Interventions and Policy Research**Intervention approaches**

- Few studies have assessed weight outcomes of child care–based interventions, and less than half (2 of 5) demonstrated positive outcomes. This failure to measure an impact on child weight may be the result of a variety of issues related to intervention approach, study design, and/or measurement.
- Successful interventions to affect children’s behavior may require more complex strategies, such as multilevel interventions guided by the Social Ecologic Model that target child (individual level), staff (inter-personal level), and policy and environment (organizational level).
- New theories or multiple theories need to be applied to address the unique structure of child care settings and the multiple targets of interest (e.g., child, staff, environment, policies, parent, community). This may require that researchers look beyond their immediate fields for potential frameworks and behavior change theories to employ.
- The most appropriate intervention length has not been determined. Existing interventions with a child-focused component have provided anywhere between 21 and 72 hours of intervention time.
- Child care workers are important in changing children’s behavior, but it is unclear what level of training is needed to effectively change staff behavior. These individuals have their own health challenges. Most are low-wage earners without insurance who are at high risk for health disparities. It may be critical to address staff’s own health issues before they take on new health promotion efforts.
- Parent engagement is another critical component because they can be important reinforcers and/or barriers for children’s behavior. However, few studies (child care or school) provide effective models for reaching parents that take into consideration the multiple demands on parents with young children (e.g., work schedules, limited resources, cultural intrusions, child demands).
- Type and structure of child care setting should be considered when planning interventions. Family child care homes are smaller operations run out of the provider’s own home. Centers and faith-based programs can vary largely in size, from just a few children to more than 100. Child care programs also vary in structure. Some programs offer year-round care while others run only 9 months; some offer full-time care and others offer only part-time care; some serve food and others do not.
- Although most child care programs are regulated at the state level, policies vary greatly from state to state. It may be impossible to create a universally accommodating intervention, but it is important for researchers to think through these issues so that they can make informed choices when designing their intervention and selecting inclusion/exclusion criteria.

Intervention study designs

- Children are naturally clustered within classrooms and centers. Depending on the intervention, children may need to be randomized by one of these groups.
- Traditional cohort designs are challenging because of the high turnover rates for children enrolled in child care. Unlike schools, enrollment in child care is optional (in the United States). It is very common for parents to move children in and out of programs often due to employment changes. A more appropriate strategy may be to intervene with the child care program and to assess repeated cross-sectional samples of children over time.
- When selecting an outcome, researchers should remember that children 2–5 years old are going through a period of rapid growth and development. Traditional indicators of weight for height (BMI, BMI percentage, BMI z-score) are crude measures for these children. Multiple measures of height and weight would allow modeling of weight gain trajectories, but this method has high participant burden and is more costly. Waist circumference and/or sum of skinfolds may be useful alternatives; however, both are technically challenging to collect, and no norms exist for comparisons.
- Other issues may be choice of outcome measure, faulty design and reporting, and lack of consideration for early life determinants (e.g., birth weight, rapid infant growth rate, sleep duration) (see below).

Considerations when working with minority populations

- Minority populations, particularly African Americans, American Indians, and Hispanics, suffer disproportionately high rates of obesity, thus making them important targets for public health intervention. Nearly half (47%) of the nation’s children younger than 5 years old are from a minority group, making child care–based interventions an important avenue to reach these populations.
- Segregation levels for African-American and Hispanic children are higher than for their adult counterparts, despite a general reduction in segregation over the last 10 years.
- African-American, American Indian, and Hispanic children also have disproportionately high poverty rates (between 31% and 35%).
- Despite the great need, many of the ECE studies regarding policies and practices have not even reported race/ethnicity of their participants. Among those that have, it seems that policies and practices vary depending on the race/ethnicity of the provider. For example, fewer Hispanic providers report eating meals together with children (24% compared to 86% of white and Asian providers); and Hispanic providers were more likely to report making children eat foods they think are good for them (85% compared to 69% of Asians and 44% of whites).
- While most ECE-based obesity prevention intervention studies report race/ethnicity, many find different outcomes depending on sample characteristics (e.g., Hip-Hop to Health, Jr).

continued on page 121

Table 2. Issues for ECE-Based Interventions and Policy Research *continued*

Policy research
<ul style="list-style-type: none"> • When assessing the impact of local, state, and federal policies, there is a wide spectrum of outcomes possible, including environment, knowledge/attitudes/beliefs, behaviors, health indicators, and disease.
<ul style="list-style-type: none"> • Structural and environmental variables include such aspects as examining the legislation enacted, funds appropriated, institutional changes (e.g., tax credits), and environmental changes.
<ul style="list-style-type: none"> • Policies can also impact knowledge, attitudes, and social norms or may change individuals' behaviors such as diet, physical activity, sedentariness, and breastfeeding; or behaviors and practices of the organization, such as food offerings.
<ul style="list-style-type: none"> • Policy makers and researchers also need to understand how the policy impacts health indicators like child BMI, or disease prevalence such as diabetes, stroke, and cancer.
<ul style="list-style-type: none"> • Randomized controlled trials are not generally practical in "real world" policy evaluation; therefore, other designs of varying degrees of strength must be employed. These include, at the lower end, single group and posttest-only designs, whereas higher-end designs include multiple time series data collection.
<ul style="list-style-type: none"> • Even in natural experiments, it is important to capture key demographic (or other) variables, to recruit a sample large enough to provide sufficient power, and to include adequate sampling of important subgroups.
<ul style="list-style-type: none"> • Policy research studies should consider what other possible groups, sites, or situations they care to generalize to.
<ul style="list-style-type: none"> • Process evaluation is also critical to insure internal validity. It is important to capture things like the extent to which the intervention was implemented, degree to which other events or experiences outside of the policy being evaluated may have affected behavior, whether enough time elapsed between implementation and the measurement of the intended effects, and any unintended effects.

provider behaviors around diet and activity, use of technology to create an objective measure of diet intake, and use of pattern recognition approaches with accelerometer data all received scores > 50%.

- Measurement of policy and environment. Development of a standard rating system for nutrition and physical activity policies was the only issue receiving a score > 50% in this category.
- Interventions. Use of financial incentives, interventions that include healthcare providers, role of screen-time, and need for multilevel interventions all received scores > 60%.
- Policy. Evaluation of the effectiveness of state-level policies and standards and evaluation of the cost-benefits associated with policies received scores > 50%.
- Capacity building. None of the issues received scores > 50%.

Discussion

The meeting was very productive in identifying the key issues related to measurement strategies, intervention design, and policy approaches for obesity prevention research in ECE settings. Themes that emerged repeatedly across sessions included the need for evidence-based policy approaches, funding challenges, and selection of the most appropriate outcomes and how to measure them. It was pointed out that the recent IOM committee report on *Early Childhood Obesity Prevention Policies*⁹ presented "evidence-informed" recommendations, because there is an insufficient evidence base on obesity prevention in child care settings. The childhood obesity crisis has driven many states to adopt policies they hope will have a positive impact on nutrition and physical activity at child care;

however, many of these policies are untested. They may have no impact, or even worse, unintended negative consequences. While this rapidly changing environment may give us pause, it also provides unique opportunities for natural experiments of which researchers should take advantage.

Current funding mechanisms present a challenge to building this evidence base. Obtaining funding using an NIH mechanism can easily take 2 years or more from the time the project is conceptualized until receiving notice of the award, and only the top 5–12% of grant applications receive funding. Foundations can provide an alternative funding channel; however, these grants are generally smaller and shorter in duration. Assessing the long-term impact of child care-based obesity prevention interventions requires following these young children into adolescence and adulthood, neither of which is likely in the current funding environment. Evaluating the long-term effectiveness of new policies and programs is critical and researchers in the United States and abroad have been struggling to address this issue.¹⁵

There is also great interest in how we define the target behaviors and outcomes measured to evaluate the impact of interventions and policies. Traditional outcome measures of diet (kcal/day) and physical activity (minutes of moderate to vigorous physical activity) are not always appropriate for children under 5. This is a period of rapid growth and development, and a child's caloric intake will be influenced by these growth spurts. Young children's physical activity looks very different from that of adults. Given children's intermittent activity patterns, perhaps a more appropriate behavior to target may be providing

Table 3. Research Priorities for Early Care and Education

Research area and research gap priority rating	Priority score (%)
Measurement of Child Diet and Physical Activity	
Develop standard and valid measures of the quality of children's meals and snacks while in ECE programs.	74
Enhance measures of diet and physical activity at ECE programs for 0- to 2-year-old children.	55
Develop valid and reliable measure of ECE provider behaviors related to children's dietary intake, physical activity, and obesity risk.	54
Explore use of technology to create an objective measure of dietary intake as well as feeding behaviors in ECE settings.	53
Apply pattern recognition approaches to accelerometer data from children under 5 years to predict sedentary, light, moderate, and vigorous physical activity and energy expenditure.	53
Explore optimal cut points for accelerometer data, particularly for sedentary behaviors (e.g., television viewing, other media use).	47
Measurement of Policy and Environment	
Develop a standard measure or rating system for ECE nutrition and physical activity policies.	54
Develop a set of indicators (e.g., checklist) that would predict if the ECE facility was complying with the best diet and physical activity practices for all age groups.	44
Examine the environmental and policy characteristics of ECE programs to determine those characteristics that provide optimal diet and physical activity opportunities for preschoolers.	42
Develop better measures for constructs within the ECE nutrition and physical activity environment (e.g., pressuring kids to eat, responsive feeding, family style, second servings, using food or physical activity as punishment or reward).	41
Develop guidelines or recommendations for what outcomes to measure when assessing policy impact.	40
Interventions	
Explore how finances and financial incentives impact intervention and policy efforts.	68
Develop and evaluate child obesity intervention strategies that include collaboration of health care providers as well as ECE programs to deliver key messages to families and their children.	66
Explore the relationship between screen time (passive, interactive, educational, and noneducational) and children's physical activity.	65
Conduct multilevel interventions using statistical methods to evaluate impact of the components at different socioecological levels (ECE facility, staff, community, parents, individual child) both individually and collectively.	61
Explore differences in dietary and physical activity behaviors of children in home care settings compared to child care center or relative care.	49
Explore strategies for engaging parents, including fathers, as partners in ECE-based promotion of healthy behaviors.	45
Explore the minimal level of intervention needed to change BMI or other health outcomes.	42
Design interventions that are cost-effective and have potential to be sustainable and generalizable.	40
Policy	
Evaluate the effectiveness of ECE standards across states.	58
Evaluate the cost-benefit associated with ECE policies and identify which components are necessary to effect change.	52
Assess burdens associated with existing and/or new policies and regulations on ECE and determine at what point regulations become too burdensome for ECE providers to remain in business or licensed.	43
Capacity Building	
Translate and simplify measurement tools for use at the local level.	44
Develop strategies for measuring the effectiveness of ECE staff training on child obesity prevention.	44
Abbreviation: ECE, early care and education.	

opportunities for active play, and a better outcome to measure may be minutes of nonsedentary time. Physical activity guidelines for early childhood from the United Kingdom, Canada, and Australia all emphasize limiting sedentary time or promoting nonsedentary time in their

recommendations for this age group.^{16–18} In addition to measures of weight, nutrition, and physical activity, researchers should also consider incorporating target behaviors and outcome measures related to other developmental outcomes such as academic performance, cognitive

ability, or quality of life. Most studies to date incorporating these outcomes have been conducted in school-age children and have shown that overweight and obese children are more likely to have lower test scores, academic performance, and cognitive functioning compared to children who are normal weight.^{19–22} These poor education outcomes may be due in part to more missed school days and greater behavior problems, both of which have been associated with child overweight.^{20,21,23} Positive findings from such cross-disciplinary studies help facilitate partnerships between professionals in public health, child development, and education, which in turn would strengthen the advocacy for disseminating obesity prevention programs and policies.

Conclusions

Creating environments that promote healthy eating and regular physical activity before children develop poor habits is critically important for obesity prevention; however, research in ECE settings is in its infancy. This gathering of research experts, leaders from national health agencies, and ECE professionals used a conference format to hear 10 experts describe significant research issues in the areas of diet and physical activity measurement, measurement of environments and policies at ECE settings, intervention and policy research, and addressing children from minority families. Through careful recording and transcribing of all discussions during the conference, as well as the final roundtable process, 64 research gaps in this area were identified. After the meeting, participants completed an on-line voting survey that allowed for the further identification of 24 priority research areas that included diet, physical activity, environment/policy measurement, intervention development and evaluation, policy research, and capacity building.

Efforts are needed to encourage funders, both federal agencies (such as NIH, CDC, and USDA), as well as foundations (RWJF, American Health Association, and others) to understand the importance of early care and education settings as critical in the fight to address obesity prevention as early as possible. Further research in this area will help identify the most promising interventions and strategies to promote healthy eating and physical activity in child care settings.

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