NCCOR
National Collaborative on Childhood Obesity Research

Advancing Measurement of Environmental and Policy Influences on Childhood Obesity

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Advancing Measurement of Environmental and Policy Influences on Childhood Obesity: Implications and Recommendations for the Field

EXECUTIVE SUMMARY

Background

The National Collaborative on Childhood Obesity Research (NCCOR) is a public-private partnership of four leading research funders—the Centers for Disease Control and Prevention (CDC), National Institutes of Health (NIH), Robert Wood Johnson Foundation (RWJF), and the U.S. Department of Agriculture (USDA)—that addresses childhood obesity through research, evaluation, and dissemination of research findings.

NCCOR aims to make an impact on childhood obesity research by creating tools for researchers and practitioners, building knowledge on key research topics, engaging with leading experts on new science, and ensuring robust communications and information dissemination. From its inception, a key priority for NCCOR has been to promote the common use of high-quality and standardized measures and methods for use with childhood obesity prevention research, including surveillance, epidemiology, evaluation, and interventions. Use of such measures enhances the potential for comparison of results across different studies and the rapid advancement of progress against childhood obesity. This progress includes the identification of individual, family, policy, and environmental factors that influence obesity risk and the development of effective interventions to address childhood obesity.

On February 27–28, 2020, NCCOR convened a workshop entitled "Advancing Measurement of Environmental and Policy Influences on Childhood Obesity." This workshop was the third in a series of three workshops and focused on identifying priorities to capture policy and environmental influences on childhood obesity. The other two workshops in the series concern measurement needs of individual behavior and measurement needs in high-risk populations, with a focus on children and families and their communities.

Workshop Aims

This third workshop aimed to convene leading experts to (1) illustrate current challenges, needs, and gaps in measurement of environment and policy; (2) discuss current practices used to adapt existing measures and develop new measures of environment and policy; and (3) determine how NCCOR can contribute to better measurement and measurement practices over the short term (1–3 years) and medium term (3–5 years) for research and evaluation on selected environmental determinants related to childhood obesity.

Workshop Proceedings

The first day of the workshop consisted of a series of panel presentations examining what policies and practices should be measured in children-specific environments and in communities. Panel presentations also examined different methods of measuring these policies and practices, including self-report, device-based, observational, mobile, and other approaches. Moderated discussions followed each group of related presentations. These discussions covered a range of topics, including ways in which environmental and policy factors contribute to, and can potentially mitigate, health inequities. The day ended with a moderated discussion of next steps to advance the science related to methods used to measure environment and policy supports for diet and physical activity.

On the second day, participants heard a final panel presentation on the data resources needed to explore the relationships between social determinants of health (SDoH) and childhood obesity, with a focus on housing and transportation. A moderated discussion followed this panel presentation. The day concluded with small group sessions in which participants discussed priorities for environmental and policy measures in the domains of the food environment, physical activity environment, and housing and transportation SDoH. Following report-outs from the small groups, the participants winnowed down the lists generated from the small groups to identify the key priorities for advancing measurement of environmental and policy influences on childhood obesity.

Next Steps

This white paper can be accessed on the NCCOR website at https://www.nccor.org/measurement-workshop-series/. White papers for the other two workshops have been posted on the NCCOR website. In addition, NCCOR plans to publish a synthesis of findings and recommendations from the three workshops in the scientific literature.

It is anticipated that recommendations from these workshops will advance the development of improved measures that can be used across a range of research, surveillance, and intervention activities related to childhood obesity. NCCOR hopes that by addressing the many levels of factors that influence childhood obesity and with focused work on environmental and policy measures, these efforts will ultimately help reduce health inequities associated with childhood obesity.

Background

One of NCCOR's main goals is to create tools and resources to make childhood obesity research more effective. A key priority is promoting the common use of high-quality and standardized measures. These measures are critical for researchers' efforts to characterize and identify the many forces influencing childhood obesity and healthy weight, develop effective interventions, and evaluate the implementation of such interventions in practice.

Through the Measures Registry, NCCOR has cataloged an extensive list of measures currently being used in the field. However, gaps still remain related to the measurement of policies and the environment. For example, neighborhood environment measures generally focus on adults, not on children. In addition, few measures have been developed on issues such as how peer and social environments influence physical activity or diet behaviors and choices, the relationships between the broad environmental contexts where children and parents spend time and their day-by-day and in-the-moment behavioral decisions, and active transportation (AT) outside of transport between school and home. Self-report measures for key environments are limited, as are measurement tools that are specific, appropriate, and valid for diverse populations.

To help advance progress in the development of measures in this field, NCCOR hosted a series of three workshops to explore next steps for measurement science relevant to diet, physical activity (PA), sedentary behavior (SB), sleep, and social determinants of health (SDoH) in children.

The first workshop examined individual behaviors, and the second workshop covered childhood obesity measurement for high-risk populations and communities.

This white paper describes the third workshop, which examined measurement needs to capture environmental and policy influences. The workshop focused on key issues for this topic, including policies and practices that should be measured in children-specific environments and in communities; the measurement of policies and practices using self-report, device-based, observational, mobile, and other approaches; and data resources needed to explore the relationships between SDoH and childhood obesity.

Key Definitions

Environments are contexts that influence more than one individual, e.g., household, institution, or community. Examples include the social and built environments.

Policy refers to laws, regulations, procedures, administrative actions, incentives, or voluntary practices of governments and other institutions.

Social determinants of health (SDoH) are conditions in the places where people live, learn, work, and play that can affect a wide range of health risks and outcomes.

SESSIONS

Session 1: What Should We Measure in Children-Specific Environments?

Session 2: What Should We Measure in Communities?

Session 3: How Should We Measure Policies and Practices Using Self-Report Methods?

Session 4: How Should We Measure Policies and Practices Using Device, Observational, Mobile, and Other Approaches?

Session 5: What Data Resources are Needed in the Social Determinants of Health Space to Explore the Relationship to Childhood Obesity?

Describing the Measurement Issues and Challenges

During five panel presentations, workshop participants discussed issues, challenges, and needs in measurement of environmental and policy influences on childhood obesity and described new advances in research and practice. Moderated discussions with two discussants, one representing a research perspective and the other a practice perspective, followed each group of related presentations. The presentations are summarized in this section of the white paper. The following section, beginning on page 16, synthesizes cross-cutting themes that emerged from the presentations and discussions and highlights the actionable steps to address short- and medium-term measurement needs that were identified as priorities.

SESSION 1: WHAT SHOULD WE MEASURE IN CHILDREN-SPECIFIC ENVIRONMENTS?

1 **Measurement of Policies and Practices to Support Diet in Child Care and Schools**
Dianne Stanton Ward, EdD, University of North Carolina, Gillings School of Global Public Health

2 **Measurement of Policies and Practices to Support Physical Activity in Child Care and Schools**
Russell Pate, PhD, University of South Carolina, Arnold School of Public Health

Discussants:
Terry T-K Huang, PhD, MPH, City University of New York, School of Public Health
Carmen N. Daniel, MPH, Georgia Shape

1 Measurement of Policies and Practices to Support Diet in Child Care and Schools
Dianne Stanton Ward

Importance of This Topic for Childhood Obesity

Children's dietary practices are influenced by multiple sources, including family, friends, and other adults. Environmental exposures throughout a child's day, such as home and organizational settings, are influential as well. More than 60% of all children not in kindergarten are enrolled in some type of out-of-home care, including early care and education (ECE) and afterschool programs. Administrators, teachers, and support staff can influence children's eating practices through educational priorities, practices, and polices implemented in the child care setting; this includes providing food and beverages to children. They also affect eating behaviors through activities within this setting related to the way children are fed. The "4 Ps"—Provisions, Practices, Planned education and outreach, and Policies—is a useful mnemonic that summarizes the different avenues of influence.

Key Challenges

Key challenges include the need to identify specific influences among the "4 Ps" that are pertinent to organizational settings, and to identify strategies for assessment that are both practical and relevant.

2 Measurement of Policies and Practices to Support Physical Activity in Child Care and Schools

Russell Pate

Importance of This Topic for Childhood Obesity

The amount of time children in child care centers and K-12 schools spend in different types of environments plays a major role in how physically active they are. These environments include those that **require** physical activity, **encourage** physical activity, **allow** physical activity, and **discourage or prevent physical activity**. A number of practices determine which of these categories the environment falls into. For child care centers, practices include the provision of adult-led physical activity, inclusion of physically active instructional practices, provision of unstructured outdoor time (i.e., recess), provision of unstructured indoor play time, and elimination of screens for non-instructional purposes. For K-12 schools, practices include support of active transport to/from and within school, provision of physical education, provision of classroom exercise breaks, provision of open classrooms and physically active instructional practices, and provision of physical activity programs before and/or after school. Resources related to the measurement of physical activity in these settings include the National Physical Activity Plan, a 2019 NASEM report on physical activity surveillance, the School Health Policies and Practices Study, the National Physical Activity Report Card for Children and Youth, a new child care surveillance system being developed by CDC, and observational tools to assess activity and related behaviors in children.

Key Challenges

A key challenge to encouraging changes in children's environments is the limited appreciation of the impact of physical activity on children's health by policy makers at the local, state, and national levels. Limited resources to plan and implement a comprehensive surveillance system for monitoring compliance with key practices and policies is a second challenge.

Discussants: Summing Up and Providing Context to the Presentations

Session 1 moderator, Jill Reedy, invited two discussants to add their perspectives to the presentations:

- **Terry Huang** provided a research perspective, noting the importance of taking a whole-of-child care and whole-of-school approach in measuring children's diet- and physical activity-related behaviors. This approach permits an assessment of the roles that health programs and curricula as well as the social, built, regulatory, and community environments play in enabling or impeding the implementation of programs and policies. This approach also takes into account the temporal context—the fact that child care or school experiences occur within the framework of a dynamic day. Measures of implementation and systems change are important and warrant further research and development. In addition, mixed methods incorporating qualitative and quantitative approaches, systems science methods, and methods from other disciplines are needed to generate new insights and new progress. The wemoveschoolsforward.com website includes examples of design guidelines to promote healthy eating and activity decisions throughout the school day.
- **Carmen Daniel** brought a practice perspective to the discussion, explaining that Georgia Shape, the state's childhood obesity prevention initiative, uses a number of methods to influence the adults who are interacting with children. Helping adults model appropriate nutrition and physical activity behaviors is one such method. Given the constraints and realities facing school administrators, teachers, and other staff, it is important to set realistic and equitable expectations and goals in assessment practices. Obtaining buy-in from staff at all levels and providing adequate and appropriate training in nutrition and physical activity issues are key challenges.

SESSION 2: WHAT SHOULD WE MEASURE IN COMMUNITIES?

1 Measurement of Policies and Practices That Influence Development from Birth to 24 Months in Hospital and Community Settings

Rafael Pérez-Escamilla, PhD, Yale School of Public Health

2 Measurement of Policies and Practices that Influence Diet in the Home and Communities

Bethany Bell, PhD, MPH, University of South Carolina, College of Social Work

3 Measurement of Policies and Practices that Influence Diet Related to the Food Service Guidelines

Steve Onufrak, PhD, Centers for Disease Control and Prevention

4 Measurement of Policies and Practices that Influence Physical Activity in Communities

Brian Saelens, PhD, Seattle Children's Hospital

Discussants:
Jamie Chriqui, PhD, MHS, School of Public Health and Institute for Health Research and Policy, University of Illinois at Chicago
David Rouse, FAICP, ASLA, Urban and Regional Planning Consultant

1 Measurement of Policies and Practices that Influence Development from Birth to 24 Months in Hospital and Community Settings

Rafael Pérez-Escamilla

Importance of This Topic for Childhood Obesity

Several important measurement goals for the Birth to 24 Months age group have been achieved. For example, most Healthy People 2020 Breastfeeding Goals have been achieved, even though racial and social inequities persist. The Baby Friendly Hospital Initiative is effective at improving breastfeeding when it is delivered by well-trained personnel, and its coverage continues to spread. Breastfeeding counseling has been mainstreamed through the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). The CDC's Breastfeeding Report Card and Maternity Practices in Infant Nutrition and Care (mPINC) survey have helped foster and document progress with breastfeeding protection, promotion, and support efforts nationwide and by state.

Key Challenges

Further improvements in breastfeeding practices across the health care system continuum—prenatal, perinatal, postnatal (i.e., facilities and community systems)—will require investing in complex, multilevel (national, state, county) quality assurance and smart management information systems that facilitate stronger coordination across different sectors including health, social protection, labor, and education, and across the continuum of care. Measurement needs include ensuring that breastfeeding counseling monitoring systems are informed by the 2018 World Health Organization Breastfeeding Counselling guideline. In addition, the Joint Commission exclusive breastfeeding indicator needs to be properly monitored and addressed for hospital reaccreditation. The quality of breastfeeding care needs to be assessed and monitored, taking into account the perspectives of mothers, families, and providers.

2 Measurement of Policies and Practices that Influence Diet in the Home and Communities

Bethany Bell

Importance of this Topic for Childhood Obesity

The focus on relationships between space (e.g., neighborhoods, schools) and health has exploded in the past two decades. Even though considerable work has been done to conceptualize and define the built food environment, research findings are mixed when examining the relationship of the built food environment and dietary outcomes. Research should move beyond the built food environment and consider predictors across multiple domains that have known associations with dietary outcomes. These domains include eating identities, perceptions, shopping behaviors, and demographics. Other possible areas to examine include social support for healthy eating, perceived control of healthy eating, and food security status; these have not yet shown statistically significant associations with dietary outcomes. One such project is FoodNEST 2.0, a systems modeling approach that maps complexities and dynamics of the local food system to identify levers that could impact economic opportunity, food security, and nutrition equity.

Key Challenges

Two issues need substantial attention, but it will be challenging to develop measures to assess and understand them. These issues are 1) how income and other financial resources drive food choices and 2) the nature of the association between neighborhood perceptions about access to healthy foods and dietary outcomes.

3 Measurement of Policies and Practices that Influence Diet Related to the Federal Food Service Guidelines

Steve Onufrak

Importance of this Topic for Childhood Obesity

Food service guidelines (nutrition standards for foods sold, served, and distributed) ensure that healthy choices are served and/or available in a variety of community settings such as cafeterias, vending machines, concession stands, and feeding programs. Avenues for enacting guidelines include state, municipal, organizational policies, food service contracts, and informal agreements. Though the influence of guidelines might seem small in less-frequently visited settings, the collective influence of these guidelines across settings has sizable potential for population impact. Community venues that may reach children include park vending machines and concessions stands; youth sports facilities and other recreation programs; summer feeding programs; museums and other recreational attractions for children; churches and faith-based institutions; juvenile detention facilities; government facilities used by children such as libraries; and food pantries. Nutrition standards can also be a part of federal/state feeding programs. For example, programs such as park and recreational summer programs can participate in the USDA summer food service program and by doing so, the associated nutrition standards for the USDA program are applied to that park and recreational program. Likewise, nonprofit juvenile detention centers (such as those run by states) are also eligible to participate in the National School Lunch Program (NSLP) and School Breakfast Program (SBP). Centers that participate would apply those federal nutrition standards to those facilities.

4 Measurement of Policies and Practices that Influence Physical Activity in Communities

Brian Saelens

Importance of this Topic for Childhood Obesity

Recently, considerable effort has gone into developing measures of built environment, such as those related to land use, density, and park availability and quality. Children's transportation-related physical activity has been shown to be related to school proximity and other transportation environment factors (e.g., traffic safety), but evidence is mixed on how much neighborhood environment is related to children's leisure or overall physical activity. Social and perceived environments of neighborhoods also have been examined as potential correlates of children's physical activity, but associations are weak and/or inconsistent. Environments within children's homes also may be important environmental determinants of children's PA and SB. Community contributions are powerful and necessary components of how built and transportation environments are designed and what they become, but measures for such community engagement in environment decision-making are lacking.

Key Challenges

One key challenge is that many neighborhood environment measures originate from transportation and urban planning and are focused on adults, not on children. In addition, the processes and decision-making that ultimately determine transportation and built environments are complex and have long timelines. A second challenge is that peer and social environment factors in a child's neighborhood could significantly influence children's physical activity, but they may be unmeasured or difficult to measure. Another challenge is that even though access to, and use of, screens and digital technology are increasing rapidly, measures of screen availability and parental limits on screen time are inadequate, particularly across stages of youth development (e.g., preschool vs. adolescents).

Discussant: Summing Up and Providing Context to the Presentations

Session 2 moderator, Steve Onufrak, invited two discussants to add their perspectives to the presentations:

- **Jamie Chriqui** shared a research perspective, noting that work in this area is messy and challenging because so many factors influence childhood obesity. Surveillance is needed at all levels to understand what is occurring nationwide because interventions may be effective in some areas but not in others. The NCCOR Catalogue of Surveillance Systems can help in this regard. She also spoke about the term "policy," explaining that policy is not "one size fits all" and that it is important to be clear when using the term. The effect of policy varies depending on the setting and structure in which it is implemented. There is a difference between "Policies" (with a capital P), such as those promulgated by state or federal agencies, and "policies" (with a lowercase p), such as those instituted by organizations. For example, recess policies vary by school district in terms of frequency, timing, and exceptions. Finally, she noted that measurement strategies vary depending on whether the food or physical activity environment is the focus. Researchers must recognize the differences between population-level exposures vs. neighborhood-level exposures.
- **David Rouse** provided a practice perspective, explaining that the community planning process incorporates five strategic points of intervention that can be used to advance a holistic planning approach to influence breastfeeding, diet, and physical activity at the community level. These intervention points are 1) community engagement; 2) creation of functional transportation, housing, parks and recreation, and neighborhood plans; 3) enactment of standards, policies, and incentives; 4) efforts to influence private development project outcomes; and 5) public investment in facilities and infrastructure. Examples of planning interventions that could promote positive change include engaging community members in the planning process, mixed-use zoning to allow retail uses near residences, and park investments that promote active recreational use. He concluded by noting that planners need easy-to-use measures for which data are available to monitor progress in achieving the goals set through a community planning process. However, current measures used by planners are tied to spatial access or other factors that do not account for behavioral and perceptual influences and complexities of the built environment. In addition, it is difficult to translate findings of environmental, behavioral, and social research into measures that can be readily applied in community planning practice.

SESSION 3: HOW SHOULD WE MEASURE POLICIES AND PRACTICES USING SELF-REPORT METHODS?

1 Self-Report from Individuals (Perceptions)

Shannon Zenk, PhD, MPH, FAAN, Institute for Health Policy Research, University of Illinois at Chicago

2 Self-Report from Key Informants in Diverse Settings

Lorrene Ritchie, PhD, RD, University of California Agriculture and Natural Resources, Nutrition Policy Institute

Discussants:
Leslie Lytle, PhD, University of North Carolina, Gillings School of Global Public Health
Anu Pejavara, MPH, Centers for Disease Control and Prevention

1 Self-Report from Individuals (Perceptions)

Shannon Zenk

Importance of this Topic for Childhood Obesity

Both the actual environment and perceptions of environment can be associated with childhood obesity. One source of information is self-report about the environment. Sources of self-reported environmental measures include children, their parents/caregivers (proxy reports), or information from residents in a neighborhood. Self-report measures reflect people's interpretations of their environments and tend to have stronger associations with behaviors and weight outcomes than do objective measures of the environment that are derived, for example, from audits or administrative data. Even though research to understand associations between environment and behavior is expanding rapidly, the development of measures with established reliability and validity has not kept pace. In particular, measures to capture the broader environmental contexts where children and parents spend time and make day-by-day and in-the-moment behavioral decisions are limited.

Key Challenges

Key challenges include the limited availability of self-report measures for key environments, inadequate testing of reliability and validity, difficulties in interpreting measures related to some environmental settings, and lack of self-report measures in important data sources such as electronic health records. Other challenges include a sole focus on home and even school neighborhood environments, when broader environments where people conduct activities and spend time should also be considered. Moreover, few real-time environment measures with demonstrated reliability and validity are available.

2 Self-Report from Key Informants in Diverse Settings

Lorrene Ritchie

Importance of this Topic for Childhood Obesity

It is unlikely that the high prevalence of child obesity will be reversed with simple interventions in single settings. Moreover, communities may want to tailor interventions to local needs and priorities. This complexity makes child obesity prevention challenging to study using randomized, controlled trials where interventions are tightly controlled and implementation fidelity is assessed. The other approach—naturalistic experiments and observational studies involving multiple simultaneous interventions over time—presents challenges in objectively assessing what, when, how, and with whom interventions were undertaken. Researchers often must rely on self-report from community stakeholders in diverse settings where nutrition and physical activity programs, policies, and environmental changes are implemented.

Key Challenges

Relying on self-report from key informants presents several challenges. The first involves identifying individuals who have detailed knowledge of community programs and policies across multiple settings. Collecting sufficient specific data from the key informants without undue burden and recall error also can be challenging. A third challenge is determining how to collect comparable data across multiple settings and multiple types of interventions. A final challenge is identifying the best means of "scoring" the information obtained so that it can be summarized and compared over time and across multiple types of interventions and be meaningfully related to measures of child adiposity-related outcomes.

SESSION 4: HOW SHOULD WE MEASURE POLICIES AND PRACTICES USING DEVICE, OBSERVATIONAL, MOBILE, AND OTHER APPROACHES?

1 Audit Tools

Natalie Colabianchi, PhD, University of Michigan

2 New Technological Methods

J. Aaron Hipp, PhD, North Carolina State University

3 Use of Existing Data

Jamie Chriqui, PhD, MHS, School of Public Health and Institute for Health Research and Policy, University of Illinois at Chicago

Discussants:
Leslie Lytle, PhD, University of North Carolina, Gillings School of Global Public Health
Anu Pejavara, MPH, Centers for Disease Control and Prevention

1 Audit Tools

Natalie Colabianchi

Importance of this Topic for Childhood Obesity

Audit tools are traditionally used to collect systematic, direct observations of the environment. Multiple tools are available that can be used to assess environments relevant to childhood obesity. These environments include parks and playgrounds, streetscapes, grocery stores, school environments, child care environments, worksites, and the home environment. Audits are usually completed on foot but can be completed in other ways, such as by car or remotely. They are often completed to objectively assess features that are not available in existing databases, such as quality of park features or presence of litter.

Key Challenges

The use of audit tools presents three major challenges. The first is usability: Audit tools need to continue to evolve to be useable by both researchers and community members. Attention to aspects such as length, accessible trainings, and streamlined data processing is needed. The second challenge is comparability: The ability to compare findings across studies will advance the field. Efforts, therefore, must be made to allow for comparisons across audit tools. The third challenge is inclusivity: Audit tools should be relevant for diverse populations, such as persons with disabilities and rural populations.

2 New Technological Tools

J. Aaron Hipp

Importance of this Topic for Childhood Obesity

Emerging technologies and big data offer new and intriguing methods for evaluating the environments where children and families are physically active. These big data are now being combined with emerging machine learning technologies to locate street trees, sidewalks, crosswalks, curb cuts, physical disorder, and other built environment attributes important for studying influences on childhood obesity. Big data associated with mobile phones and their apps are now being accessed and used to understand where people are, and are not, active; their sentiments and preferences while there; and with whom they may be interacting. Other advances include digital technologies, which can capture real-time images and video along with additional environmental sensors, including air quality and decibels of sound. Video can be combined with edge computing technologies to create algorithms that can be used to annotate these images for predetermined data, such as walkability features and use of space. Advances in big data and emerging technologies present new opportunities for visualizing and sharing data with communities, stakeholders, practitioners, policy makers, and researchers.

Key Challenges

New technologies and big data highlight several challenges (the 4 V's). The first is **vernacular:** Public health, urban planning, and parks and recreation are distinct fields with unique jargons, but technological advancements require collaboration between these fields and with additional multi-disciplinary fields that also have their own terms and acronyms. The second challenge is **value**: Working across fields requires added value for each, such as improved public health surveillance and improved computer vision algorithms. Big data and technology have great potential public health value, but most of these sources and methods were not developed with public health in mind. Value also refers to the importance of personal, especially phone and app, data to individuals, who are often not aware of data sharing settings on their devices and programs. The third challenge is **vulnerability:** A digital divide remains in access and use of smart phones, apps, and the ability to use resources such as Google Street View and webcams to evaluate active living and communities. The fourth challenge is **visualization:** Visualizations of data and use of technologies and big data require analytic advances so that researchers do not have to use terabytes of image data to produce a simple yes/no dichotomy or to represent a mean.

3 Use of Existing Data

Jamie Chriqui

Importance of this Topic for Childhood Obesity

Although a number of surveillance systems ask for self-reported information on policies and practices that are relevant to childhood obesity (e.g., the CDC's School Health Policies and Practices Survey, USDA's School Nutrition and Meal Cost Study), self-reported policy data often reflect what is happening in practice rather than formally adopted policies. To truly measure implementation and impact of "on-the-books" policies, researchers must first have accurate data as to how policies are enacted. Furthermore, researchers need to account for the complexity of linking policy data to environmental and outcome data and the challenges associated with such linkages.

Key Challenges

Studies that seek to evaluate the impact of policies on obesity-related outcomes need to rely on systematic data collection methods to ensure comparability in what is being measured and, ultimately, evaluated. Without such precision in the measurement of the policy data, analyses linking policy data to environmental and other outcomes will be compromised. Other challenges associated with measuring and evaluating policy influences relate primarily to linkages between policy data and environmental or other outcomes. First, it is important to ensure a "conceptual match" between the policy data and the environment or outcome measures to which the policy data are being linked. Second, it is essential to have geocodes in large, national administrative data sets that correspond to the policy jurisdiction of interest. Third, it is important to ensure that the policies have been adopted and have time to take effect before the outcome being measured. It is important to recognize the need for accounting for policy lags when linking policy data to outcomes. Finally, because of the limited availability of longitudinal national data sets for linking on a large scale to policy data compiled from across the United States, many studies are forced to examine associations between policies across the United States rather than their impact on outcomes. This leads to endogeneity concerns.

Discussants: Summing Up and Providing Context to the Presentations

Session 3 and 4 moderators, Susan Carlson and David Berrigan, invited two discussants to add their perspectives to the presentations:

- **Leslie Lytle** provided a research perspective, noting that environments can be thought of as macro-environments (city, state, or nation) or as micro-environments (home, school, or neighborhood). Evaluating macro-environments will often rely on existing data collected from state and federal agencies. Tools to assess micro-environments are often more relevant to the work of researchers and practitioners because they provide insights into why obesity risk varies from community to community and can inform policies and practices. Efforts to achieve sustainable community-wide change by influencing policies and practices should follow four principles: 1) engage in community partnerships, 2) develop evaluation tools that have established validity and reliability and are appropriate and specific for the community where they will be used, 3) ensure that these tools are linked to relevant policy levers for change and are designed to shorten the time between evaluation and potential community change, and 4) keep the big picture in mind. She noted that two major challenges are the lack of measurement tools that are specific, appropriate, and valid for diverse populations, and the fact that environmental assessment tools are often resource intense and difficult to translate into actionable items, which delays the time between agenda setting and decision-making in the policy process.

- **Anu Pejavara** brought a practice perspective to her remarks, explaining that interventions that use policy, systems, and environmental (PSE) approaches at the population level can expand the reach of public health efforts by establishing frameworks in which simpler and healthier choices become the default options in places where Americans work, live, and play. State and local recipients of CDC's Division of Nutrition, Physical Activity, and Obesity (DNPAO) cooperative agreements are tasked with implementing PSE strategies and monitoring their impact. Performance monitoring and outcome evaluations present a unique opportunity to contribute to practice-based evidence and move the field forward. Due to the varied context of recipients' states and communities, identifying common methods for measuring PSE changes is challenged by difficulties in determining how best to monitor contextual factors and in balancing the need for culturally tailored approaches vs. the need to use standardized methods to capture valid measurement data. Suggestions when working with funded DNPAO programs include the following: 1) consider recipient burden and capacity when prioritizing data collection instruments, 2) engage key community partners in the evaluation design, 3) ensure recipients use mixed methods to fully capture impact and community context, 4) leverage big data or crowdsourced data, and 5) ensure that evaluation findings are shared in a timely fashion.

SESSION 5: WHAT DATA RESOURCES ARE NEEDED IN THE SOCIAL DETERMINANTS OF HEALTH SPACE TO EXPLORE THE RELATIONSHIP TO CHILDHOOD OBESITY?

1 Housing as a Social Determinant of Health

Craig Pollack, MD, MHS, Johns Hopkins Bloomberg School of Public Health

2 Transportation and the Social Determinants of Health Among Children

Richard Larouche, PhD, University of Lethbridge

Discussants:
Tamara Dubowitz, ScD, SM, MSc, RAND Corporation
Byron Rushing, Atlanta Regional Commission

1 Housing as a Social Determinant of Health

Craig Evan Pollack

Importance of this Topic for Childhood Obesity

Health outcomes and costs are related to multiple aspects of housing and the surrounding neighborhoods, each of which presents unique challenges and opportunities for data collection and integration related to childhood obesity. At least four aspects of housing have been linked with health. **Stability** refers to a spectrum that includes homelessness, frequent moves, falling behind on rent, or couch surfing. **Quality and safety** describe the environmental factors that have been shown to influence health, such as lead exposure, mold, and poor ventilation. **Affordability** indicates the amount of money that households pay on rent and utilities relative to their income. **Neighborhood characteristics** include features of the built and social environment. The Moving to Opportunity for Fair Housing Demonstration Program attempted to disentangle the impacts of neighborhood context and neighborhood people composition. Based on the findings that children who received housing vouchers had lower rates of hospitalization and lower hospital spending over the long term, a Congress appropriated $25M in 2019 and $25M + $3M for evaluation in 2020 for a new housing voucher demonstration program to help low-income families move to lower-poverty neighborhoods. The U.S. Department of Housing and Urban Development (HUD) is permitted to require random selection of families eligible to receive mobility assistance, which could enable use of the program by public health stakeholders to explore the relative impacts of neighborhood context and individual characteristics on obesity-related outcomes.

Key Challenges

Housing measurement presents several key challenges. First, multiple tools exist, and housing measures often lack standardization and have not been validated. Second, self-reported exposures may differ from objective measures. For example, both under- and over-reporting

of federal housing assistance have been shown when these data are compared to administrative records. Third, family decisions about where to live are not random, potentially confounding results. Fourth, housing studies are often cross-sectional, but housing and neighborhood environments likely have long-term impacts, which require a life course perspective. Finally, renters and homeowners face similar concerns (e.g., fear of eviction vs. foreclosure).

2 Transportation and the Social Determinants of Health Among Children

Richard Larouche

Importance of this Topic for Childhood Obesity

Transportation is an overlooked SDoH that influences access to multiple settings and has the potential to interact with other SDoHs. Among children and youth, consistent evidence indicates that active transportation (AT) is associated with higher physical activity and that cycling to and from school is associated with greater cardiovascular fitness. However, the evidence on associations between AT and obesity is mixed. Despite its benefits, the prevalence of AT to and from school has decreased markedly over the past few decades in several countries; increasing distance appears to be the largest contributor to this decline. Since the late 1990s, researchers have investigated the role of the built environment in influencing AT, and multiple walkability indices that can predict adult AT, and even obesity, have been developed. However, relationships between walkability indices and children's AT are inconsistent, and few studies have examined AT to non-school destinations (e.g., parks, shops, friends' and relatives' houses). Improved instruments to measure trips to such places are needed. Transportation also may intersect with poverty. Despite higher rates of AT in children from low-income households, poverty is associated with obesity. Low-income communities also appear to face barriers to implementing AT interventions, such as Safe Routes to School and walking school buses. These findings point to a need for evaluation of AT interventions in low-income neighborhoods based on comprehensive models, such as the REAIM framework.

Key Challenges

An important source of physical activity, AT is a complicated construct to understand. Poverty can lead children to engage in AT despite living in unsafe environments that might otherwise discourage AT. Long distances between home and school are a critical barrier to AT, but traffic may deter children from engaging in AT even if they live close to school. Other challenges in measuring transportation are that walkability indices may not capture key built environment determinants of AT and the overwhelming majority of AT studies among children have focused only on the school trip.

Discussants: Summing Up and Providing Context to the Presentations

Session 5 moderator, Heather Devlin, invited two discussants to add their perspectives to the presentations:

- **Tamara Dubowitz** shared a research perspective, noting that researchers and practitioners need to expand the definition, understanding, and measurement of features of the social and built environments if they are to obtain a full understanding of the factors that directly affect diet, physical activity, sleep, and other behaviors relevant to childhood obesity. The field needs to think outside the box and across sectors, but this approach faces a number of practical difficulties. She urged the field to recognize that a neighborhood's socioeconomic conditions are an integral part of the food and physical activity environment, to understand that diet and physical activity behaviors co-exist with other health behaviors, and to consider other outcomes besides body mass index and obesity. She also noted that researchers tend to examine issues on a national level, but action occurs at the local level. Doing deep dives into local communities and obtaining local-level data can yield important insights. Natural experiments are needed but are difficult to conduct.
- **Byron Rushing** brought a metropolitan planning perspective to the session's presentations. He demonstrated technical computer monitoring results, which show how trip distances influence the mode of transport: Once trips hit one mile, walking drops off. Bicycling trips are generally 1–3 miles. Half of car trips are <4.5 miles and 25% of driving trips are less than one mile. Transit trips are 5–15 miles, and most start or end with walking so those routes always need sidewalk and crosswalk components. He is particularly interested in understanding more about driving trips of less than one mile. Much of the Atlanta Regional Commission's training and technical assistance work focuses on walkable and semi-walkable areas, especially in high-density urban areas and 4-lane roads, which are the most dangerous roads for walkers. Rushing concluded by noting that many transportation mandates exist, and they are generally focused on improving safety or mitigating congestion. He noted that the Commission has tried to use a broad approach that also includes housing, health, and other factors in its efforts to build a region where it is easy and safe for everyone to walk or bike.

IDENTIFYING CROSS-DOMAIN PRIORITIES TO

Advance Measurement of Environmental and Policy Influences on Childhood Obesity

During the presentations and subsequent discussions, a number of priorities emerged for advancing environmental and policy measurement, with an added focus on the social determinants of housing and transportation. In addition, participants were asked to consider short- and medium-term actionable steps that would be top priorities for NCCOR to pursue. Groups considered the following questions to guide their discussions:

For each domain (food environment, physical activity environment, and housing and transportation) as a social determinant of health:

1. **What are the gaps that most need to be addressed?**
    a. **For researchers? For practitioners?**
    b. **Are there unique needs for measurement of environment and policy supports by age group?**
    c. **Are there needs related to development of metrics and data collection? Data linkages? Getting local data?**
    d. **What are the needs for data integrations across the different methods, with other data, or across domains?**
2. **What challenges would need to be overcome to address these gaps?**
3. **What are some promising and emerging ways to address these gaps, and what is needed to begin addressing them?**
4. **What are some top priorities to advance the science in the next 5 years (short- to medium-term)?**

Several cross-cutting themes and priorities emerged during the workshop and are discussed here.

Specific priorities are listed in the tables that follow.

1. Identify measures, methods, and approaches for collecting data where little information exists.

Advancing progress in environmental and policy measures requires a solid understanding of the environments in which children live, eat, are physically active, and interact with others. However, large gaps currently exist in this knowledge, and a priority is to identify measures, methods, and approaches for collecting these data.

Researchers and practitioners need to understand more about how to measure children's social environments generally. The child psychology field may already have some insights that would be useful to glean. In addition, the digital environment is a key new element of social ecology; some have referenced the need to measure the "screenome."

It also would be useful to consider gaps in knowledge about the influences of social environments on diet and physical activity behaviors specifically. The Community Guide highlights evidence that suggests social support can promote increased physical activity in adults. However, more work is needed to understand social supports for PA in children and adolescents. Social supports may be occurring with nutrition as well (e.g., one study of electronic health records (EHR) and nutrition showed that 15% of participating families said they changed their behaviors when clinicians asked about intake of sugar-sweetened beverages as part of EHR questions).

It is challenging to learn about the totality of children's food environments because few surveillance measures exist outside of schools and ECE settings. Alternative sources of data to help characterize the food environment could be considered, such as data from zoning policies or data on crime, that provide context for food accessibility, shopping practices, and other relevant safety features within a community. Another potential approach to learning about children's food environments is to obtain access to food retail data sharing agreements. For example, researchers are trying to understand the impact of kids' meals default beverage policies by doing intercept surveys, which are time intensive. Access to retailers' sales data could help answer that question.

Detailed data on where and how child-level physical activity occurs also are greatly needed. Information is needed about child-level physical activity beyond merely whether children are meeting physical activity guidelines. Researchers and practitioners need to know more about where and how children are physically active and about the prevalence of programs and resources that exist to support children's physical activity.

As part of this effort, both new measures and new methods will need to be developed. New measures could include local-level measures that are relevant for assessing physical activity environments, such as those on safety, crime, lighting, and other amenities. New analytical methods could include approaches for conducting analyses using non-traditional data sources, such as EHR and big data. New statistical methods for small area estimates also are needed.

There is also a need for development and use of measures that integrate multiple environmental supports for physical activity. Resources that have indices or could be used to develop these indices could include the AARP Livability Index, the Canadian 8-80 Cities planning construct (i.e., a construct stating that a planning design that works for individuals ages 8 years and 80 years will work for all), and the Active Communities Tool from CDC.

Data on active transport is another major gap in knowledge about physical activity environments. Surveillance data are limited, and the available data do not provide insights into community-level AT. Data on AT, beyond just to school, is lacking and should be collected. Data on AT to school should be strengthened to include measures of policies, behavior, and other relevant factors. In addition, many children live too far from school to use AT, and it would be helpful to develop measures to quantify this factor.

2. Create measures with public health practitioners and community members in mind and develop improved approaches for engaging with communities in equitable and culturally appropriate ways to ensure that efforts to create measures include those relevant to community concerns and needs.

A variety of strategies are needed to truly engage communities in research and interventions focused on improving community environments to reduce childhood obesity. One potentially important strategy is to frame research projects and interventions around issues that communities themselves identify as important, such as climate change or the need for multidisciplinary solutions to local problems. This would help to place childhood obesity issues within a broader community environment context, which could facilitate new partnerships to advance progress. For example, a school-based intervention could be framed so that its outcomes of interest are aligned with the priorities of educators. Interventions in communities whose priorities are safety or economic prosperity could be developed within partnerships with community sectors who are responsible for those issues.

Focused and deliberate conversations with community members are required to understand their issues of concern and to engage diverse segments to ensure that everyone is included. Successful community engagement also requires proactive approaches to work with communities to identify modifiable environmental determinants of obesity and factors behind disparities in outcomes. Involving communities in collecting and interpreting data is critical. These efforts could be part of an initiative to measure the amount and quality of community engagement in all types of community planning.

Particular attention must be paid to populations that have previously received little attention, such as immigrant populations. Different acculturation pathways lead to different lifestyle behaviors among immigrants, and the way immigrants respond to interventions are influenced by their acculturation pathways. Good measures of perceived discrimination have been extensively tested in African American communities and could be adapted for this purpose. Researchers and practitioners also will need to acknowledge issues of equity and access and ensure that sophisticated online and cell phone methods of engaging communities do not leave out people who do not have cell phones and computers.

Pursuing this kind of approach will require flexible design thinking to evaluate continually evolving behavior change activities in different kinds of communities. Researchers and practitioners also will need to develop new methods and approaches to address declining survey response rates, such as using hybrid approaches for surveillance and data collection. Methods to combine and triangulate data may be especially useful in this respect. The NIH Office of Disease Prevention webinar, *Developing and Validating Metrics and Measures for Stakeholder Engagement in Research*, may be a useful resource.

3. Create new approaches for optimizing measurement, incorporating measures into existing sources of data and disseminating them widely.

With increasing recognition of the need for focused attention on environmental and policy influences on childhood obesity, creating new measurement approaches and disseminating them widely to leverage their impact and improve learning is a critical priority. This can be accomplished in a variety of ways.

One approach is to optimize the availability and usefulness of data. Publishing and finding additional ways to use data that have been collected but are currently unpublished could help with longitudinal research. Finding new uses for existing data could also be valuable. For example, decades of existing climate change data could be mined to assess how climate change affects physical activity (e.g., examining impacts of fires in California, which prevented children from going outside to play). Biases in these sources of found and repurposed data would need to be identified, however. Researchers will need to determine who is not in the data and address endogeneity issues.

Another potentially useful activity would be to assess and identify the most important data linkages among physical activity, nutrition, weight, sleep, and SDoH and create a roadmap to link the growing body of existing work on SDoH to childhood obesity, similar to the existing Health and Transportation Affordability Index. A third option is to identify ways to work with private sector groups to access proprietary data.

A fourth approach is to improve surveillance systems, especially modernizing ECE and afterschool (particularly school-based) surveillance systems. For example, a recent Committee on Strategies for Implementing Physical Activity Surveillance at the National Academies suggested three actions to improve ECE surveillance around physical activity: 1) CDC should implement a system for monitoring existing state-level policies for the promotion of physical activity in child care settings; 2) CDC should incorporate the existing procedures for describing and assessing state regulations relevant to promotion of children's physical activity in child care settings into a comprehensive surveillance system that monitors both pertinent state regulations and setting-level practices in all the states; and 3) CDC should implement a national system for monitoring the implementation of physical activity practices at the child care center level.[2]

Finally, researchers and practitioners can advance the field by creating and promoting new and existing measures. They could create action-oriented measures with input from a variety of sectors and decision makers and position them so that they can be widely applied. Companion tools that show how to tailor these measures to specific communities also are needed. This could be done by identifying key elements that any user should collect and then allowing customized items to be collected based on users and community needs. In addition to the measures available in the NCCOR Measures Registry, NCCOR could encourage the use of standardized, common measures.

Greater dissemination of existing and new data also could be accomplished through data repositories and warehouses.

4. Create new platforms through which researchers and practitioners from various disciplines and sectors can collaborate and share state-of-the-art measures and data.

Understanding environmental and policy influences on the behavior of children and families necessarily involves a variety of sectors and disciplines. As such, establishing platforms so that these sectors and disciplines can communicate and collaborate will be critical. This can be done by establishing avenues for information sharing and connecting across sectors, such as through digital channels, annual meetings, shared membership on panels, and other approaches. CDC sponsors nutrition and physical activity forums (NOPREN and PAPREN), which are associated with Prevention Research Centers. Each month, an information-sharing webinar is held for forum members. A similar type of virtual learning collaborative focused on convening those interested in housing, transportation, and urban planning could be developed. To increase the utility of the data shared, better ways to engage with research end users are needed, as are tools that can help users to enhance their applications of the data.

Another approach is to explore ways for various disciplines to become comfortable with each other's methods and vocabularies and to strengthen connections. Encouraging team science and trans-disciplinary teams and incorporating team science into academic training is one way to accomplish this goal. Another is to create an online hub for information sharing that could help different disciplines learn to "speak each other's language." A third approach is to elevate the visibility of related fields in existing organizations. For example,

the Transportation Research Board (TRB) has elevated the health and transportation topic to committee status, which may enhance the visibility of health priorities within transportation. The childhood obesity field could consider how to strengthen existing connections with the TRB and improve its understanding of how the TRB's work influences children's health.

Continuing existing conversations also could be valuable. In December 2019, representatives from CDC, NIIH, and the Department of Housing and Urban Development met to discuss opportunities for collaboration. A follow-up meeting to explore additional specific metrics and opportunities for collaboration should be pursued.

Establishing communications with potential new partners also could yield opportunities to learn more about environmental impacts on children's nutrition and physical activity behaviors. For example, establishing communications with technology companies, such as Google or Verizon, could be a valuable way to learn about how technology is used to gather and analyze data and to explore ways in which these approaches could be used to advance environmental measurement for childhood obesity. This could include talking with companies that already use Google street-level and other data.

Finally, methods to link the many sources of local, state, and national data are sorely needed. Linkage challenges include access to data resources which may be unavailable on the web, poorly cataloged, and lacking metadata or standardized formatting. These may require costly and often duplicative efforts to identify, obtain, clean, and link to other data sets of interest. NCCOR's Catalogue of Surveillance Systems includes nearly 100 different systems with geocodes and linkages when available. Most importantly, many health data are protected because of the sensitive nature of health information and the fact that linkage and variables used for linkage such as personal identifiers and address data lead to identification of participants in the data set and disclosure of sensitive information. Such disclosure may be unethical or illegal as well jeopardize future relationships with study participants. Solutions include creation of data repositories or data lakes, linkage analysis in protected data centers, analysis of protected data with secure online access, and statistical methods for blurring location and identity. These approaches can be effective but are often costly, and the case for investment in such systems and approaches needs to be carefully thought through to further motivate opportunities for linkage.

5. Work across disciplines and sectors to synthesize measurement approaches that have been well developed in other sectors and identify measures from other sectors that are appropriate for community health.

Many sectors have developed measures that can be used or adapted for community health purposes. For example, housing and transportation sectors have metrics that are well developed and could be useful for community health, such as measures of housing stability, affordability, and quality. An initial step in using these measures would be to identify data sources that include such metrics or to which such metrics might be added.

To strengthen cross-disciplinary efforts, it also may be useful to examine the feasibility of using health and childhood obesity measures in non-health studies and surveys and to conduct a survey of academic institutions to identify which ones may have programs that combine trainings in housing, transportation, urban planning and health. Georgia Tech's architecture, planning, and transportation training survey may be a useful resource.

The urban planning field has tools and measurement approaches that may also be helpful to communities wishing to create planning tools to improve built environments. For example, an "active communities" tool could include constructs to improve routes to desired destinations to make them more feasible and appealing. Tools like these should build on existing work and have a clear purpose (e.g., one-time surveillance or repeated measures, local or other-level data, equity considerations).

Groups wishing to use urban planning tools and measures should note that urban planners do not focus only on children, or any one age group, for that matter. They tend to follow the previously mentioned 8-80 construct (e.g., a construct stating that a planning design that works for individuals ages 8 years and 80 years will work for all) for their planning purposes.

6. Enhance measures for conducting research aimed at identifying policies that influence children's dietary and physical activity behaviors, including measures such as extent of implementation, and across levels at which policies are enacted.

Policies are a major factor influencing the environments in which children live, their diet and physical activity behaviors, and therefore their risk of overweight and obesity. As improved physical activity and diet environmental measures and tools are developed, researchers and practitioners will be able to better monitor

policy and practice changes to determine how they relate to specific community needs. Audit tools may be especially useful as an approach for quickly collecting information on policies and subsequent community change. A random sample of municipalities also may yield useful information about which physical activity and nutrition policies are in place or being planned.

It is important to ensure that policy data are collected with meaningful geographic context and are linked to outcomes. Policies are enacted at a jurisdictional level. Linkages of policy information with any other data set must be done within jurisdictional areas; data from catchment areas do not align. To fully understand the effects of policies, these data also must be linked to implementation data at various levels from local to national.

Considerable data concerning potential environmental correlates of childhood obesity are available from the U.S. Census. However, such data are not always available for relevant geographic units, such as villages, towns, or cities, which may completely or partially overlap census tracts and other census administrative units. This can make it difficult, costly, or both to link policy relevant units to census areas for planning and evaluation. A toolbox of policy examples and best practices organized by type of community (i.e., small towns vs. large, because tools will vary in their effectiveness) could be useful.

7. **Identify measurement, data, and analytic needs to advance systems science and other approaches to better understand how people interact with their food, physical activity, and social determinants environments.**

The complexities inherent in measuring the full spectrum of environmental and policy influences on children's nutrition and physical activity create important opportunities for systems sciences approaches. Systems modeling and other approaches can be developed to measure how children and families interact with the food and physical activity environment so as to understand influencing factors on social interactions, cultural traditions, physical environment, consumer behaviors, and integration of social supports.

Systems science approaches can be used in an effort to create a "proof of principal" surveillance system that starts small by deliberately selecting specific communities in which to conduct "deep dive" examinations of interactions in the behavioral, social, and physical environment. Such an examination could result in a comprehensive surveillance system that is granular and meaningful for planning at the state and local level, with core and optional modules. Local data and local systems modeling also will be important, as predictors of behavior may vary by locality.

Systems science approaches also may be useful to examine key transitions across the life span that offer opportunities to change physical activity and diet habits, as well as factors of influence that operate at different levels of the socio-ecological model.

Psychometrically sound measures, particularly those involving perceptions (e.g., perceptions of unhealthy food availability, food marketing, and online food environments) should be developed as part of efforts to understand how children interact with their food, physical activity, and social environments. Other potentially useful measures could include measures of implementation and systems change; measures of the social environment that are specific to influences on youth activity (e.g., peers, screens, ECE settings); and measures of community engagement (i.e., the community voice) in the built environment process and decision making.

Next Steps

This white paper can be accessed on the NCCOR website at https://www.nccor.org/measurement-workshop-series/. White papers for the other two workshops are also available on the NCCOR website. In addition, NCCOR plans to publish a synthesis of findings and recommendations from the three workshops in the scientific literature.

It is anticipated that recommendations from these workshops will advance development of improved measures that can be used across a range of research, surveillance, and intervention activities related to diet, physical activity, and childhood obesity by addressing the many levels of influences that impact the onset and progression of childhood obesity. NCCOR aims for these efforts, along with other strategic activities, to facilitate research and interventions to help reduce health inequities associated with childhood obesity.

Other Recommendations for Priority Actions to Advance Measurement of Individual Behaviors Related to Childhood Obesity

During the presentations and discussions, a number of priorities emerged for advancing measurement of environmental and policy influences. In addition, participants were asked to consider short- and medium-term action steps that would be top priorities for NCCOR to pursue. The previous section synthesized priorities and action steps common across all the domains. **The following priorities, some of which may overlap with the synthesis above, represent specific action items discussed during the course of the workshop related to Social Determinations of Health (SDoH), Diet, and Physical Activity and Sedentary Behavior (PA/SB). These items have been categorized into six headings: (1) develop new measures; (2) review what is known and maximize use of cross-sectoral collaboration; (3) build measurement tools, guidance, and data resources; (4) enhance capacity, dissemination, and collaboration; (5) develop research methods, approaches, and enhanced linkage; and (6) expand data collection, research, and publication. All resources highlighted in the following tables are listed in the Reference section.**

PRIORITY	DOMAIN		
DEVELOP NEW MEASURES	**SDoH**	**DIET**	**PA/SB**
Understand how to measure peer/social environments drawing from expertise in child psychology field. Are specific issues unique to diet and PA? • Develop comprehensive measures of the neighborhood and the child peer/social active play environment. Develop methods to address gaps in knowledge about children's social environment relevant to physical activity • In EHRs, expand measures of nutrition related to influence of clinician's recommendations	x	x	x
Develop more psychometrically sound measures, particularly those involving perceptions. This might include measures of implementation and systems change; measures of the social environment that are specific to influences on youth activity (peers, screens); measures of community engagement (community voice) in built environment process and decision making; or measures on perceptions of unhealthy food availability, food marketing and on-line food environments.	x	x	x
Understand how to measure the digital environment as a key new element of social ecology (i.e., the need to measure the "screenome").	x	x	x
Develop measures for surveillance of children's food environments beyond school and early care and educate (ECE) settings. Consider alternate data sources that help characterize the food environment, e.g., zoning policies, crime data.		x	
Address gaps in active transport measurement and incorporate measures into surveillance systems: • Enhance surveillance data on active transport, particularly at the community level • Expand data on active transport to school to include measures of policies, behavior, and other factors • Develop metrics to quantify distance from schools and how this may influence children's use of AT • Identify types of active transport beyond those used for school or work • Develop a child walkability index			x
Identify measures of safety, crime, lighting, and other amenities that are relevant for assessing PA environments.			x
Measure the quantity and quality of community engagement in all types of community planning (i.e., what shapes a community and its livability).	x	x	x
Create measures that have input from sectors and decision makers and are action-oriented; position measures so that people can use them.	x	x	x
Develop new measures in implementation science to determine what works in ECE settings.		x	x

REVIEW WHAT IS KNOWN	SDoH	DIET	PA/SB
Identify existing resources for making the economic case for changing environmental factors to improve health- or obesity-related health behaviors.		x	x
Examine the feasibility of using health and childhood obesity measures in non-health studies and surveys with an initial focus on housing, transportation and planning.	x	x	x
Identify metrics from housing and transportation sectors that are well developed and could be useful for community health, such as measures of housing stability, affordability and quality. Identify data sources which include such metrics or to which such metrics might be added.	x	x	x
BUILD MEASUREMENT TOOLS, GUIDANCE, AND DATA RESOURCES	**SDoH**	**DIET**	**PA/SB**
Identify what SDoH metrics are most relevant to childhood obesity. • Add resources from sources (e.g., RWJF, Measuring What Works project)	x	x	x
Create measures that can be widely applied and companion tools that show how to tailor the measure to specific communities. This can be done by identifying key elements that any user should collect and then allowing for customized items to be collected based on users and community needs.	x	x	x
Promote the use of common measures. NCCOR has made lists of measures but has not focused on enhancing use of standardized, common measures. What persuades people to use the same measure (other than federal requirements as part of funding)?	x	x	x
Develop better ways to engage with and communicate with research end users. Develop tools with end users to increase the utility of data.	x	x	x
Create planning tool for communities to improve built environments (i.e., a new "active communities" tool). For example, it could include constructs to improve a person's route to desired destinations. Build on existing work and clarify purpose (surveillance one time or repeated measures, local or other levels, equity considerations).	x	x	x
Improve the granularity of data collection and sources: • Policy implementation; linking policy to behavior and other linkages (locally all the way up to nationally); opportunities around big data • Local data and local systems modeling are needed: predictors of behavior may vary by locality and systems may change, need to understand all the levels for issues such as food purchases • For child-level PA, need to get beyond merely whether children are meeting PA guidelines to learn where and how are kids physically active; prevalence of programs and resources that exist to support kids' PA; overlaying different levels of data conveniently (i.e., child and community) • Determine priorities for collecting local-level physical activity data, such as through non-traditional proto analyses (e.g., electronic health record, big data analyses) and develop methods for small area estimates	x	x	x
Develop a comprehensive surveillance system that is granular and meaningful for planning at the state and local level with core and optional modules. Allow for creation of innovative modules as needed.	x	x	x
Design policies and program evaluation and monitoring systems, taking into account the socio-ecological model and Complex Adaptive Systems frameworks. Such systems are needed for all behaviors relevant to childhood obesity.	x	x	x
Create "proof of principle" surveillance systems. Deliberately select communities in which to conduct deep-dive data collection. This approach starts small, rather than building a national surveillance system that might be limited in number of measures.	x	x	x
ENHANCE CAPACITY, DISSEMINATION, AND COLLABORATION	**SDoH**	**DIET**	**PA/SB**
Encourage capacity building through webinars. Suggested topics include: • Addressing frameworks for PA measurement to help users make decisions about which key PA measures to include • Measuring systems change with input from diverse disciplines and topic domains	x	x	x
Compile theoretical frameworks and approaches to support and inform community engagement. This may require framing the projects around issues the communities care about, such as climate change and multi-disciplinary solutions to local problems. Pay particular attention to populations that have received little attention (e.g., immigrants).	x	x	x
Consider approaches to ensure that sophisticated online and cell phone methods of engaging communities do not leave out some communities, e.g., issues of equity and access for people who do not have cell phones.	x	x	x

ENHANCE CAPACITY, DISSEMINATION, AND COLLABORATION	SDoH	DIET	PA/SB
Develop proactive approaches to engage and align with communities to identify modifiable community determinants of obesity; collect and interpret data. • Consider the measurement needs of the broader context of childhood obesity, e.g., if we're in schools, how do we situate our outcomes of interest within the priorities of the educators. Same with communities whose priorities are safety, economic prosperity, and partnering with other sectors. • How do we engage diverse segments of population in all communities so that we're not overlooking certain segments? This might include asking communities about challenges (e.g., immigration, turnover/school leadership problems) to better understand disparities in outcomes.	x	x	x
Create a roadmap to link the growing body of existing work on SDoH to childhood obesity (e.g., Health and Transportation Index).	x	x	x
Identify ways to work with private sector groups to access proprietary data. This may pertain to data from mobile devices, retail purchasing, and Google and other tech companies in the areas of diet and PA.		x	x
Determine how to obtain streamlined access to the food retail data sharing agreements (e.g., time-intensive intercept surveys have been used to understand impact of the kids' meal default beverage policy—retailers have sales data that directly answer the question).		x	
Establish communications with technology companies such as Google or Verizon to explore ways of using technology to gather and analyze data. This could include talking with companies that already use Google street-level and other data for tracking PA or other health data.		x	x
Establish avenues for sharing information and connecting across sectors such as through digital channels, annual meetings, shared membership on panels (e.g.,) and other approaches. • The Transportation Research Board (TRB) has elevated the health and transportation topic to committee status, which may enhance influencing health priorities within transportation. Consider how to strengthen existing connections with the TRB and help bolster TRB's understanding of how its work influences children's health. • Support a virtual learning collaboration to convene those working in housing, transportation, and urban planning (e.g., CDC NOPREN and PAPRN groups monthly meetings via videoconferencing).	x	x	x
Explore ways for various disciplines, such as housing and transportation, to become versed in each other's methods and vocabularies, perhaps through an online hub for information sharing.	x	x	x
Continue work from the December 2019 HUD-CDC-NIH meeting to discuss additional specific metrics and opportunities for collaboration.	x	x	x
Encourage team science and trans-disciplinary teams; support incorporating team science into academic training.	x	x	x
DEVELOP RESEARCH METHODS, APPROACHES, AND ENHANCED LINKAGE	**DIET**	**PA/SB**	**SLEEP**
Develop methods and approaches to address declining survey response rates, such as using hybrid approaches for surveillance. May need to combine and triangulate data.	x	x	x
Develop approaches to encourage better and more extensive use of NHANES dietary data. Some approaches include: • Calibrate NHANES data against other dietary data sets • Correlate the detailed dietary data collected in NHANES with WHO's eight core Infant and Young Child Feeding indicators • Add WIC infant feeding study questions (i.e., how children are being fed, feeding practices, and developmental milestones) to other dietary instruments, including those within NHANES		x	
Identify ways to optimize use of measures from existing climate change data to assess how climate change affects PA and diet.		x	x
Use flexibility of design thinking to evaluate continually evolving activities in different kinds of communities to change behaviors.	x	x	x
Develop methods to link local, state, and national data.	x	x	x
Develop approaches for linking policy data to outcomes data.		x	x
Develop systems modeling and other approaches for measuring "how" people interact with food and physical activity environments to understand factors that influence interactions, such as social supports, cultural influences, built environment/design, and consumer behaviors.		x	x

EXPAND DATA COLLECTION, RESEARCH, AND PUBLICATION	SDoH	DIET	PA/SB
Conduct a survey of a random sample of municipalities to assess what PA and nutrition policies are in place or being planned. Consider the issue of planning for this related to the 8-80 cities design planning.	x	x	x
Conduct a survey of academic institutions to identify which ones may have training programs that combine trainings in housing, transportation, urban planning, and health.	x	x	x
Collect data to learn more about where and how child-level physical activity occurs.			x
Collect data on perceived discrimination (developed and tested in African Americans) as a measure of SDoH; assess its validity for use in other populations experiencing discrimination.	x		
Collect data on acculturation and pathways to acculturation, as they may lead to different lifestyle behaviors among immigrants and influence how immigrants respond to interventions.	x		
Ensure policy data are collected with meaningful geographic context • Policies are enacted at a jurisdictional level; thus there is a need for data specific to jurisdictional areas (not catchment areas) for data linkage • Trying to link municipalities to census areas is challenging; it's hard to determine how they relate to each other • Consider creating a toolbox of examples and best practices organized by type of community (small towns vs. large); tools may vary in their effectiveness according to community characteristics		x	x
Collect data to monitor policy and practice changes relative to specific community needs and as improved PA and diet environmental measures and tools are developed. Consider the use of audit tools that can be used to collect data quickly and assess change.	x	x	x
Modernize school-based ECE and afterschool surveillance systems.		x	x
Publish and find additional ways to use data that have been collected but remain unpublished; such data may help with longitudinal research.		x	x
Leverage existing SDoH data that are increasingly common in individuals but not often used in health research. Mine data, such as through CMS Center for Innovation's Accountable Health Communities initiative, EHRs, and national surveys.	x	x	x
Identify and address biases of using found/repurposed data. Determine who are not represented in such data and address endogeneity issues.	x	x	x
Encourage the publication of methods research and the inclusion of methods of assessment in papers within peer-reviewed journals.		x	x
Support research to evaluate natural experiments designed to identify policy- and place-based changes that could individually or collectively have positive health outcomes.	x	x	x
Encourage examination of key transitions across the life span that offer opportunities to change PA and diet habits.		x	x
Encourage and support efforts to engage in "deep dive" examination of interactions in the behavioral and social and physical environment.	x	x	x

In addition, each presenter shared a series of opportunities to consider ahead of the workshop to help enhance the discussion. The following list represents these ideas.

Opportunities Shared by Presenters

PRIORITY	DOMAIN		
DEVELOP NEW MEASURES	**SDoH**	**DIET**	**PA/SB**
Develop shared ground truth datasets and related measures.	x	x	x
Develop assessment tools that are effective and efficient in identifying potential policy and practice levers for change specific to community needs.	x	x	x
Develop measures of community context, as interventions may have differential impacts on different populations.	x	x	x
Develop comprehensive measures of the neighborhood and the child/peer social active play environment.			x
Update existing home environment measures to better capture the complexity of parental/caregiver practices around children's screen use.			x
Develop self-report measures of routine activity spaces for children and parents, with attention to possible demographic differences in activity hubs.			x
Examine travel to/from places other than home and school (e.g., parks, shops, friends' and relatives' houses) and develop valid, reliable, and feasible measures of such trips.			x
Develop and test reliability and validity of self-report environment measures for activity space hubs and travel routes.			x
Develop child-specific walkability indices.			x
Develop standardized approaches to assess housing stability and affordability and to establish the validity of these measures overall and across subgroups of the population.	x		
REVIEW WHAT IS KNOWN	**SDoH**	**DIET**	**PA/SB**
Research and identify effective planning and policy interventions ("upstream" factors) that can be modeled for use by multiple communities.	x		
Examine emerging evidence from GPS and other location data to identify currently unexamined aspects of community environments that should be measured.	x	x	x
Use best available data and analysis strategies to present a broad perspective of quantitative and qualitative needs within an equitable policy framework.	x		
Determine policies and practices to limit urban sprawl and encourage attendance at local schools and/or provide drop-off spots for children to engage in some AT.			x
Prioritize high-impact audit items, such as items that are potential targets for environmental or policy change or are highly associated with health behavior.	x	x	x
BUILD MEASUREMENT TOOLS, GUIDANCE, AND DATA RESOURCES	**SDoH**	**DIET**	**PA/SB**
Develop new research tools to assess environmental components, especially pragmatic tools.	x	x	x
Develop new tools and methods to measure implementation and systems change in child settings.	x	x	x
Consider the burden on funding recipients and available resources when prioritizing methods and data collection instruments.	x	x	x
Guide funding recipients on how to collect data when working with specific priority populations or populations that are hard to reach.	x	x	x
Guide funding recipients toward the appropriate assessment, audit, or measurement tools for their intervention design and setting.	x	x	x
Encourage prospective data collection over retrospective self-report whenever possible to reduce recall error and missingness.	x	x	x
Establish a holistic and comprehensive vision that encompasses the full urban landscape: transportation mobility, community form, and diverse demographics.	x	x	x

BUILD MEASUREMENT TOOLS, GUIDANCE, AND DATA RESOURCES	SDoH	DIET	PA/SB
Design breastfeeding policies and program evaluation and monitoring systems that take into account the socio-ecological model and Complex Adaptive Systems frameworks.	x	x	
Incorporate extensive tool development, testing, training, certification, and quality assurance protocols for interviewers and coders, and rely on experienced individuals to conduct interviews and collect data.	x	x	x
Guide funding recipients in maximizing the use of existing secondary data before conducting primary data collection.	x	x	x
Guide funding recipients on how to access available data when owned by other entities (e.g., procurement data, sales data, transportation data). Guide the development of data sharing agreements.	x	x	x
Ensure systematic, reliable, and valid policy data measurement.	x	x	x
ENHANCE CAPACITY, DISSEMINATION, AND COLLABORATION	**SDoH**	**DIET**	**PA/SB**
Provide webinars from diverse disciplines and topical domains on measuring systems change.	x	x	x
Provide program tools, training, and certification for public use.	x	x	x
Use human-centered and data-driven approaches to design change interventions.	x	x	x
Encourage the formation of local/school wellness councils with top level policy implementation.	x	x	x
Develop funding mechanisms and evaluation teams with value for public health substance and technology or engineering breakthroughs.	x	x	x
Advocate more effectively for resources to support implementation and monitoring of practices aimed at increasing children's physical activity.			x
Organize hot-topic meetings to convene trans-disciplinary thinkers and innovators.	x	x	x
Connect innovators with real-life research, evaluation, or practice-based challenges.	x	x	x
Build partnerships between public health and planning professionals to research and develop new measures that can be applied in community planning practice (e.g., survey methodologies to measure behavioral and perceptual factors that influence the ways people use the built environment).	x	x	x
Explore collaborations and memoranda of understanding with big data companies (e.g., Google, Apple, Twitter, The Weather Company).	x	x	x
Encourage practitioners to work with researchers to establish baseline measures before implementing programs and policies and to identify right tools for tracking change.	x	x	x
Encourage practitioners to work with evaluation experts to identify right tools for assessments.	x	x	x
Engage the community to identify modifiable community determinants of obesity risk and develop related measurement tools and processes for data collection.	x	x	x
Engage key partners and community members in the design of evaluations.	x	x	x
DEVELOP RESEARCH METHODS, APPROACHES, AND ENHANCED LINKAGE	**SDoH**	**DIET**	**PA/SB**
Develop and test reliability and validity of self-report real-time environment measures.	x	x	x
Develop approaches to understand how the sum of the parts affects decisions to engage in healthy behaviors.	x	x	x
Support a multi-level (socio-ecologically-based) approach to examining the interactions between the physical, social, and intra-individual environments and their influence on health behaviors.	x	x	x
Use a whole school, whole community, whole child approach.	x	x	x
Consider the use of big data or crowdsourced data to inform efforts.	x	x	x
Ensure the use of evaluation findings in program improvement through mid-course corrections.	x	x	x
Maintain a focused approach to prioritizing and funding outcome-based projects that serve a wide range of local and regional communities.	x	x	x
Document the individual, as well as collective, impacts of components of the environment.	x	x	x
Develop adaptations of existing interventions that might work best in targeted settings.	x	x	x
Design studies to account for endogeneity concerns.	x	x	x
Ensure a sufficient time lag between policy effective dates and outcome measurement dates.	x	x	x

DEVELOP RESEARCH METHODS, APPROACHES, AND ENHANCED LINKAGE	SDoH	DIET	PA/SB
Investigate written polices vs. "usual practice."	x	x	x
Develop and test programs and policies tailored to the experiential context of children.	x	x	x
Ensure recipients of funding use mixed methods for program evaluation to fully capture both impact and context.	x	x	x
Support work that can examine seemingly upstream determinants of diet (e.g., neighborhood resources and socioeconomic conditions; housing stability, quality, and affordability; access to quality early childhood education).	x	x	
Validate new methods of obtaining audit information.	x	x	x
Integrate and explore existing administrative data sources. This may involve merging with federal data sources, for example, on the receipt of federal housing assistance. Identify local data sources, such as housing code violations.	x	x	x
EXPAND DATA COLLECTION, RESEARCH, AND PUBLICATION	**SDoH**	**DIET**	**PA/SB**
Identify key informants through online searches and snowball sampling and screen to ensure appropriate knowledge.	x	x	x
Consider complementing interview and/or survey methods with document review, secondary data, and site observation, as appropriate, depending on the research questions.	x	x	x
Collect multiple characteristics of interventions from key informants, as different expressions have been related to different outcomes; no single or simple way has been identified to assess "what works."	x	x	x
Support natural experiments to identify policy and place-based changes that could either individually or collectively have positive health and dietary impacts.		x	
Leverage new SDoH data that are increasingly common in individuals. Mine sources of data, such as the Center for Medicare and Medicaid Innovation's Accountable Health Communities initiative, EHR, and national surveys, which offer opportunities to explore these complex relationships.	x	x	x
Assess environments of broad activity spaces where children and parents conduct routine activities and spend time to more accurately capture neighborhood environment exposures.	x	x	x
Use randomized and natural experiments to help identify causal links between housing and neighborhood environments and outcomes. These experiments can not only help address basic mechanisms but also identify policy levers that may be used to promote health.	x	x	x
Fund, implement, and evaluate AT interventions in low-income neighborhoods to address environmental injustice.	x		x
Conduct research aimed at identifying, in child care and school settings, the practices that exert the greatest influences on children's physical activity.			x
Conduct policy research aimed at identifying polices that exert the greatest influences on key practices and children's physical activity.			x
Implement lower speed limits and traffic calming measures to encourage AT.			x
Conduct research to disentangle purchasing decisions and pricing information from location and type of store.		x	
Conduct research to see how malleable eating identities are. If they can be altered, this will allow for a promising area of future intervention research.		x	

ABBREVIATIONS

AT	Active transport
CDC	Centers for Disease Control and Prevention
ECE	Early care and education
NCCOR	National Collaborative on Childhood Obesity Research
NIH	National Institutes of Health
PA	Physical activity
PSE	Policy, systems, and environmental approaches
RWJF	Robert Wood Johnson Foundation
SB	Sedentary behavior
SDoH	Social determinants of health
USDA	U.S. Department of Agriculture

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Following is a list of selected references provided by workshop participants, grouped by workshop session.

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ACKNOWLEDGMENTS

First, we want to acknowledge and honor our colleague, Chris Kochtitzky, who passed away shortly after this workshop.

Chris had an extensive career at CDC which began in 1992 as a presidential management intern. He served in numerous leadership roles throughout his distinguished career, most recently as a senior advisor in DNPAO, where he served as an expert on the development of evidence-based guidelines and recommendations to increase physical activity across the country.

Chris was one of the founders of the field of built environment and health at CDC. He published an influential MMWR on the subject in 2006, helped organize CDC's Built Environment and Health Group in 2008, and was a key contributor to the Surgeon Generals Call to Action to Promote Walking and Walkable Communities in 2015. Most recently, he was a driving force in organizing the Transportation Research Board (TRB) Conference on Active Transportation and Health. His work in this area supported TRBs decision to create a Committee on Transportation and Health in February, a seminal moment in the field, which is also noted in the discussion of this paper.

As one of the initial urban planners hired at CDC, Chris worked tirelessly as a bridge between the fields of planning and public health. In 2010, he began serving as an adjunct professor at Emory University and taught a course on Public Health and the Built Environment, with joint enrollment from Emory public health students and Georgia Tech urban planning, architecture, and engineering students. Through all of his work, Chris was known for the strength of the partnerships he developed and maintained. His networks allowed for the spread and scale of science and implementation of programs across federal, state, and local agencies as well as the private and non-profit sectors.

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ADVANCING MEASUREMENT OF ENVIRONMENTAL AND POLICY INFLUENCES ON CHILDHOOD OBESITY

AGENDA

February 27, 2020 9:00 a.m. – 5:00 p.m.
February 28, 2020 8:30 a.m. – 2:00 p.m.

AC Hotel by Marriot Atlanta Midtown
53 14th St NE, Atlanta, GA 30309

Goal: Determine how NCCOR can contribute to better measurement and measurement practices for research and evaluation on selected environmental determinants related to childhood obesity

Working definition for environments: Influencing more than one individual, e.g., household, institution, or community; the social and built environment

Workshop Objectives:

1. Illustrate current challenges, needs, and gaps
2. Develop short- and medium-term recommendations to address gaps for NCCOR, researchers and practitioners, and funders

Workshop Deliverables:

- White paper based on the workshop findings
- Clear recommendations for the next steps to advance the science (short [1–3 years] and medium-term [3–5 years] goals)
  - » Recommendations for NCCOR
  - » Recommendations for researchers and practitioners
  - » Recommendations for funders

DAY 1 February 27, 2020

8:30–9:00	**Breakfast**
9:00–9:15	**Welcome** – *Elaine Arkin, NCCOR Coordinating Center*
9:15–9:45	**Background and Workshop Goals** – *Deborah Galuska, CDC*
9:45–10:15	**Session 1: What should we measure in children-specific environments?** Moderator: *Jill Reedy, NIH* • Measurement of policies and practices to support diet in childcare and schools – *Dianne S. Ward, Gillings School of Global Public Health University of North Carolina, Chapel Hill* • Measurement of policies and practices to support physical activity in childcare and schools – *Russell Pate, Arnold School of Public Health, University of South Carolina*
10:15–10:45	**Session 1 Discussion: What should we measure in children-specific environments?** Moderator: *Jill Reedy, NIH* • Discussant (Research) – *Terry T-K Huang, Graduate School of Public Health and Health Policy, City University of New York* • Discussant (Practice) – *Carmen N. Daniel, Georgia Shape, Georgia Department of Public Health*
10:45–11:00	**Break**
11:00–11:50	**Session 2: What should we measure in communities?** Moderator: *Steve Onufrak, CDC* • Measurement of policies and practices that influence development from birth to 24 months in hospital and community settings – *Rafael Perez Escamilla, Yale School of Public Health* • Measurement of policies and practices that influence the food environment in the home and communities – *Bethany Bell, College of Social Work, University of South Carolina* • Food Service Guideline policies in the community – *Steve Onufrak, Centers for Disease Control and Prevention* • Measurement of policies and practices that influence physical activity in communities – *Brian Saelens, University of Washington and Seattle Children's Research Institute*
11:50–12:20	**Session 2 Discussion: What should we measure in communities?** Moderator: *Steve Onufrak, CDC* • Discussant (Research) – *Jamie Chriqui, School of Public Health and Institute for Health Research and Policy, University of Illinois at Chicago* • Discussant (Practice) – *David Rouse, Urban and Regional Planning Consultant*
12:20–1:15	**Lunch**
1:15–1:45	**Session 3: How should we measure policies and practices using self-report methods?** Moderator: *Kathy Watson, CDC* • Self-report from individuals (perceptions): Challenges, progress and recommendations – *Shannon Zenk, Institute for Health Research and Policy, University of Illinois at Chicago* • Self-report from key informants in diverse settings: Challenges, progress and recommendations – *Lorrene Ritchie, Nutrition Policy Institute, University of California Agriculture and Natural Resources*
1:45–2:30	**Session 4: How should we measure policies and practices using device, observational, mobile, and policy approaches?** Moderator: *David Berrigan, NIH* • Audit tools: Challenges, progress and recommendations – *Natalie Colabianchi, University of Michigan* • New technological methods: Challenges, progress and recommendations – *J. Aaron Hipp, North Carolina State University* • Considerations and challenges in measuring and evaluating policy influences on childhood obesity – *Jamie Chriqui, School of Public Health*
2:30–2:45	**Break**
2:45–3:45	**Session 3 & 4 Discussion: How should we measure policies and practices?** Moderator: *Susan Carlson, CDC* • Discussant (Research) – *Leslie A. Lytle, Gillings School of Global Public Health, University of North Carolina, Chapel Hill* • Discussant (Practice) – *Anu Pejavara, CDC*
3:45–4:45	**Discussion: Measurement priorities by method –** Elaine Arkin, *NCCOR Coordinating Center* 1. What are the gaps that most need to be addressed? a. For researchers? For practitioners? b. Are there needs related to development of metrics and data collection? Data linkages? Getting local data? c. What are the needs for data integration across the different methods or with other data? 2. What challenges would need to be overcome to address these gaps? 3. What are some promising and emerging ways to address these gaps, and what is needed to begin addressing them? 4. What are some top priorities to advance the science in the next 5 years (short to medium-term)?
4:45–5:00	**Day 1 wrap-up** – *Elaine Arkin, NCCOR Coordinating Center*

DAY 2 February 28, 2020

8:30–9:00	**Breakfast**
8:30–8:45	**Welcome and Review of Day 1** – *Elaine Arkin, NCCOR Coordinating Center and Seraphine Pitt Barnes, CDC*
8:45–9:15	**Session 5: What data resources are needed in the social determinants of health space to explore the relationship to childhood obesity?** Moderator: *Heather Devlin, CDC* • Housing as a social determinant of health – *Craig Pollack, Johns Hopkins Bloomberg School of Public Health* • Transportation and the social determinants of health among children – *Richard Larouche, University of Lethbridge*
9:15–10:00	**Session 5 Discussion: What data resources are needed in the social determinants of health space to explore the relationship to childhood obesity?** Moderator – *Heather Devlin, CDC* • Discussant (Research) – *Tamara Dubowitz, RAND Corporation* • Discussant (Practice) – *Byron Rushing, Atlanta Regional Commission*
10:00–10:15	**Break**
10:15–12:00	**Small group discussions: Measurement priorities by domain** **Breakouts:** 1. Food Environment Woodruff Room Dial in: 1-866-668-0721; Code: 703-686-2738 2. Physical Activity Environment Symphony 1 & 2 (main dial in) 3. Housing & Transportation as a Social Determinant of Health Media Salon Dial in: 1-866-668-0721; Code: 434-859-2032
12:00–12:30	**Report out**
12:30–1:30	**Lunch / Activity: Prioritizing needs to advance the field in measurement of relevant environmental areas discussed during the workshop**
1:30–1:45	**Review of top priorities** – *Elaine Arkin, NCCOR Coordinating Center*
1:45–2:00	**Next steps and wrap-up** – *Elaine Arkin, NCCOR Coordinating Center and Laura Kettel Khan, CDC*