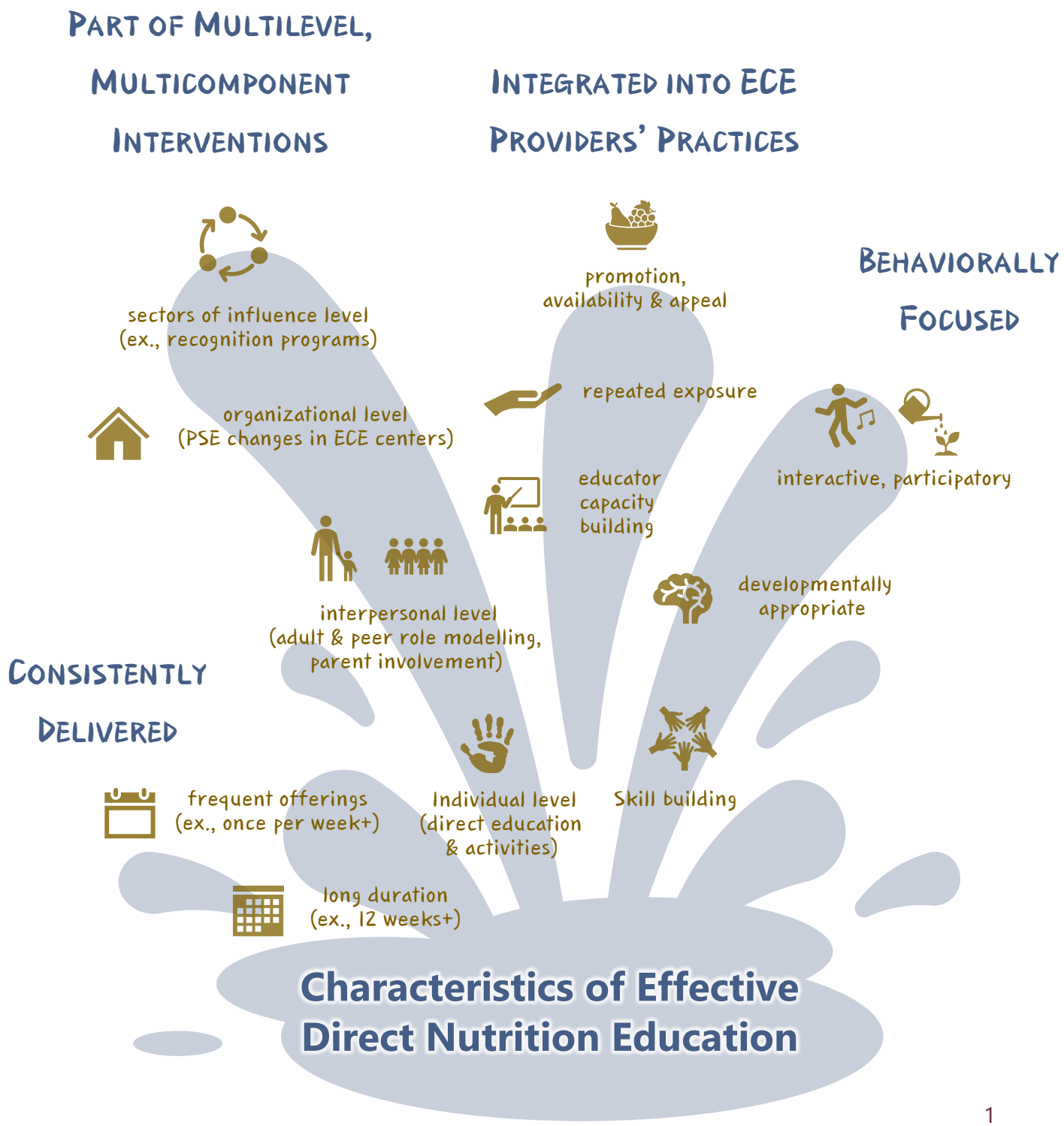
Annotated Bibliography

Evidence for the Effectiveness of Direct Nutrition Education & Multilevel Interventions in the Early Care & Education (ECE) Setting



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This bibliography was developed for Arizona's Supplemental Nutrition Assistance Program-Education (SNAP-Ed), known as the AZ Health Zone. The author, Theresa LeGros, is an evaluator operating out of the University of Arizona's Department of Nutritional Sciences and Wellness.

THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
Nutritional Sciences & Wellness

Review Papers

Contento I, Balch GI, Bronner YL, Lytle LA, Maloney SK, Olson CM, Swadener SS. (1995). Chapter 3: Nutrition Education for Preschool Children. *Journal of Nutrition Education*, 27(6): 291-297. https://doi.org/10.1016/S0022-3182(12)80089-6v

This synopsis was part of a larger USDA-sponsored effort, published as *The Effectiveness of Nutrition Education and Implications for Nutrition Education Policy, Programs, and Research: A Review of Research* in the same issue. Its purpose was to better understand nutrition education and inform the expansion of what would later become known as the Supplemental Nutrition Assistance Program-Education (SNAP-Ed). Chapter 3 explores the evidence for the effectiveness of two nutrition education models centered around preschool-aged children: (1) the information dissemination model, also known as the knowledge-attitude-behavior (KAB) model and (2) the behavioral strategy model, often but not always used *without* didactic teaching. There was evidence that the KAB model resulted in increased knowledge, with limited to no evidence that attitudes or behaviors changed. The behavioral strategy model was found to be more effective in changing children's behaviors (i.e., increasing their food acceptance), in particular when these strategies were employed: repeated food exposures, peer and adult modelling, positive emotional tone when foods were offered, and "appropriate" food rewards (some types of food rewards were not effective). Overall, the effectiveness of nutrition education for this age group was most strongly linked to *parent and family involvement*, a *behaviorally focused approach* that included systems-level changes like repeatedly offering foods, *developmentally appropriate learning experiences*, the *use of food-related activities* (e.g., tastings, gardens), and *activity-based teaching*. Evidence of the effectiveness of a KAB approach was more limited, especially with respect to behavior change. There was also evidence that systems-level supports for regularly recurring activities were more likely to be implemented into Early Care & Education (ECE) practices and environment when staff were well-trained and confident, the materials were accessible and affordable, and the ECE provider integrated them into their broader curriculum.

DeCosta P, Møller P, Bom Frøst M, Olsen A. (2017). Changing children's eating behaviour - A review of experimental research. Appetite, 113: 327-357. https://doi.org/10.1016/j.appet.2017.03.004

This review only included experimental studies (n=120 experiments) to better elucidate the causal connections between various intervention strategies and the eating behaviors of both preschoolers *and* school-aged children. After reviewing the literature, the authors reported summary findings for the effectiveness of 11 intervention strategies. In the language of the socioecological model (useful for the purposes of this bibliography but not used by Decosta et al.), some strategies were clearly linked to the PSE organizational level, others had characteristics of direct nutrition education at the individual level, and others could conceivably operate at any of the individual, interpersonal, and/or organizational levels. At the individual level, *sensory*

education (i.e., taste-based lessons) with mostly school-aged children was not found to have a substantive effect on their food preferences, though some experiments reported a greater short-term willingness to try new foods. There was emerging evidence that behaviorally-focused *cooking programs* with school-aged youth had positive effects on their vegetable preferences and consumption. *School garden* interventions usually combined direct education with the garden itself. Though school garden strategies did not include preschoolers, it is worth noting that gardens were found to positively influence vegetable preferences and were generally more effective than direct nutrition education alone. At the interpersonal level, controlling strategies—including *parental control* (e.g., restriction, pressure to eat) and the *use of rewards*—were found to be counterproductive to preschoolers' developing healthy eating habits. In contrast, *social facilitation around heathy eating* (peer modelling, adult modelling) positively influenced preschool- and school-aged children's behaviors. At the organizational level, the *availability and accessibility* of fruits and vegetables had a clear and positive influence on schoolchildren's fruit and vegetable intake; no experimental studies with preschoolers were reviewed due to a paucity of research. Similarly, *choice architecture* was found to influence schoolchildren's short-term selection of fruits and vegetables, but again, no experimental studies with preschoolers were available. Research that did include preschool-aged children found that *branding/packaging/spokes-characters* were effective in promoting healthy eating, as were *preparation method/serving style/serving order*. *Offering a choice* of fruits and vegetables to preschoolers was less studied, but there was some evidence that this can also be an effective strategy. Collectively, these findings reflect (1) strong experimental evidence for the efficacy of PSE intervention strategies that target the availability, access, and appeal of nutrient-dense foods to preschoolers and school-aged children and (2) convincing evidence that behaviorally-focused strategies are more effective than didactic nutrition education alone in influencing children's eating behaviors.

Matwiejczyk L, Mehta K, Scott J, Tonkin E, Coveney J. (2018). Characteristics of Effective Interventions Promoting Healthy Eating for Pre-Schoolers in Childcare Settings: An Umbrella Review. *Nutrients*, 10(3):293. https://doi.org/10.3390/nu10030293

This umbrella review examined 12 previously published systematic reviews to achieve three aims: (1) gauge the effectiveness of healthy eating interventions in the ECE setting, (2) identify characteristics shared by effective nutrition interventions, and (3) offer recommendations for future interventions. Most of the primary studies included in this review were conducted in the United States after the year 2000. The primary study interventions were found to have an overall positive influence on preschoolers' food choices and intake, including increased fruit and vegetable consumption and decreased saturated fat consumption. *Multilevel, multicomponent interventions that incorporated policy, systems, and environment (PSE) support (e.g., ECEs' written policies, revised menus) were the most effective*. Moreover, improvements in healthy eating behaviors were linked to interventions delivered in partnership with researchers or other experts,

versus those delivered by ECE providers without external support. Other characteristics associated with positive outcomes were: ECE educators' modelling healthy eating, using positive verbal reinforcement during meals, serving fruits and vegetables prior to other foods, and using non-food rewards; workplace wellness interventions for ECE staff; professional development for ECE staff; parental involvement in intervention activities in a variety of ways (ex., cooking, growing vegetables); and frequent, long-duration interventions. For interventions that directly involved preschoolers, interactive activities and peer social interactions were especially effective. Girls were more influential role models than boys for all children, younger children's eating patterns were influenced by older children's choices, and peer groups in general influenced children's willingness to try and consume foods. Together, these findings led the researchers to suggest the routine incorporation of multilevel interventions into the ECE setting, especially those that include characteristics such as *high parental engagement*, *behaviorally-focused activities*, and *capacity-building for educators*.

Arlinghaus KR, Schroeder M, Gold A, Goodman LP, Wagner G, Pass M, Hunt S, Stang J. (2023). Outcomes From Healthy Eating and Physical Activity Recognition Programs in Early Child Care and Education: A Scoping Review. *American Journal of Health Promotion*, 37(1): 132-145. https://doi.org/10.1177/08901171221116064

This scoping review examined ECE healthy eating and physical activity recognition programs to better understand their characteristics and the evidence for their effectiveness. Seven studies covering three unique recognition programs met the eligibility criteria and were included in the review. Unlike Quality Improvement Rating Systems, the recognition programs included various levels of trainings and technical assistance tailored to the ECE provider. They also included a variety of recognition incentives/awards. Each of the three programs were described as follows:

- *Start Right Eat Right* (Southern and Western Australia). Five of the seven studies included in the review assessed this nutrition-focused recognition program. Incentives included local advertisements for recognized centers, greater eligibility for center accreditation, and workforce training to improve center management and function. This program was also found to have the strongest evidence for its effectiveness: Participating ECEs reported high satisfaction with the program's benefits and the actual recognition award, most ECEs improved their menus and feeding practices, there was a 17-fold increase in the number of staff trained in food safety and hygiene, and the two studies that measured children's eating behaviors reported improvements.
- The *Empower Program* (Arizona, USA). One of the seven studies examined Empower, none of which assessed changes in children's behaviors. Recognized centers were granted discounted licensing fees for implementing the Empower Standards, and all participating centers self-reported at least partial program implementation, including staff role modelling and not using food as a reward or punishment. Two limitations of this study were the potential for self-reporting bias, especially given the licensing discount incentive, and that no comparison was made with non-participating centers.

- The *Healthy Apple Program* (San Francisco, CA, USA). One of the seven studies examined The Healthy Apple Program, which involved tailored support for completing the Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) improvement process. Recognized centers were awarded the Healthy Apple Program certification in a ceremony. There was also a one-time $25 incentive paid to ECE providers for participation. Nearly half (47%) of the ECE centers randomized into the intervention group received technical assistance, compared to 12% of centers in the non-intervention group. Similarly, 47% of intervention ECEs set at least one NAP SACC goal, compared to 4% in the non-intervention group. While the study did not assess children's behaviors, it did measure weight outcomes. Compared to the non-intervention group, the intervention group children saw significant reductions in zBMI scores and the incidents of overweight and obesity.

Together, these findings suggest that ECE recognition programs may be an effective way to (1) improve ECE centers' PSEs and (2) improve children's health-related outcomes. The evidence suggests that high-quality training and technical assistance may be especially important, though more work is needed to understand what "high quality" entails.

Recent Primary Studies (not included in above reviews)

Blue Bird Jernigan V, Taniguchi T, Haslam A, Williams MB, Maudrie TL, Nikolaus CJ, Wetherill MS, Jacob T, Love CV, Sisson S. (2022). Design and Methods of a Participatory Healthy Eating Intervention for Indigenous Children: The FRESH Study. *Frontiers in Public Health*, 10: 790008.
https://doi.org/10.3389/fpubh.2022.790008

These authors offer a cogent argument for the development and testing of multilevel healthy eating interventions for American Indian (AI) communities, including preschoolers. AI populations, they assert, were historically forced to rely on government food subsidies lacking nutritional quality, and many communities in tribal reservation areas face unique structural barriers to food access and availability. In response, this study was designed to understand the effectiveness of a multilevel, multicomponent ECE intervention—Food Resource Equity and Sustainability for Health (FRESH)—developed using a community-based participatory approach. This article describes the study design and intervention, while findings are reported in the next article. The FRESH study was designed as a randomized, wait-listed controlled trial carried out in partnership with the Osage Nation in Oklahoma. FRESH included three main components:

(1) *A 15-week nutrition and gardening ECE curriculum* aimed at increasing preschoolers' vegetable knowledge, willingness to try vegetables, and taste preferences for vegetables. The curriculum was adapted from other behaviorally-focused, gardening-centered curricula. Each week included a reading activity, an indoor and outdoor sensory activity, and a cooking

activity with a take-home recipe kit. Although this was classified as a curricular intervention, it included physical ECE garden beds as teaching tools (i.e., an environmental change).

(2) *A 16-week hybrid nutrition education and food sovereignty curriculum for parents/guardians*. This curriculum was also adapted from existing materials. It included 12 video modules and three in-person family night workshops. Again, although this was classified as a curriculum, the workshops involved community-engaged discussion around food sovereignty and community involvement in the local indigenous food system. The workshops also included meal preparation using indigenous ingredients and offered free child care.

(3) *A PSE component in the form of ECE program menu modifications*. Menu modifications were informed by the Child and Adult Care Food Program (CACFP) and also ensured that the vegetables covered in the ECE curriculum were served. ECE teachers and cooks were trained to introduce the menu changes and address emergent challenges.

Taniguchi T, Haslam A, Sun W, Sisk M, Hayman J. (2022). Impact of a Farm-to-School Nutrition and Gardening Intervention for Native American Families from the FRESH Study: A Randomized Wait-List Controlled Trial. *Nutrients*, 14: 2601. https://doi.org/10.3390/nu14132601

This paper covers the FRESH findings from the wait-listed, controlled trial described in the previous article. Two Osage communities received the ECE intervention and completed baseline and follow-up assessments (n=94 children and 85 adults), and two acted as the control (n=82 children and 66 adults). Intervention group children and adults were more likely to identify as Native American, while control group students and adults were more likely to identify as Caucasian. The adult intervention group was also more likely than the control to have an annual household income of over $50,000, have a higher education, and work full time. Of the six vegetables covered by the intervention and measured using plate waste, there were highly statistically significant increases in preschoolers' consumption of two: squash and beans. These increases were not found for the control group. Children's willingness-to-try-beans scores also increased significantly for the intervention but not the control. *Adults* in the intervention group had a slight, nonsignificant increase in fruit and vegetable intake and a small but nonsignificant improvement to systolic blood pressure not found in the control group. In dietary recalls, the adult intervention group reported a significant improvement in total energy consumption not measured among the control. Neither group reported changes in food security status. Taken together, the findings suggest that *the multilevel, multicomponent FRESH intervention was effective in encouraging preschoolers in rural Native American ECEs to try and consume more vegetables*. Adults may have also experienced some tangential benefits, though *more comprehensive parental components may be needed to support household-level changes*.

Kostecka M. (2022). The Effect of the "Colorful Eating is Healthy Eating" Long-Term Nutrition Education Program for 3- to 6-Year Olds on Eating Habits in the Family and Parental Nutrition Knowledge. *International Journal of Environmental Research and Public Health*, 19: 1981. https://doi.org/10.3390/ijerph19041981

This study was intended to measure the effectiveness of a nutrition education program for 3- to 6-year olds on their *parents'* nutrition knowledge. The six-lesson *Colorful Eating is Healthy Eating* curriculum was administered to preschool-aged children in Poland over a series of months; one 30-60 minute lesson was provided each month on a different topic. Parents of children that received the education (n=211) were surveyed before and after the intervention, and parents of control group children that did not receive the intervention (n=310) were also surveyed. Of note, the intervention group parents differed significantly form the control group parents: They were less likely to live in larger cities, more likely to have a university-level education, and more likely to be permanently employed. The author found that parents reported some improvements to family eating habits after the intervention, significantly decreasing their sweetened beverage intake and increasing their water intake. However, it is worth noting that the final two monthly intervention topics were focused on reducing added sugars and drinking water, and no longer-term follow-up survey was conducted to assess the extent to which these changes were sustained. Also of note, the intervention was *not* found to alter sweet food *preferences*. Moreover, the intervention group parents may have been susceptible to self-reporting bias since their children had more recently been taught the topics most reported to change. In terms of parental knowledge, the intervention group scores increased for fiber, reading food labels, and for the "knowledge" that breakfast "is the most important meal of the day." Parental knowledge did not improve around snacking or the relationship of sweeteners to dental caries and excess weight. Article weaknesses—including misalignment of the author's messaging with USDA messaging and an inaccurate assertion that very young children "are not yet highly influenced by their peers and the environment"—warrant caution. Nevertheless, considering how nutrition education taught *outside* the home can influence food environments and behaviors *within* the home may be useful for designing and evaluating ECE-based interventions. This includes the study's general finding that parents with older children were more likely to increase their nutrition knowledge, presumably because the children were sharing more about the lessons due to their (generally) more advanced cognitive development.

Primary Studies of AZ Health Zone Approved Preschool Curricula*

*There are two AZ Health Zone approved curricula for this age group: *Color Me Healthy* and *Grow It Try It Like It!* In the studies reported here, both curricula were described as part of broader, multilevel ECE interventions. No research studies have been published around the effectiveness of the *Grow It, Try It, Like It!* curriculum, although the abstract described below did include this curriculum as part of a larger program.

Dunn C, Thomas C, Ward D, Pegram L, Webber K, Cullitan C. (2006) Design and Implementation of a Nutrition and Physical Activity Curriculum for Child Care Settings. *Preventing Chronic Disease*, serial online. Available at: http://www.cdc.gov/pcd/issues/2006/apr/05_0039.htm

This article describes the early implementation and evaluation of the *Color Me Healthy* curriculum. The authors, three of whom developed the curriculum, describe *Color Me Healthy* as guided by social cognitive theory and the socioecological model. At the individual level of the socioecological model, children and adults learn about healthy eating and physical activity through 12 circle-time lessons that engage multiple senses. At the interpersonal level, parents are engaged through take-home materials (posters and newsletters), and educators act as role models. Organizationally, the curriculum is intended to be integrated into the ECE setting via a train-the-trainer model to influence the amount and quality of nutrition education and physical activity opportunities provided to preschoolers; the ECE environment is also enhanced with *Color Me Healthy* posters. More broadly, the authors say that the curriculum seeks to bring awareness to community-level nutrition and physical activity PSEs, and that it can be used at the societal level when it becomes part of a larger PSE initiative—for example as part of a statewide program. Based on this model, the authors explored the effectiveness of a *Color Me Healthy* train-the-trainer approach in which county representatives were first trained on the curriculum during a statewide workshop. After the initial workshop, county teams created local dissemination plans for training ECE staff in their respective communities. This led to 1,338 ECE staff participating in 53 experiential, hands-on trainings. Eight weeks after the local trainings, the ECE staff participants were invited to complete post-training surveys about the effectiveness of the training, the actual *Color Me Healthy* materials, and any other suggestions they had for training improvements. Nearly 500 participants completed the 38-item survey. Results revealed positive experiences, including: 94% reported the training effectiveness to be excellent or very good; 97% rated the *Color Me Healthy* materials as excellent or very good; 92.0% said that using *Color Me Healthy* increased children's physical activity; 79.0% indicated that children were more willing to try new foods after the *Color Me Healthy* lessons; 82.0% said the curriculum increased children's fruit and vegetable recognition; 92% reported that using *Color Me Healthy* helped them realize the value of teaching nutrition in ECE settings; and nearly all respondents (99.8%) said that they would use *Color Me Healthy* in the future. Thus, although this study did not measure the effectiveness of the actual curriculum (the intervention study below covered that topic), it did offer evidence that a train-the-trainer model for *Color Me Healthy* has the potential to influence multiple levels of the socioecological model, most notably the organizational, interpersonal, and individual levels. In particular, the authors found that state-and-county interagency partnerships offered a valuable infrastructure for implementing and disseminating trainings to local ECEs around the state. They also suggested that the train-the-trainer model may be more effective when county/local-level *teams*, rather than single trainers, manage local ECE training plans.

Witt KE, Dunn C. (2012). Increasing Fruit and Vegetable Consumption among Preschoolers: Evaluation of Color Me Healthy. *Journal of Nutrition Education and Behavior*, 44(2): 107-113. http://dx.doi.org/10.1016/j.jneb.2011.01.002

This intervention study included two groups of randomly assigned ECE centers: 10 sites (n=165 preschoolers) received the *Color Me Healthy* intervention, and seven (n=98 preschoolers) did not, thereby acting as the comparison group. *Color Me Healthy* was a six-week intervention consisting of two circle time lessons and one imaginary trip per week, for a total of 18 periods of structured activity in under two months. The curriculum itself was behaviorally-focused (for example, by employing sensory explorations like taste testing), with a particular emphasis on fruits and vegetables. Lead ECE teachers were trained to implement the curriculum. Parents were also engaged via *Color Me Healthy* newsletters and take-home activities. From baseline to the three-month follow-up assessment, the intervention group saw statistically significant increases in children's fruit (up 21%) and vegetable (up 33%) snack consumption—and not in their cracker consumption, used as a control since the curriculum did not promote cracker intake. In contrast, the comparison group did not experience any significant changes in their consumption patterns. The authors also found that *Color Me Healthy* was the *only* significant predictor of fruit and vegetable intake in their analysis. Parent engagement was described as challenging, though some parents were especially involved in supporting the take-home activities: 22% completed all six activities, and on average, 3.4 of the 6 activities were completed. Together, these findings support the idea that *behaviorally-focused nutrition education with preschoolers can be effective under certain circumstances*. In this study, those circumstances included:

- *Activities took place regularly over a prolonged period*. Here, they were taught three times per week and additionally included a weekly take-home activity over six weeks.
- T*he curriculum was taught by a trained ECE instructor*. Training ECE instructors to teach *Color Me Healthy* shares conceptual overlap with an ECE systems change approach to nutrition education. Although the study did not explicitly explore adult or peer influence, it is possible that modelling by ECE instructional staff and/or peers contributed to the positive results.
- *The curriculum engaged at least a proportion of parents* in the intervention. Because parental engagement in the evaluation component was low (14%), the authors were unable to draw substantive conclusions about changes in the home environment. The extent to which parental support for intervention messages influenced the preschoolers' fruit and vegetable snack intake while *at* the ECE center was not studied.

Wass J, Hofing G, Goolsby L, Haynes-Maslow L, Dunn C. (2017). Color Me Healthy for SNAP-Ed Supplemental Toolkit: A Comprehensive Approach to the Social-Ecological Model. *Journal of Nutrition Education and Behavior*, 49(7S1): S53. https://doi.org/10.1016/J.JNEB.2017.05.263

This abstract briefly describes a multilevel intervention approach in the ECE setting that combined the *Color Me Healthy* curriculum used in SNAP-Ed direct education with NAP SACC, focused on improving PSEs. SNAP-Ed-participating ECE providers engaged in the five-step NAP SACC improvement process while also delivering *Color Me Healthy* to enrolled preschoolers. The authors reported NAP SACC to foster sustainable relationships between ECEs and their SNAP-Ed partners: as of the abstract submission, 82% of the ECEs had completed the full NAP SACC

improvement cycle, and a third of ECEs had participated in the comprehensive program for at least two years, moving through one NAP SACC improvement cycle per year. A second evaluation component was designed to assess changes in preschoolers' behaviors through parent and educator surveys, however the abstract did not report those individual-level results. The authors concluded that combining NAP SACC with direct education using *Color Me Healthy* can be an effective way to address multiple levels of the socioecological model in the ECE setting.

O'Connor T. (2019). Outcomes from the Colorado Team Nutrition Cooking Up Healthy Options with Plants (CHOP) Program. Journal of Nutrition Education and Behavior, 51(7S): S25-26. https://doi.org/10.1016/j.jneb.2019.05.364

This abstract briefly describes results from a quasi-experimental pre-post evaluation of a multilevel Farm-to-ECE initiative called Cooking Up Healthy Options with Plants (CHOP). CHOP was designed to improve ECE providers' eating environments by enhancing their offerings of seasonal, fresh, local, and/or onsite garden-grown fruits and vegetables. It involved training chefs on these kinds of produce, providing funding for ECEs to establish gardens and teach the *Grow it, Try it, Like It!* curriculum to preschoolers, and technical assistance from Master Gardeners and a Team Nutrition Grant Educator. The evaluation revealed that the in-person culinary trainings improved the chefs' knowledge of food service practices related to fruits and vegetables. The intervention was also associated with improvements to the ECE food environment, including an increase in the amount of seasonal, fresh, or garden produce offered to children. No changes in the trainees' knowledge of the USDA Dietary Guidelines or CACFP meal patterns were found, and no individual-level outcomes for preschoolers' eating behaviors were reported. The author concluded that a competitive subgrant program can be an effective way to promote Farm to ECE programs such as CHOP.