

WORK-IN-PROGRESS AND LESSONS LEARNED

Development of a Community Coalition to Influence Nutrition and Physical Activity in Early Childhood Education

Meghan M. Slining PhD MPH ^{a*}, Melissa Fair ^a, Laura Paige Penkert ^b, Sally Wills ^c, Joanna Smyers, ^d Ariella R. Korn ^b, Sean Rusnak ^e, Stephanie Knobel ^f

^a Health Sciences Department, Furman University, Greenville, SC, USA; ^b Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy, Tufts University, Boston, MA, USA; ^c LiveWell Greenville, Greenville, SC, USA; ^d SNAP-Ed Clemson University, Clemson, SC, USA; ^e University of Colorado Denver, Denver, CO, USA; ^f YMCA Judson Community Center, Greenville, SC, USA

*Corresponding author: Meghan M. Slining, PhD, Furman University, 3300 Poinsett Highway, Greenville, SC, USA, Phone 864-294-3684, e-mail address: [Meghan.slining@furman.edu](mailto: Meghan.slining@furman.edu)

Acknowledgements: This work was supported in part by grant P20GM103499 (SC INBRE) from the National Institute of General Medical Sciences, National Institutes of Health, by grant UL1 TR001450 (NIH/NCATS CTSA) from the National Institutes of Health, and by funding from the Jolley Foundation. The authors wish to acknowledge the study participants.

Submitted 4 May 2020, revised 18 May 2021, accepted 25 August 2021

ABSTRACT

Background: Recognizing insufficient support for healthy eating and physical activity in early childhood education (ECE) centers in Greenville, SC, a group of stakeholders formed a Workgroup as an organizing structure. Members developed and implemented a 2-year community-based participatory research initiative aimed at nutrition and physical activity policy, systems and environment change in 10 ECE centers.

Objectives: This article: 1) describes engagement efforts and partnerships leading to formation of the Workgroup and Initiative, 2) presents data on Workgroup members' knowledge and engagement, and 3) shares lessons learned.

Methods: Workgroup member knowledge and engagement related to obesity prevention was measured at 2 time points during the EC Initiative using the "Stakeholder-driven Community Diffusion Survey."

Lessons Learned: Knowledge and engagement scores increased over the measurement period. Scores for engagement were higher than scores for knowledge at both time points. There was a substantial increase in perceived leadership and stewardship, knowledge of intervention factors and how to intervene sustainably, and understanding of local resources and roles. An important strength was stakeholder buy-in and ownership of planning and implementation processes.

KEYWORDS: Community-Based Participatory Research, Diet, Healthy, Exercise, Education, Sociology and Social Phenomena, Pediatric Obesity, Child, Preschool

Background

In 2010 over 25% of U.S. preschoolers had overweight or obesity, with low-income and minority children disproportionately affected ¹. Healthy eating and physical activity behaviors developed at an early age remain consistent into middle childhood, thus making intervention in early childhood education (ECE) critical to shaping lifelong habits ²⁻⁵.

Nearly 80% of preschoolers with employed mothers participate in regular out-of-home care ⁶, often receiving the majority of daily calories and physical activity in these settings ⁶. Because ECE settings are strong predictors of behavior ⁷, these environments may have lasting impacts on child nutrition and physical activity.

Community-based participatory research (CBPR) is “a collaborative approach to research that equitably involves all partners in the research process and recognizes the unique strengths each brings ⁸.” Participatory research models, whereby academic and community partners are actively engaged throughout the research process, are key to the national prevention research agenda ⁹.

Although there is substantial evidence for CBPR approaches to obesity prevention, few studies in ECE settings have employed these methods. Furthermore, gaps exist in our understanding of how CBPR processes work ¹⁰.

Acknowledging the challenge of pediatric obesity and recognizing insufficient support for improving nutrition and physical activity in ECE centers within Greenville County, a group of ECE stakeholders formed the LiveWell Greenville (LWG) ECE Workgroup in April 2015. The ECE Workgroup developed a shared long-term goal of reducing overweight in children aged zero to five through coordinated nutrition and physical activity policy, systems and environmental change in ECE centers. A secondary objective was to actively engage

stakeholders from the ECE Workgroup in development and implementation of the ECE Initiative through a CBPR process. To achieve these aims, the ECE Workgroup identified four objectives:

1. Determine best practices and resources to support nutrition and physical activity in Greenville County ECE centers.
2. Pilot a two-year process to provide support for improving nutrition and physical activity in ECE centers, the LWG ECE Initiative.
3. Collaborate with existing organizations offering trainings and networking opportunities to promote nutrition and physical activity in ECE centers
4. Evaluate effectiveness of the LWG ECE Initiative on nutrition and physical activity policies and environments.

This article aims to: 1) describe community engagement efforts and collaborative partnerships leading to formation of an ECE Workgroup and Initiative, 2) present data on changes in ECE Workgroup members' knowledge and engagement related to childhood obesity prevention, and 3) describe lessons learned.

Methods

Formation of the LiveWell Greenville Early Childhood Workgroup

LiveWell Greenville (LWG) is a community coalition formed in 2011 in response to pediatric obesity concerns in Greenville County, South Carolina (SC). Comprising more than 200 non-profit, government, and industry partners, LWG targets multiple environments where children and their families live, play, learn, work and pray in Greenville County, SC ¹¹. LiveWell

Greenville harnesses community efforts to reduce obesity throughout Greenville County.

Workgroups, consisting of community influencers, create policies, systems and environments that support improved nutrition and physical activity. The EC Workgroup, created in April 2015 responds to the call from key stakeholders for an increased focus on Greenville's youngest citizens.

Founding members recruited additional stakeholders through community contacts and ECE providers. The resulting ECE Workgroup consisted of 11 stakeholders from local ECE centers, ECE development non-profits, governmental agencies including the South Carolina Department of Health and Environmental Control (DHEC), South Carolina Department of Social Services, South Carolina SNAP-ED (Clemson University Youth Learning Institute) and the local university (Furman University).

Community Action Planning

The ECE Workgroup initially developed a community action plan. From August 2015 to February 2016, the ECE Workgroup met monthly to establish goals and determine strategies to achieve them. At each meeting, a consultant facilitated trust-building so that partners could engage in difficult conversations to identify common goals. The consultant ensured transparency by communicating with partners between monthly meetings.

Midway through development of the community action plan, LWG secured local funding to formalize the ECE Workgroup structure. LWG hired a part-time staff member to coordinate partner efforts, assure regular communication between and among partners, shepherd the work of the community action plan and coordinate with evaluators. Two ECE Workgroup facilitators

were selected from among ECE Workgroup members to maintain partner trust, create a neutral table for partners, and assure community action plan momentum. An academic partner was selected to serve as lead evaluator.

ECE Workgroup members understand that they are attending a workgroup, not an advisory board. There is a set expectation for members to share talents and resources to tackle a community problem. Typical ECE Workgroup meetings involved discussions regarding next steps on the action plan (e.g. recruitment of pilot sites or timelines for data collection), identification of partner contributions to move action forward (e.g. securing speakers for networking sessions or bringing funding to the table), and facilitating evaluation of action plan items.

Development and Evaluation of the LiveWell Greenville Early Childhood Initiative

The ECE Workgroup reviewed state and national standards and best practices^{12, 13} to develop a comprehensive list of best practices appropriate for Greenville County ECE centers. Members then identified national, state and local resources associated with each best practice.

In August 2016, LWG launched a two-year ECE Initiative to create nutrition and physical activity policies, systems and environmental changes in 10 ECE centers. The LWG ECE Initiative consisted of: 1) baseline data collection and self-assessment using the Nutrition and Physical Activity Self-Assessment for Child Care (Go-NAP SACC), 2) tailored goal setting and action planning for ECE centers, 3) individual and group-based technical assistance and access to resources, 4) follow-up data collection, and 5) celebration of success.

Workgroup members recruited 10 pilot sites participating in Palmetto Shared Services ¹⁴, a project designed to help SC childcare providers extend resources through shared purchasing power. ECE centers who were already receiving technical assistance or support for nutrition and physical activity through any publicly funded childcare support programs were excluded.

To ensure a commitment to a CBPR approach, the evaluator and partnership coordinator participated in the Community Engaged Scholars Program (CES-P) through the South Carolina Clinical and Translational Research (SCTR) Institute at the Medical University of South Carolina. CES-P is a nine-month training program designed to increase capacity of community-academic partnerships to conduct community-based health research with mutual ownership of process and products.

Funding from the SCTR allowed for assessment of the ECE Workgroup's community engagement using the "Stakeholder-driven Community Diffusion Survey." ¹⁵ The survey measures knowledge and engagement properties among stakeholders leading the design and implementation of community-level childhood obesity prevention interventions. The knowledge construct assesses stakeholders' understanding of community-level obesity prevention efforts. The engagement construct represents stakeholders' passion, enthusiasm, and agency (i.e. capability, ability) for preventing childhood obesity and considers relational dynamics between community members, community-based organizations, agencies and higher education institutions. All items are assessed on a five-point agree/disagree Likert scale. The survey also measures self-reported age, gender, race, and highest level of education completed. Survey development and testing, including evidence to support content validity and reliability is described in detail elsewhere ¹⁵.

Survey Administration

Data collection occurred during ECE Workgroup meetings among 10 members in April 2017 (two-year initiative mid-point) and nine members in May 2018 (post two-year initiative). At both intervals, the study investigator introduced the survey, explained informed consent and answered questions. After providing written informed consent, participants completed the web-based, self-administered survey on personal laptops or tablets. The study was approved by the Furman University Institutional Review Board on June 21, 2016.

Data Analysis

Descriptive statistics were computed for knowledge and engagement scales. Composite and domain-specific scores were also calculated. Domain-specific scores were weighted to reflect the number of items per domain to ease domain-to-domain comparisons. Among participants who completed both surveys (n=9), Wilcoxon signed-rank tests were conducted to test significance of differences between baseline and follow-up scores for each domain and overall. Results were considered statistically significant at $p < 0.05$. Data was analyzed using Stata Version 13.1 (College Station, TX).

Results

From April 2015 through June 2018, 13 stakeholders from a diverse range of ECE organizations participated in the ECE Workgroup. Membership changed slightly throughout the initiative. Most notably, once the community action plan was developed, three additional ECE Workgroup members were added, representing agencies that provide technical assistance to ECE centers. In

2017, 45% of the ECE Workgroup members were 30-40 years of age and all were female. Nearly all (90%) had at least a Master's degree. Respondents reported primary affiliations with community-based organizations (36%), early education or center-based care (36%), state health department (9%), university academic (9%), and federal government (9%).

Over 38 months, the ECE Workgroup developed a community action plan and met all of its objectives: 1) determined best practices and resources to support nutrition and physical activity in Greenville County ECE centers, 2) piloted the LWG ECE Initiative to provide support for improving nutrition and physical activity in ECE centers, 3) collaborated with existing organizations to enhance nutrition and physical activity training and networking opportunities, and 4) evaluated effectiveness of the LWG ECE Initiative.

Ten ECE centers were included in the pilot initiative. Two centers merged during the intervention and one center dropped out. Nine of the 10 centers set goals using the Go-NAP SACC tool. Six of the 10 centers met over 50% of their goals at the end of the two-year initiative. Over the two-year initiative two nutrition and physical activity trainings for 149 center staff were offered, an early childhood training conference for 100 EC providers was hosted by the EC Workgroup, and six networking events were provided for EC center directors.

Knowledge and engagement scores from Workgroup members present at both time points (April 2017 and May 2018) are reported in Table 1. In both 2017 and 2018, the mean composite engagement score was higher than the mean composite knowledge score. While both scores increased over the one-year period, indicating stronger agreement (on average) of their understanding (knowledge) and capability (engagement), the mean knowledge score increased

substantially more than engagement (4.4 points $p=.01$ vs. 1.8 points $p=.12$, maximum composite score of 25 points).

Table 1. Knowledge and engagement results ($n=9$). Data from survey administered in 2017 and 2018 to members of LiveWell Greenville Early Childhood Community Advisory Committee (*see last page of manuscript*)

We also examined domain specific scores (maximum five points) for knowledge and engagement. In 2017, the “problem” knowledge domain yielded the highest mean score of 4.3 ± 0.9 (suggesting that on average, respondents agreed that childhood obesity was a problem), while the “intervention factors” knowledge domain was highest in 2018 (4.4 ± 0.9) (on average, respondents agreed that they understood which modifiable determinants of childhood obesity to address and at which level of social ecology to address them). In 2017, knowledge domains that yielded the lowest mean scores were “sustainability,” and “resources,” (indicating that on average, respondents disagreed that they knew how to intervene for sustainability and were aware of available resources to address childhood obesity). Both “sustainability and “resources” domain scores increased significantly over the one-year period (1.7 points $p=.02$ and 2.3 points $p=.02$ respectively).

In 2017, engagement domains that yielded the highest mean scores were “dialogue and mutual learning” (4.4 ± 0.5), “flexibility” (4.4 ± 0.5), and “trust” (4.4 ± 0.6), suggesting that on average, respondents agreed they were capable of exchanging skills and understanding among people, willing and able to compromise and adapt, and had belief and confidence in others in the Workgroup. In 2018, “leadership and stewardship” was the highest scoring engagement domain and increased significantly over time (0.7, $p=.01$), indicating that on average, respondents

agreed they were capable of directing and being responsible for a group of people or course of events relating to childhood obesity efforts. In both 2017 and 2018, the “influence and power” domain yielded the lowest domain-specific score (3.8 ± 0.79 and 4.2 ± 1.25 points), suggesting room for growth in respondents’ ability or capability to have an effect on the course of events or others’ thinking and behavior.

Lessons Learned and Conclusions

Community coalitions have been identified as an important bridge between science and practice^{16, 17}. Community changes observed during the two-year LWG ECE Initiative were significant and subsequent expansion of this work is notable. We set out to understand how ECE Workgroup member knowledge and engagement may influence changes in ECE policies, systems and environments that lead to healthy eating and active living. Results from the survey suggest potential ways by which the coalition may have contributed to these accomplishments.

From the outset, our intention was to utilize known principles and best practices for engaging community stakeholders while also paying particular attention to our specific context, allowing for flexibility to incorporate community knowledge and evidence, and to adapt based on existing capacities of stakeholders involved¹⁸.

Workgroup member scores for engagement were high at both time points. Stakeholder-driven Community Diffusion theory highlights the importance of engagement for motivating stakeholders to share their knowledge with others, and is an indicator of ability and intention to translate knowledge into effective action¹⁵. Many ECE stakeholders had worked with LWG on other initiatives prior to the formation of the ECE Workgroup and viewed LWG as a trusted

facilitator. Due to previously established trust, stakeholders played an integral role in developing a community action plan that encouraged partners to move through difficult conversations and identify creative strategies to achieve common goals.

Additionally, the composition and organizational dynamics of the ECE Workgroup facilitated stakeholder engagement. Primarily comprised of community and organizational influencers, ECE Workgroup members held managerial level positions in ECE settings, equipping them with experience to know what is feasible while also having decision-making power to implement and influence policies. Shared experiences between ECE Workgroup members due to similar positions and roles in ECE settings lead to beneficial relational dynamics which further increased efficacy of the ECE Workgroup.

Strong relational dynamics were demonstrated in survey results. Workgroup members scored high on dialogue and mutual learning, demonstrating strength in the exchange of skills and understanding among multiple people. Workgroup members also scored high on flexibility and trust, revealing willingness to compromise and adapt as well as confidence in fellow coalition members.

The structure of the ECE Workgroup underscores the importance of organizational structure for future community impact efforts. LWG acted exclusively as a convener. The Workgroup was led by two facilitators who were chosen for their neutrality and their expertise in early childhood settings. The facilitators were not LWG staff members, but instead carefully selected stakeholders; thus the activities and plan of action were not dictated by LWG but originated in the ECE community. LWG's primary role as a convener instead of an expert in ECE led to an

inverted workgroup structure that placed the convener at the bottom while promoting stakeholders to facilitation roles, further increasing collaboration and ownership of key stakeholders.

Following analysis of 2017 knowledge and engagement scores, the evaluator presented results to Workgroup members. She intentionally used her presentation as an opportunity for education on principles of community and coalition engagement. The discussion allowed Workgroup members to better understand why LWG works the way it does and instill an even greater sense of ownership. Through the discussion members themselves evaluated Workgroup composition and intentionally identified additional members already doing work that would contribute to Workgroup goals and who would benefit from the coalition's connections and resources. At the conclusion of the pilot initiative, there was a substantial increase in perceived leadership and stewardship among ECE Workgroup members.

The greatest improvements over the one-year period were stakeholders' knowledge and understanding of community-level obesity prevention efforts. Throughout the coalition process, finding the balance of respecting stakeholders' expertise while simultaneously facilitating capacity building was challenging. Survey findings from 2017 demonstrated the ECE Workgroup's understanding of 'how to intervene for lasting impact' and 'available resources for childhood obesity prevention' was relatively low. These results highlighted that while trying not to act in an 'academic consultant' role, the evaluator did not contribute her expertise sufficiently. In the subsequent year, she shared more of the ECE community intervention literature with the Workgroup and members appeared to have greater appreciation for, and interest in, the existing knowledge base. Additionally, as the Workgroup members discussed 2017 survey findings, they

collectively identified gaps in the coalition and intentionally recruited Workgroup members representing agencies that provide direct technical assistance to ECE centers and regularly utilize local resources. As a Workgroup, improvements in scores in these knowledge domains (intervention factors, roles, sustainability and resources) from 2017-2018 were a particular source of pride. Finally, concurrent with formation of the ECE Workgroup and the ECE Initiative, the broader LWG coalition participated in a coalition-wide assessment of strengths and opportunities using the Core Capacity Assessment Tool ¹⁹. The overall coalition scored highly in Adaptive Capacity and Leadership Capacity, with noted strengths including organizational learning, internal leadership and leadership vision and influence. In addition to identified strengths of the ECE Workgroup, previous research on characteristics of effective coalitions supports our findings that a strong LWG internal staff and board with an understanding of coalition mission can adapt to meet partner needs and demonstrate partner value and roles within coalition goals and activities ²⁰⁻²².

Limitations

While findings from our work are promising, it is important to note any lessons learned must be adapted for specific context prior to implementation. Because the researcher was an integral ECE Workgroup member it is possible that Workgroup member answers were influenced by social desirability bias. Furthermore, while the analytic sample only included members present at both time points, it is important to acknowledge contributions of Workgroup members that strengthened the coalition over the measurement period may have influenced findings. Finally, although LWG has had great success engaging influencers in different sectors of the community, LWG has been less successful engaging the ultimate target population (children and their

parents). CBPR practice demands that the community comes first, however it is challenging to engage parents and children in ECE center policies, systems and environmental changes.

Throughout this process, the frontline staff who engaged in technical assistance and implementation of initiatives, served as quasi representatives of the voice of children and parents they serve. As the coalition moves forward, the ECE Workgroup plans to invite parents into the conversation.

Next Steps

Building on the trust developed between partners, the coalition has now expanded the initiative to over 30 ECE centers across eight counties in Upstate South Carolina. Key partners have taken the lead in developing the timeline, process, and evaluation of the expansion instead of coalition staff. Based on lessons learned from the pilot initiative, strategic changes to the expanded ECE Initiative include: 1) a partner organization has assumed full responsibility for individual level technical assistance with participating ECE centers, and 2) the Workgroup is focused exclusively on group-based networking with participating ECE centers, sharing lessons learned on how to intervene sustainably, and how to utilize local resources. Future engagement will continue to build upon lessons learned and create a larger network of ECE providers, creating a culture of health for South Carolina's youngest citizens.

References

1. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA*. Feb 1 2012;307(5):483-90. doi:jama.2012.40 [pii] 10.1001/jama.2012.40 [doi]
2. Patrick H, Nicklas TA. A review of family and social determinants of children's eating patterns and diet quality. *Journal of the American College of Nutrition*. Apr 2005;24(2):83-92.
3. Skinner JD, Carruth BR, Wendy B, Ziegler PJ. Children's food preferences: a longitudinal analysis. *J Am Diet Assoc*. Nov 2002;102(11):1638-47.
4. Singer MR, Moore LL, Garrahie EJ, Ellison RC. The tracking of nutrient intake in young children: the Framingham Children's Study. *Am J Public Health*. Dec 1995;85(12):1673-7.
5. Jones RA, Riethmuller A, Hesketh K, Trezise J, Batterham M, Okely AD. Promoting fundamental movement skill development and physical activity in early childhood settings: a cluster randomized controlled trial. *Pediatr Exerc Sci*. 2011;23(4):600-15.
6. Statistics NCfE. *Early Childhood Program Participation Survey of the National Household Education Surveys Program (ECPP-NHES:2005)*. 2005. Accessed February 18, 2017. https://nces.ed.gov/programs/digest/d09/tables/dt09_044.asp
7. Zhou YE, Emerson JS, Levine RS, Kihlberg CJ, Hull PC. Childhood obesity prevention interventions in childcare settings: systematic review of randomized and nonrandomized controlled trials. *Am J Health Promot*. 2014;28(4):e92-103. doi: 10.4278/ajhp.121129-LIT-579. Epub 2013 Nov 7.
8. Community-Based Participatory Research. Accessed 1/9/2017, <https://depts.washington.edu/ccph/commbas.html>
9. Dankwa-Mullan I, Rhee KB, Williams K, et al. The science of eliminating health disparities: summary and analysis of the NIH summit recommendations. *Am J Public Health*. 2010;100(Suppl 1):S12-8. doi:10.2105/AJPH.2010.191619
10. Sandoval JA, Lucero J, Oetzel J, et al. Process and outcome constructs for evaluating community-based participatory research projects: a matrix of existing measures. *Health Educ Res*. 2012;27(4):680-690. doi:10.1093/her/cyr087
11. greenville I. Nov 9, 2019, livewellgreenville.org
12. SCDHEC. ABC Quality. Accessed 08/31, 2018. <http://www.schildcare.org/providers/become-an-abc-provider.aspx>
13. Ward D, Morris E, McWilliams C, et al. *Go NAP SACC: Nutrition and Physical Activity Self-Assessment for Child Care, 2nd Edition*. 2014.
14. Palmetto Shared Services. Accessed 08/31, 2018. <https://www.palmettosharedservicesalliance.org/>
15. Korn AR, Hennessy E, Tovar A, Finn C, Hammond RA, Economos CD. Engaging Coalitions in Community-Based Childhood Obesity Prevention Interventions: A Mixed Methods Assessment. *Child Obes*. Nov/Dec 2018;14(8):537-552. doi:10.1089/chi.2018.0032
16. Shapiro VB, Oesterle S, Hawkins JD. Relating coalition capacity to the adoption of science-based prevention in communities: evidence from a randomized trial of Communities That Care. *Am J Community Psychol*. 2015;55(1-2):1-12. doi:10.1007/s10464-014-9684-9
17. Roussos ST, Fawcett SB. A review of collaborative partnerships as a strategy for improving community health. *Annual Review of Public Health*. 2000;21:369-402. doi:10.1146/annurev.publhealth.21.1.369
18. Fixsen DL, Naoom SF, Blase KA, Friedman RM, Wallace F. *Implementation Research: A Synthesis of the Literature*. 2005.

19. Group T. Core Capacity Assessment Tool.
20. Zakocs RC, Edwards EM. What Explains Community Coalition Effectiveness?: A Review of the Literature. *American Journal of Preventive Medicine*. 2006/04/01/ 2006;30(4):351-361. doi:<https://doi.org/10.1016/j.amepre.2005.12.004>
21. Brown LD, Feinberg ME, Greenberg MT. Determinants of community coalition ability to support evidence-based programs. *Prev Sci*. 2010;11(3):287-297. doi:10.1007/s11121-010-0173-6
22. Kegler MC, Rigler J, Honeycutt S. How does community context influence coalitions in the formation stage? a multiple case study based on the Community Coalition Action Theory. *BMC public health*. 2010/02/23 2010;10(1):90. doi:10.1186/1471-2458-10-90

Table 1. Knowledge and engagement results (n=9). Data from survey administered in 2017 and 2018 to members of LiveWell Greenville Early Childhood Community Advisory Committee

Constructs and domains	# items	Max score	2017		2018		p-value ^b
			Median score (IQR) ^a	Mean score (SD) ^a	Median score (IQR) ^a	Mean score (SD) ^a	
Knowledge							
<u>Composite</u>	18	25	14.6 (13.3-23.3)	17.1 (5.8)	22.5 (21.7-25)	21.5 (4.4)	0.01*
<u>Domain-specific</u>							
1. Problem: The problem of childhood obesity	3	5	4.2 (4.2-5)	4.3 (0.9)	5 (4.2-5)	4.4 (0.9)	0.36
2. Intervention factors: Which modifiable determinants of childhood obesity to address at what level of social ecology to address them	6	5	4.2 (2.9-5)	3.8 (1.3)	5 (4.6-5)	4.5 (0.9)	0.048*
3. Roles: Stakeholders' roles in the whole intervention, what others are doing, and knowledge of multi-setting components	3	5	3.3 (2.5-5)	3.6 (1.2)	4.2 (4.2-5)	4.3 (0.9)	0.048*
4. Sustainability: How to intervene for sustainability	3	5	1.7 (0.8-5)	2.5 (0.7)	4.2 (4.2-5)	4.2 (1.0)	0.02*
5. Resources: Available resources	3	5	2.5 (2.5-5)	2.9 (1.3)	4.2 (4.2-5)	4.2 (1.3)	0.02*
Engagement							
<u>Composite</u>	25	25	20.5 (19.5-21.8)	20.9 (2.5)	23.3 (22-24.3)	22.6 (2.4)	0.12
<u>Domain-specific</u>							
1. Dialogue & mutual learning: The exchange of skills and understanding among multiple people	7	5	4.5 (3.9-5)	4.4 (0.5)	4.8 (4.3-5)	4.6 (0.5)	0.39
2. Flexibility: The willingness to compromise and adapt	3	5	4.2 (4.2-5)	4.4 (0.5)	4.6 (4.6-5)	4.6 (0.5)	0.2
3. Influence & power: The ability or capacity to have an effect on a course of events, others' thinking and behavior	2	5	3.8 (3.8-5)	3.8 (0.8)	5 (3.8-5)	4.2 (1.3)	0.19

4. Leadership & stewardship: The action of directing and being responsible for a group of people or course of events	10	5	3.8 (3.5-4.3)	4.0 (0.65)	4.5 (4.5-5)	4.6 (0.4)	0.01*
5. Trust: the belief and confidence in others	3	5	4.6 (3.8-5)	4.4 (0.6)	4.6 (4.6-5)	4.6 (0.4)	0.3

^a All items were on a 5-point agree/disagree Likert scale. Data were weighted to reflect the number of items per domain to ease domain-to-domain comparisons. Composite scores are a mean of the total, not a sum of means; therefore, domain scores may not add up to composite scores.

^b Wilcoxon Signed Rank