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Provider Adherence to Nutrition and Physical Activity Best Practices Within Early Care and Education Settings in Minnesota, Helping to Reduce Early Childhood Health Disparities

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Abstract

Licensed child care providers, and the early care and education settings in which they operate, are uniquely situated to influence children's healthy eating and physical activity through practices, attitudes, and supportive physical and social environments. However, preliminary research indicates that child-, family-, and provider-level characteristics affect adherence to best practices across early care and education settings. The current article used survey data ($n = 618$) to characterize differences in child care providers' adherence to nutrition, physical activity, and mealtime best practices, based on child-, family- and provider-level characteristics, and to describe secular trends in adherence to nutrition and physical activity best practices between 2010 and 2016. Results indicate that differences exist across certain characteristics, including child race/ethnicity, family's use of child care assistance, language spoken at home, and provider educational attainment; however, it is notable that in most cases providers serving children of minority race and children in low-income families have a higher rate of compliance with the nutrition and physical activity best practices studied. Additionally, the comparison of adherence to best practices from 2010 to 2016 suggests that, while there was an increase in mean adherence from 2010 to 2016, overall trends in adherence across child-, family- and provider-level characteristics have been consistent across time. Public health professionals should continue to advocate for opportunities for providers to learn how to best incorporate best practices within their setting (e.g., education and training opportunities) as well as for the development and adoption of systems-level changes (e.g., expansion of food assistance programs) to reduce barriers to adherence to best practices.

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Keywords

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The number of American preschoolers who are at an unhealthy weight has reached a concerning plateau in the past three decades, with obesity affecting nearly 9% of children aged 2 to 5 years (Ogden et al., 2002; Ogden, Flegal, Carroll, & Johnson, 2002; Ogden, Carroll, Curtin, Lamb, & Flegal, 2010; Ogden, Carroll, & Flegal, 2008; Ogden, Carroll, Kit, & Flegal, 2014; Ogden et al., 1997; Ogden et al., 2016); furthermore, obesity is unequally distributed among preschoolers with clear disparities observed by race/ethnicity and socioeconomic status (SES) (Ogden, Flegal, et al., 2002; Ogden, Kuczmarski, et al., 2002; Ogden et al., 2008; Ogden et al., 2010). Contributing to these obesity rates are unhealthy dietary and physical activity (PA) patterns, including: (1) high consumption of high-calorie-low-nutrient snack foods and sugar sweetened beverages; (2) inadequate consumption of fruits, vegetables, and water; and (3) excessive sedentary behavior and limited movement throughout the day (Newby, 2007).

Licensed child care providers, and the early care and education (ECE) settings (Anon, n.d.) in which they operate, play a critical role in shaping children's food and active play preferences and establishing their physical and social environment (American Academy of Pediatrics, American Public Health Association, & National Resource Center for Health and Safety in Child Care and Early Education, 2002; Benjamin Neelon & Briley, 2011; Birch, Parker, & Burns, 2011; Nicklas et al., 2001). ECE settings offer opportunities for obesity prevention, as more than 60% of children aged 5 years and younger spend a significant portion of their waking hours and routinely eat one to two meals and snacks in ECE settings (Capizzano, 2000; National Academies of Sciences, Engineering, and Medicine, 2016). The knowledge that child care providers are uniquely situated to influence children's healthy eating and PA through practices, attitudes, and supportive physical and social environments (Kaphingst, French, & Story, 2006) has led to the development of best practices for the promotion of healthy eating and PA in ECE settings (American Academy of Pediatrics, 2002; American Dietetic Association, 2005; Benjamin Neelon & Briley, 2011; Pratt, Stevens, & Daniels, 2008). Unfortunately, implementation of recommended best practices is unregulated, and the burden of adherence to these recommendations lies on the child care providers.

Research examining differences in adherence to best practices across child-, family-and provider-level characteristics is limited; however, data suggest that disparities in knowledge and practices exist across ECE settings (Freedman & Alvarez, 2010; Huang et al., 2012; Lanigan, 2012; Lynch & Batal, 2011; Nahikian-Nelms, 1997; Nicklas et al., 2001; Taveras, LaPelle, Gupta, & Finkelstein, 2006; Tovar, Mena, Risica, Gorham, & Gans, 2015; Trost, Messner, Fitzgerald, & Roths, 2009). For example, a study conducted within a small convenience sample of 72 multiethnic center and family-home providers found that more than 85% of Hispanic providers reported pressuring children to eat specific healthful food items (e.g., vegetables, nutritious main dishes), as compared with 69% of Asian and 44% of

White providers (Freedman & Alvarez, 2010). In the same study, providers of minority race were also found to be significantly more likely to insist on children eating all the food provided to them, more likely to report only preparing foods that they know the children will like, and significantly less likely to report eating meals alongside the children in their care, indicating that providers of minority race in this small sample were less likely to adhere to mealtime best practices in ECE settings (Freedman & Alvarez, 2010).

Several descriptive studies have identified provider knowledge, training, and beliefs as important to adherence to best practices. For example, one study found that center- and family-home-based providers ($n = 45$) serving children from low-income families and in families of minority race reported feeling comfortable distributing information on healthy nutrition and PA to parents but uncomfortable being involved in other types of activities (e.g., parent or child educational events or activities, staff trainings) related to the promotion of good nutrition or regular PA for the children in their care (Taveras et al., 2006). A lack of knowledge, training, and appropriate curriculum, as well as concerns about offending parents, were identified as barriers to increased involvement in health promotion efforts by providers involved in this study (Taveras et al., 2006). Furthermore, a study by Lanigan (2012), which surveyed 72 providers from 45 different center-based ECE settings, concluded that provider beliefs, which are often greatly dependent on a provider's racial/ethnic and SES background, greatly influence their training as well as their nutrition and PA practices within their child care setting (Lanigan, 2012). Overall, this handful of studies exploring adherence to best practices within ECE settings provides preliminary evidence that adherence to best practices may be influenced by child-, family- and provider-level characteristics; however, large gaps exist in our understanding of how these characteristics are associated with the multitude of best practices recommendations that exist.

Additional research investigating differences in child care provider adherence and barriers to implementing nutrition and PA best practices based on child-, family-, and provider-level characteristics is needed. This research can improve our understanding of the nuances of early-childhood education and potential to reduce existing health disparities. Thus, the current study used data from the *Healthy Start, Healthy State* study, which surveyed 618 semirandomly sampled and licensed center- and family-based child care programs serving infants to 5-year-old children in Minnesota, to achieve the following aims: (1) to characterize differences in application of nutrition and PA best practices, including recommended mealtime practices based on provider- and family-level characteristics; (2) to identify barriers to achieving best practice standards across provider- and family-level characteristics; and (3) to describe secular trends in adherence to nutrition and PA practices across provider- and family-level characteristics between 2010 and 2016.

Method

In 2016, the University of Minnesota conducted a survey of licensed Minnesota child care providers in collaboration with the Center for Prevention and Blue Cross and Blue Shield of Minnesota (*Healthy Start, Healthy State* study). This survey was the follow-up to a 2010 survey of providers in Minnesota and Wisconsin (Nanney et al., 2016); this follow-up survey was not conducted in response to any specific policy change during this time. An active

advisory board of child care experts and key stakeholders were relied on to guide all aspects of the study, including development of the survey instrument, interpretation of study findings, and dissemination of the results to key decision makers. The advisory board in large part was carried over from the 2010 study and included individuals representing state agencies like the State Departments of Health (e.g., Early Care and Education Specialist, Nutrition) and Education (e.g., Child and Adult Care Food Program [CACFP] director and staff), local public health (Bloomington Public Health, Statewide Health Improvement Program), nonprofit advocacy organizations (Public Health Law Center, Hunger Impact Partners), association representatives (e.g., West Central Initiative, Association of Family Home Providers, State Head Start Director), licensure regulators (Minnesota Department of Health Services child care licensing), a CACFP sponsoring organization, and a handful of ECE providers. Members of the advisory board were not allowed to participate in the survey.

Study Design and Provider Recruitment

A stratified random sampling procedure was used at both time points; a random sample of providers stratified by location (rural and urban) and type (center and family home) were selected to receive the survey mailing with the goal of surveying a sample of licensed child care providers that represented providers from different locations and different types of care settings. Additionally, all 2010 survey participants that still had an active license to provide care in Minnesota in 2016 were invited to participate. Providers were mailed a packet that included the study description, a unique link to a site to take the survey online, a paper copy of the survey, and a postage paid return envelope in which to return a completed paper survey. Providers were given a \$30 gift card for their participation in the study. Additionally, surveys were completed by an open, convenience-based sample of providers; members of the Healthy Start, Healthy State advisory board were provided with an e-mail that included a study description and a link to the online survey and invited to pass along this invitation to any potential participants. For this convenience sample, only the online survey option was available, and no monetary incentive was provided. Surveys were completed by the provider, director, or teacher most familiar with the program's nutrition and PA policies and practices. The University of Minnesota Institutional Review Board approved all study protocols in both 2010 and 2016.

The analysis sample included for this study included 597 providers who completed the 2016 survey (203 center based and 394 family-home based) and 418 providers who completed the 2010 survey (214 center based and 204 family-home based; Table 1). For the description of secular trends from 2010 to 2016 (Aim 3), the sample of all Minnesota providers who completed a 2010 survey was utilized. Finally, for all three aims, data collected from Head Start centers (2010: $n = 28$; 2016: $n = 21$) were excluded from analysis. The decision to exclude Head Start centers from analysis was made out of concern that inclusion of these programs might confound study results given that centers are required to adhere to more rigorous nutrition and PA standards and also serve a special population of children (e.g., low income, special needs); stratified analysis was also not appropriate given the small number of these centers in our data set. The analytic sample does include providers that participate in the CACFP; 50.7% of centers and 92.8% of family homes were actively participating in

CACFP. The potential implication of CACFP participation on the current study results is discussed in detail within the Discussion section.

With the goal of improving the quality of ECE settings in Minnesota and throughout the United States, the Healthy Start, Healthy State study team is open to sharing the full data set collected as a part of the study with interested advocates, policy makers, and researchers; please visit the study website to request access to the data (z.umn.edu/healthystarthealthystate).

Survey Instrument Development and Measures

The 115-item survey developed for this study examined compliance with existing nutrition and PA best practices, as well as challenges faced by (ECE) providers in implementing best practices. In 2010, a 97-item survey was developed through a thorough review of literature and available best practices; the 2010 survey was pilot tested with 12 providers; additional details about this survey development are available elsewhere (Nanney et al., 2016). The 2016 survey included many of the existing 97 items from the 2010 survey for longitudinal analysis, as well as additional items guided by current literature. Because no gold standard list of nutrition and PA best practices for child care providers exists, the best practices identified for this study were pulled together based on standards outlined in the child care literature, including Caring for our Children, Nutrition and Physical Activity Self-Assessment for Child Care, and CACFP guidelines, with some additions and adaptations made based on the feedback from our stakeholder advisory board (Minnesota Department of Health Services, n.d.; Nutrition and Physical Activity Self-Assessment for Child Care, n.d.; “Right from the Start–OPHI,” n.d.; UConn Rudd Center for Food Policy and Obesity, n.d.; U.S. Department of Agriculture, Food and Nutrition Service, n.d.). Survey questions were then pilot tested with nine providers and further adapted based on feedback received during pilot testing. Complete copies of the 2010 and 2016 surveys are available for review at the project website z.umn.edu/healthystarthealthystate.

Nutrition and Physical Activity Best Practices

Nutrition best practices included 23 questions within five categories assessing whether providers serve healthy meals, snacks, and beverages ($n = 12$); provide nutrition education lessons to children at least three times a year ($n = 1$); encourage healthy eating habits and provider/staff role modeling ($n = 6$); encourage provider training ($n = 1$); and write, implement, and distribute a healthy nutrition policy ($n = 3$).

PA best practices included 11 questions within five categories assessing whether providers meet frequency and time standards for PA, including for special needs children ($n = 3$); limit inactive time ($n = 3$); provide PA lessons to children at least three times a year ($n = 1$); encourage provider training at least once a year ($n = 1$); and write, implement, and distribute a PA policy ($n = 3$).

Six response options allowed participants to indicate either (1) how difficult it would be to comply with each best practice (using a 5-point Likert-type scale: “very difficult,” “somewhat difficult,” “not at all difficult”) or (2) to indicate that they “already do this”; for

the current study, we determined adherence (or lack of adherence) to a particular best practice via the response of “I already do this” (yes or no).

Summary scores were constructed by summing the number of nutrition-related best practices already implemented ($n = 23$) (range 0–23; Cronbach’s $\alpha = .88$) and the number of PA-related best practices already implemented ($n = 11$) (range 0–11; Cronbach’s $\alpha = .83$). For descriptions of secular trends, summary scores were constructed from best practice items included in both the 2010 and the 2016 surveys (nutrition: [$n = 15$] [range 0–15; Cronbach’s $\alpha = .78$]; PA: [$n = 8$] [range 0–8; Cronbach’s $\alpha = .75$]).

Barriers to Nutrition and Physical Activity Best Practices

Providers were given a list of 19 items for nutrition-related barriers (e.g., cost of purchasing healthier foods, lack of time to prepare and serve healthy foods) and 15 items for PA-related barriers (e.g., weather constraints, cost of purchasing equipment for active play) and asked to select and rank their five most challenging barriers from each list. The list of barriers for participants to choose from was developed in collaboration with the stakeholder advisory board; that said, participants were also given the option to write in of barriers that were not included in the list.

Child-, Family-, and Provider-Level Characteristics

The questions marked with an asterisk (*) in this section were not asked in 2010, limiting their inclusion in analyses requiring both time points.

*Family-level income** was assessed by asking providers “What would you guess the average yearly income to be of the families whose children attend your program?” *Use of child care assistance and/or other types child care scholarships** was assessed by asking “Do you have children in your program whose care is paid for at least in part by child care assistance/scholarships?” *Child food insecurity* was assessed by asking “How often do you notice children in your program who do not appear to be getting enough food to eat at home?”

*Language(s) spoken at home** was assessed by asking providers “To the best of your knowledge, what languages are spoken in the children’s homes? (Check all that apply.). Twenty-five language options were available to select from, with additional options to write in a response or select “I do not know.” For this study, we created a dichotomous variable: “No new immigrant languages” versus “1 or more new immigrant languages.” New immigrant languages were selected based on immigrant populations arriving in Minnesota after 1970 (Liuzzi, 2016) and their country of origin and included *Mexico*: Spanish; *Laos/Myanmar/Thailand/Vietnam/Cambodia/Philippines*: Hmong, Karen, Lao, Vietnamese, Burmese, Khmer, Tagalong; *African/East African*: Amharic, Somali, Oromo, Bassa, Ewe; and *India*: Nepali, Arabic.

Child race/ethnicity was assessed by asking providers “On a typical day, how many children in your program are of the following racial and ethnic backgrounds?” Based on provider responses to this question, the percent of “children of minority race” was calculated for each child care site; responses other than Caucasian were categorized as minority race. Providers were asked to respond to this question with the caveat of “on a typical day” as some children

attend less than full time, making it possible that this response could vary slightly day-to-day.

Provider race/ethnicity was assessed by asking “Which of the following do you consider yourself?” *Provider level education* was assessed by asking “What is the highest grade or year of school you have completed?” Additional details on child, family, and provider characteristics, including response options, can be found in Table 1.

Analysis

Two-sample two-sided *t* tests (for two category variables) and analysis of variance (ANOVA) models (for variables with more than two categories) were used to compare mean nutrition and PA scores across categories of child, family, and provider characteristics. If the ANOVA *F* test was significant, post-hoc *t* tests with the Tukey adjustment for multiple comparisons (which preserves the overall type I error rate at .05) were used to identify which categories had significantly different mean scores. Chi-square tests were used to identify significant differences in the distribution of percent of providers who already do each mealtime practice across categories of child, family, and provider characteristics (Table 2). For characteristics with more than two categories, a significant chi-square test does not specifically identify which groups have significant differences. Descriptive statistics were used to characterize secular trends in adherence to best nutrition and PA practices from 2010 to 2016. Significance level (alpha) of .05 was used to identify statistical significance in all tests and models. SAS version 9.4 was used for all statistical analyses.

Results

In 2016, child care providers had a mean nutrition summary score of 11.9 (*SD*: 5.5) out of 23 possible [center based: 12.2 (5.6), family-home based: 11.7 (5.5)] and a mean PA summary score of 5.6 (*SD*: 3.1) out of 11 possible [center based: 6.7 (3.0), family-home based: 5.0 (3.1)]. Additional details are included in Table 1.

Comparisons between 2010 and 2016 should be interpreted with caution because of small cell counts in several cells (see Tables 3 and 4). The mean nutrition and PA summary scores were higher in 2016 than in 2010 indicating a general trend of improvement in adherence to best nutrition and PA practices. Overall, the pattern of differences in mean nutrition and PA scores across child and provider characteristics categories was consistent in 2010 and 2016. For example, in both years, mean nutrition and PA scores increased with increasing provider education and were higher in programs where providers sometimes to very often served children with food insecurity.

Overall, child care providers who reported currently serving families that utilize child care assistance had a significantly higher ($p = .03$) mean nutrition summary score: 12.6 out of 23.0 possible (*SD*: 5.8), as compared with mean (*SD*) scores of 11.0 (5.4) and 11.7 (5.2) out of 23 among providers who would not or did not currently accept this type of assistance, respectively.

Child care providers who reported currently serving families that use child care assistance had a significantly higher ($p < .01$) mean PA summary score of 6.5 (SD : 3.0) out of 11 possible, as compared with mean (SD) scores of 4.7 (3.1) and 5.0 (2.9) out of 11 among providers who would not or did not currently accept this type of assistance, respectively. Mean PA summary score was also significantly higher ($p = .01$) among child care providers who reported serving between 50% and 100% children of minority race compared with programs that did not serve any children of minority race (mean PA scores of 6.5 and 5.1 out of 11, respectively). Providers who reported serving families who spoke one or more new immigrant languages had a significantly higher ($p < .01$) mean PA summary score of 6.5 out of 11 compared with programs that reported only serving families that spoke English or nonnew immigrant languages (mean score of 5.2). Child care providers who reported serving children experiencing food insecurity were found to have a significantly higher mean PA summary score of 6.7 out of 11 compared with a score of 5.2 out of 11 among programs that reported never to rarely serving children experiencing food insecurity ($p < .01$). Finally, providers with at least some college education reported significantly higher ($p < .01$) mean PA summary scores as compared with providers who had a high school diploma or less (mean PA scores of 6.1 and 4.4 out of 11, respectively).

As seen in Table 2, a higher percentage of providers serving families that use child care assistance served family style or combination meals, had at least one adult sit at the table and eat the same meals, and modeled healthy eating during meal and snack times, as compared with providers that did not currently or would not accept this type of assistance (all $p < .05$; Table 2). A higher percentage of providers serving families that spoke one or more new immigrant languages served family style or combination meals or had at least one adult sit at the table and eat the same meals, as compared with providers serving families who spoke only English or nonnew immigrant languages at home (both $p < .01$). Finally, providers with a college degree were significantly more likely to have at least one adult sit at the table and eat the same meals and model healthy eating behaviors during meal and snack time, as compared with providers without a college degree (both $p < .05$).

Providers identified the following as the top five barriers to compliance with nutrition best practices: cost of healthier foods (reported by 72% of center-based providers, 74% of family-home providers), fresh foods spoiling quicker than other foods (center = 43%, family home = 40%), children not responding well (center = 22%, family home = 47%), inability to shop more than once per week (center = 29%, family home = 40%), and lack of time to prepare and serve healthy foods (center = 31%, family home = 35%). Providers identified the following as the top five barriers to compliance with PA best practices: weather (reported by 63% of center-based providers, 81% of family-home providers), children sent without appropriate clothing (center = 47%, family home = 54%), cost of purchasing equipment (center = 47, family home = 48%), lack of indoor space (center = 37, family home = 48%), and lack of equipment for safe play (centers = 14%, family home = 18%). No differences in the top barriers were identified across family- or provider-level characteristics (data not shown).

Discussion

The aim of the current article was to characterize differences in child care provider's adherence to—and barriers against—implementing nutrition, PA, and mealtime best practices, based on child-, family-, and provider-level characteristics. Study results tell a particularly interesting story; it is typically assumed that providers who serve primarily families from a low SES background would charge lower tuition to meet the needs of the families they serve and therefore be forced to cut costs, resulting in a potentially negative impact on nutrition and PA offerings in their setting. Instead, in contrast to this hypothesis and findings from previous research (Freedman & Alvarez, 2010; Huang et al., 2012; Lanigan, 2012; Nahikian-Nelms, 1997; Nicklas et al., 2001), the results of the current study suggest that many providers serving families from low SES backgrounds are finding ways to maintain similar, and in most cases better, levels of adherence to best practices as compared with providers that are serving families from higher SES backgrounds.

Important work across the state of Minnesota through a multitude of programs such as the Statewide Health Improvement Program (Minnesota Department of Health Services, 2010), Families First of Minnesota (n.d.), the West Central Initiative (n.d.), and the Public Health Law Center (n.d.) points to a concerted effort to provide comprehensive support to child care providers serving all types of families. The unanticipated results of the current study may be a result of providers having access to these varied opportunities to improve their knowledge and skills related to creating healthy nutrition and PA environments for the children in their care. Many of these programs are free for providers to access, making participation feasible for providers with limited financial resources; furthermore, outreach for these programs often targets providers who work with low-income or otherwise disadvantaged families. Thus, it might be as a result of these concerted efforts that child care providers struggling with income-based barriers are finding creative solutions to achieving nutrition and PA best practices.

Additionally, more than 50% of providers in the current study (50.7% of centers and 92.8% of family homes) were actively participating in CACFP, a federal nutrition assistance program that provides reimbursement for meals and snacks for children in participating child care programs. CACFP makes a pointed effort to promote healthy eating behaviors within child care environments serving low-income families by requiring program participants to serve meals and snacks that comply with specific nutrition standards in order to qualify for monetary reimbursement through CACFP (Moats, Sutor, Yaktine, & Murphy, 2011). More recently, CACFP sites are also encouraged to offer daily opportunities for PA and to limit children's exposure to screen time. Providers that participate in CACFP are offered opportunities to undergo training aimed at helping them meet standards for reimbursement. CACFP participation has been associated with increased compliance with nutrition best practices, including offering whole grain foods daily and providers modeling healthy food intake, as well as greater consumption of milk, vegetables, and reduced consumption of sweets (Korenman, Abner, Kaestner, & Gordon, 2013; Liu, Graffagino, Leser, Trombetta, & Pirie, 2016; Moats et al., 2011; Monsivais, Kirkpatrick, & Johnson, 2011; Ritchie et al., 2012). It might be that providers serving families from low SES backgrounds have better adherence to both nutrition and PA best practices as a result of their participation in CACFP;

future research should aim to better understand the impact that CACFP and other support program participation has on provider compliance with nutrition and PA best practices, particularly among providers serving families from diverse backgrounds. Child care providers should be encouraged to participate in support programs available at the local, state, and national level, and advocates for child care providers should work to identify and remove barriers to program participation to promote full realization of the benefits these programs provide to the children and families who rely on child care facilities.

Study findings stratified by type of child care setting (center versus family-home based) were less consistent, suggesting that the setting may play a role in how well a provider is able to adhere to nutrition and PA best practices. Variance in access to resources, support, or training aimed at promoting nutrition and PA or in distinctions in the regulatory structure may account for observed differences across these two types of settings. However, while findings were less consistent for family-home-based providers, overall findings suggest that providers serving low-income and/or children of minority race report similar, if not higher, adherence to nutrition and PA best practices as compared with providers serving a lower percentage of low-income and/or children of minority race. To our knowledge, the Healthy Start, Healthy State study is one of the first that has sought to understand differences in adherence to nutrition and PA best practices by child care provider type (center versus family home); additional research is needed to replicate findings and to allow for a better understanding of the role that provider type plays in observed associations (Larson, Looby, Frost, Nanney, & Story, 2017). Furthermore, future research aimed at understanding how all providers with limited financial resources successfully adapt to achieve best practices is needed and could provide insight into how to provide assistance to other providers who need additional resources.

Results indicated that adherence to PA and mealtime best practices differed significantly by provider educational attainment; in most cases, providers who had completed at least some college had a significantly higher PA summary score and were more likely to report positive adult modeling at mealtimes, as compared with providers who had not completed any college. Knowing this, public health professionals ought to consider the range of formal education when designing, messaging, and training materials for providers. Additionally, pathways to further support provider education and field professionalization should be explored.

The use of a large, semirandom sample of both center- and family home-based child care providers to explore differences in adherence to nutrition and PA best practices represents an important addition to the extant literature. Furthermore, stakeholder input into the survey development adds greatly to the utility of the data generated. However, study findings represent the experience of licensed child providers serving 2- to 5-year-olds in Minnesota and may not be generalizable to providers in other states, serving other age-groups, nor do these findings characterize the large population of unlicensed family, friend, and neighbor caregivers, who may face especially unique challenges to applying nutrition and PA best practices in their settings. Finally, we relied on provider report of child-family-level characteristics (e.g., family income, language spoken at home); it is likely that providers

were not always able to report on these variables with complete accuracy, introducing the possibility of measurement error.

Conclusions

Providers serving families from low SES backgrounds are finding ways to maintain similar, if not better, levels of adherence to best practices as compared with providers serving families from higher SES backgrounds. Overall, findings suggest that public health professionals should continue to advocate for low-cost trainings and widespread accessibility to support and resources that promote adherence to nutrition and PA best practices to providers serving all types of families. Despite limitations, the findings of this study should serve as a highly positive reflection on the hard work of child care provider advocates and programs, as well as the providers themselves.

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Table 1. Mean (SD) Nutrition and Physical Activity Practice Summary Scores by Family and Provider Characteristics: Overall and Stratified by Center or Family-Home Based.

Characteristics	Nutrition practice summary score, possible range 0–23, <i>M</i> (SD)					
	Overall	Center based ¹	Family-home based	Overall	Center based ¹	Family-home based
Total <i>N</i> ²	597	203	394	597	203	394
Summary score	11.9 (5.5)	12.2 (5.6)	11.7 (5.5)	5.6 (3.1)	6.7 (3.0)	5.0 (3.1)
Family-level characteristics						
Family income						
<\$25,000	12.7 (5.9)	12.2 (5.9)	13.5 (5.9)	5.4 (3.2)	5.9 (2.8)	4.7 (3.6)
\$25,000–\$59,999	11.6 (5.8)	11.9 (5.6)	11.4 (5.9)	5.7 (3.3)	7.1 (2.9)	5.0 (3.3)
>\$60,000	12.0 (5.0)	12.4 (5.2)	11.8 (5.0)	5.8 (2.9)	7.1 (2.7)	5.1 (2.8)
Don't know	12.0 (5.8)	12.4 (6.2)	11.9 (5.7)	5.2 (3.0)	6.0 (3.3)	5.0 (2.9)
<i>p</i> value ³	.67	.96	.59	.37	.15	.95
Family child care assistance program participation						
Yes	12.6 (5.8) ^a	13.0 (5.6) ^a	12.1 (6.1)	6.5 (3.0) ^a	7.4 (2.7) ^a	5.4 (3.1)
No	11.0 (5.4) ^b	11.3 (4.5) ^{ab}	11.0 (5.5)	4.7 (3.1) ^b	4.6 (2.0) ^b	4.7 (3.2)
Accepts but no families qualify	11.7 (5.2) ^{ab}	10.6 (4.8) ^b	11.9 (5.3)	5.0 (2.9) ^b	5.4 (2.9) ^b	4.9 (2.9)
<i>p</i> value ³	0.03	0.04	0.31	<0.01	<0.01	0.22
Minority race/Hispanic ethnicity (percent)						
None (0%)	11.8 (5.5)	11.2 (4.7)	11.8 (5.5)	5.1 (3.0) ^a	5.7 (3.7)	5.1 (3.0)
More than 0% to <25%	11.4 (5.0)	11.4 (5.0)	11.4 (4.9)	5.8 (3.0) ^{ab}	6.7 (2.8)	4.8 (2.9)
25% to <50%	12.0 (6.0)	13.2 (6.3)	11.2 (5.8)	5.7 (3.3) ^{ab}	7.3 (3.1)	4.6 (3.0)
50% to 100%	13.3 (6.1)	13.4 (6.2)	13.3 (6.1)	6.4 (3.0) ^b	6.7 (2.9)	6.1 (3.1)
<i>p</i> value ³	.08	.14	.28	.01	.44	.11
Languages spoken at home						
English or non-new immigrant language	11.8 (5.5)	11.5 (5.4)	11.8 (5.5)	5.2 (3.1)	6.1 (3.2)	5.0 (3.0)
1 or more new immigrant language	12.1 (5.8)	12.6 (5.6)	10.5 (5.9)	6.5 (3.0)	7.1 (2.8)	5.0 (3.3)

Characteristics	Nutrition practice summary score, possible range 0–23, <i>M</i> (<i>SD</i>)			Physical activity practice summary score, possible range 0–11, <i>M</i> (<i>SD</i>)		
	Overall	Center based ¹	Family-home based	Overall	Center based ¹	Family-home based
<i>p</i> value ⁴	.58	.16	.13	<.01	.03	.99
Experience food insecurity						
Never or rarely	11.9 (5.5)	12.1 (5.4)	11.7 (5.6)	5.4 (3.1)	6.5 (2.9)	5.0 (3.0)
Sometimes to very often	12.2 (6.0)	12.4 (6.0)	11.7 (6.0)	6.7 (3.0)	7.4 (2.7)	5.3 (2.9)
<i>p</i> value ⁴	.63	.75	.96	<.01	.06	.61
Provider-level characteristics						
Educational attainment						
Some HS or HS graduate	10.8 (5.9)		10.7 (5.8)	4.4 (3.0)^a		4.3 (3.0)^a
Trade school or some college	12.0 (5.8)	11.9 (7.1)	12.0 (5.5)	5.6 (3.2)^b	6.4 (3.4)	5.4 (3.1)^b
Bachelor or graduate degree	12.2 (5.2)	12.3 (5.0)	12.0 (5.4)	6.1 (3.0)^b	6.9 (2.8)	4.9 (2.9)^{ab}
<i>p</i> value ⁵	.10	.74	.14	<.01	.39	.02
Race/ethnicity						
Non-Hispanic White	11.8 (5.5)	12.1 (5.5)	11.7 (5.5)	5.6 (3.1)	6.8 (2.9)	4.9 (3.0)
Hispanic or minority race	11.8 (6.2)	11.9 (5.0)	11.8 (7.0)	6.1 (3.2)	7.2 (1.7)	5.4 (3.8)
<i>p</i> value ⁴	1.00	.89	.93	.39	.64	.56

Note. Statistically significant differences (as determined by a *p* value < .05) are indicated by boldface. Superscript letters found next to boldfaced means (*SD*) indicate results of post hoc comparison of means conducted to identify where significance difference was present when three or more means were being compared; means with different superscript letters in boldface are significantly different at *p* < .05. *M* = mean; *SD* = standard deviation; HS, high school.

¹Data from Head Start center providers (*n* = 21) were dropped from the current analysis.

²As differ slightly for each analysis due to missing data for characteristic variables.

³*p* values were calculated using analysis of variance (ANOVA) *F* tests.

⁴*p* values were calculated using *t* tests of difference in means.

⁵*p* values were calculated using ANOVA *F* test, except that a two-sample *t* test was used for centers given the small sample size (*n* = 1) for center providers with a “Some HS or HS graduate.”

Prevalence of Providers Engaged in Mealtime Best Practices Across Family- and Provider-Level Characteristics: Overall and Stratified by Center or Family-Home Based.^a

Table 2.

Characteristic	Serve family-style or combination meals “Already Do This,” n(%)			Have at least one adult sit at the table and eat the same meals “Already Do This,” n(%)			Model healthy eating behaviors during meal and snack times “Already Do This,” n(%)			Allow children to decide when they are full “Already Do This,” n(%)		
	Overall	Center based ^b	Family-home based	Overall	Center based ^b	Family-home based	Overall	Center based ^b	Family-home based	Overall	Center based ^b	Family-home based
Total N ^c	597	203	394	597	203	394	597	203	394	597	203	394
“Already do this,” n(%)	182 (30.5)	80 (39.4)	102 (25.9)	298 (49.9)	148 (72.9)	150 (38.1)	387 (64.8)	145 (71.4)	242 (61.4)	445 (74.5)	165 (81.3)	280 (71.1)
Family-level characteristics												
Family income												
<\$25,000	11 (35.5)	9 (50.0)	2 (15.4)	21 (67.7)	15 (83.3)	6 (46.2)	23 (74.2)	14 (77.8)	9 (69.2)	22 (71.0)	14 (77.8)	8 (61.5)
\$25,000–\$59,999	71 (33.5)	27 (39.1)	44 (30.8)	110 (51.9)	47 (68.1)	63 (44.1)	138 (65.1)	45 (65.2)	93 (65.0)	152 (71.7)	54 (78.3)	98 (68.5)
>\$60,000	59 (28.4)	31 (40.8)	28 (21.2)	100 (48.1)	57 (75.0)	43 (32.6)	136 (65.4)	59 (77.6)	77 (58.3)	166 (79.8)	68 (89.5)	98 (74.2)
Don't know	33 (26.8)	10 (31.3)	23 (25.3)	59 (48.0)	24 (75.0)	35 (38.5)	82 (66.7)	23 (71.9)	59 (64.8)	93 (75.6)	24 (75.0)	69 (75.8)
p value ^d	.48	.62	.26	.20	.57	.25	.79	.38	.61	.25	.19	.47
Family child care assistance participation												
Yes	100 (40.8)	69 (49.3)	31 (29.5)	147 (60.0)	108 (77.1)	39 (37.1)	176 (71.8)	104 (74.3)	72 (68.6)	189 (77.1)	115 (82.1)	74 (70.5)
No	17 (16.8)	0 (0)	17 (18.7)	36 (35.6)	6 (60.0)	30 (33.0)	61 (60.4)	9 (90.0)	52 (57.1)	65 (64.4)	9 (90.0)	56 (61.5)
Accept but no families qualify	58 (25.8)	8 (19.5)	50 (27.2)	105 (46.7)	29 (70.7)	76 (41.3)	141 (62.7)	27 (65.9)	114 (62.0)	181 (80.4)	37 (90.2)	144 (78.3)
p value ^d	<.01	<.01	.19	<.01	.38	.40	.04	.27	.25	.01	.40	.01
Minority race/Hispanic ethnicity (percent)												
None 0%	56 (27.3)	3 (33.3)	53 (27.0)	83 (40.5)	6 (66.7)	77 (39.3)	130 (63.4)	6 (66.7)	124 (63.3)	149 (72.7)	9 (100.0)	140 (71.4)
>0% to <25%	55 (27.9)	35 (32.7)	20 (22.2)	108 (54.8)	76 (71.0)	32 (35.6)	135 (68.5)	76 (71.0)	59 (65.6)	157 (79.7)	87 (81.3)	70 (77.8)
25% to <50%	28 (30.8)	18 (51.4)	10 (17.9)	45 (49.5)	25 (71.4)	20 (35.7)	57 (62.6)	26 (74.3)	31 (55.4)	64 (70.3)	28 (80.0)	36 (64.3)
50% to 100%	32 (42.7)	18 (46.2)	14 (38.9)	48 (64.0)	32 (82.1)	16 (44.4)	53 (70.7)	30 (76.9)	23 (63.9)	59 (78.7)	32 (82.1)	27 (75.0)
p value ^d	.077	.171	.120	.002	.559	.777	.501	.871	.647	.214	.549	.342

Characteristic	Serve family-style or combination meals "Already Do This," n(%)			Have at least one adult sit at the table and eat the same meals "Already Do This," n(%)			Model healthy eating behaviors during meal and snack times "Already Do This," n(%)			Allow children to decide when they are full "Already Do This," n(%)		
	Overall	Center based ^b	Family-home based	Overall	Center based ^b	Family-home based	Overall	Center based ^b	Family-home based	Overall	Center based ^b	Family-home based
Languages spoken at home												
English or nonnew immigrant language	114 (26.9)	24 (31.2)	90 (25.9)	186 (43.9)	50 (64.9)	136 (39.2)	270 (63.7)	51 (66.2)	219 (63.1)	308 (72.6)	61 (79.2)	247 (71.2)
1 or more new immigrant language	68 (39.3)	56 (44.4)	12 (25.5)	112 (64.7)	98 (77.8)	14 (29.8)	117 (67.6)	94 (74.6)	23 (48.9)	137 (79.2)	104 (82.5)	33 (70.2)
<i>p</i> value ^d	.003	.060	.953	.0001	.046	.213	.359	.200	.061	.096	.556	.891
Experience food insecurity												
Never or rarely	142 (28.7)	52 (36.6)	90 (25.6)	234 (47.4)	105 (73.9)	129 (36.7)	325 (65.8)	103 (72.5)	222 (63.1)	376 (76.1)	120 (84.5)	256 (72.7)
Sometimes to very often	34 (41.5)	26 (48.2)	8 (28.6)	57 (69.5)	40 (74.1)	17 (60.7)	55 (67.1)	38 (70.4)	17 (60.7)	59 (72.0)	41 (75.9)	18 (64.3)
<i>p</i> value ^d	.021	.141	.727	.0002	.985	.012	.820	.763	.804	.417	.161	.338
Provider-level characteristics												
Educational attainment												
Some HS or HS graduate	24 (25.5)		23 (24.7)	38 (40.4)		37 (39.8)	61 (64.9)		60 (64.5)	69 (73.4)		68 (73.1)
Trade school or some college	64 (27.6)	16 (40.0)	48 (25.0)	102 (44.0)	27 (67.5)	75 (39.1)	138 (59.5)	27 (67.5)	111 (57.8)	171 (73.7)	31 (77.5)	140 (72.9)
Bachelor or graduate degree	86 (34.7)	61 (39.4)	25 (26.9)	150 (60.5)	117 (75.5)	33 (35.5)	177 (71.4)	114 (73.6)	63 (67.7)	194 (78.2)	130 (83.9)	64 (68.8)
<i>p</i> value ^d	.131	.941	.930	.0001	.306	.800	.023	.446	.226	.444	.344	.739
Race/ethnicity												
Non-Hispanic White	159 (29.3)	73 (39.5)	86 (24.1)	271 (50.0)	136 (73.5)	135 (37.8)	355 (65.5)	133 (71.9)	222 (62.2)	412 (76.0)	153 (82.7)	259 (72.6)
Hispanic or minority race	10 (43.5)	4 (44.4)	6 (42.9)	12 (52.2)	6 (66.7)	6 (42.9)	15 (65.2)	7 (77.8)	8 (57.1)	15 (65.2)	6 (66.7)	9 (64.3)
<i>p</i> value ^d	.147	.765	.111	.838	.651	.703	.978	.700	.703	.238	.222	.498

Note. HS = high school.

^aStatistically significant differences (as determined by a *p* value <.05) are indicated by boldface.

Data from Head Start center providers ($n = 21$) were dropped from the current analysis.

Category Ns may not sum to total N due to missing data for characteristic variables.

χ^2 values were calculated from chi-square tests.

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Mean (*SD*) Nutrition Summary Scores by Family and Provider Characteristics in 2010 and 2016: Overall and Stratified by Center or Family-Home Based.^a

Table 3.

Characteristic	Nutrition Best Practice Summary Score, ^b <i>M</i> (<i>SD</i>)					
	Overall		Center		Family Home	
	2010, <i>N</i> = 418	2016, <i>N</i> = 597	2010, <i>N</i> = 214	2016, <i>N</i> = 203	2010, <i>N</i> = 204	2016, <i>N</i> = 394
Survey respondents	6.7 (4.0)	8.4 (3.6)	7.1 (4.1)	8.6 (3.6)	6.4 (3.9)	8.3 (3.6)
Children: Percent minority race/Hispanic ethnicity						
None (0%)	6.2 (3.9)	8.3 (3.6)	6.6 (3.9)	8.8 (3.1)	6.1 (3.9)	8.3 (3.6)
>0% to <25%	6.8 (3.8)	8.1 (3.3)	6.9 (3.9)	8.0 (3.3)	6.6 (3.6)	8.2 (3.2)
25% to <50%	7.7 (4.6)	8.6 (3.9)	8.0 (4.5)	9.0 (4.0)	7.0 (4.7)	8.3 (3.8)
50% to 100%	6.1 (3.3)	9.3 (3.9)	6.8 (4.5)	9.3 (3.9)	5.8 (2.8)	9.3 (4.0)
25% to 100% (top two categories combined)	7.4 (4.4)	8.9 (3.9)	7.9 (4.5)	9.2 (4.0)	6.7 (4.3)	8.7 (3.9)
Food insecurity						
Never or rarely	6.6 (4.0)	8.4 (3.6)	6.9 (4.2)	8.5 (3.5)	6.4 (3.9)	8.3 (3.7)
Sometimes to very often	7.1 (3.7)	8.6 (3.9)	7.4 (3.5)	8.7 (3.9)	6.3 (4.2)	8.3 (4.0)
Provider education						
Some high school or high school graduate	5.7 (4.1)	7.6 (3.9)	6.6 (4.3)	NA (<i>n</i> = 1)	5.6 (4.1)	7.6 (3.9)
Trade school or some college	6.8 (4.2)	8.5 (3.7)	6.7 (4.8)	8.3 (4.6)	6.9 (3.9)	8.5 (3.5)
Bachelor or graduate degree	7.1 (3.7)	8.6 (3.4)	7.3 (3.8)	8.7 (3.2)	6.4 (3.4)	8.6 (3.6)
Provider's race/ethnicity						
Non-Hispanic White	6.8 (4.0)	8.4 (3.6)	7.1 (4.1)	8.5 (3.6)	6.4 (3.9)	8.3 (3.6)
Hispanic or minority race	5.9 (4.2)	8.4 (4.0)	6.2 (3.9)	8.8 (3.6)	5.2 (5.4)	8.2 (4.3)

^aNote. *M* = mean; *SD* = standard deviation; NA = not applicable.

^bShaded cells have small cell counts so changes related to these categories should be interpreted cautiously.

^cThis mean nutrition summary score is based on the 15 items that were included in both the 2010 and 2016 survey; thus, summary scores presented in this table should not be compared with summary scores presented in Table 1.

Table 4. Physical Activity Best Practice Summary Scores by Family and Provider Characteristics in 2010 and 2016: Overall and Stratified by Center or Family Home-Based.^a

Characteristic	Physical Activity Best Practice Summary Score, <i>M</i> (<i>SD</i>)					
	Overall		Center		Family Home	
	2010, <i>N</i> = 418	2016, <i>N</i> = 597	2010, <i>N</i> = 214	2016, <i>N</i> = 203	2010, <i>N</i> = 204	2016, <i>N</i> = 394
Survey respondents	3.5 (2.3)	4.4 (2.3)	4.0 (2.4)	5.1 (2.0)	2.9 (2.0)	4.0 (2.3)
Percent minority race/Hispanic ethnicity						
None (0%)	2.9 (2.1)	4.1 (2.3)	3.8 (2.0)	4.6 (2.6)	2.7 (2.0)	4.1 (2.3)
>0% to <25%	3.7 (2.3)	4.6 (2.1)	3.9 (2.4)	5.1 (1.9)	3.2 (1.7)	4.0 (2.2)
25% to <50%	4.2 (2.5)	4.5 (2.5)	4.7 (2.4)	5.7 (2.2)	3.2 (2.3)	3.8 (2.4)
50% to 100%	3.1 (1.6)	4.9 (2.2)	4.0 (1.2)	5.1 (2.0)	2.6 (1.7)	4.7 (2.3)
25% to 100% (top two categories combined)	4.0 (2.4)	4.7 (2.3)	4.6 (2.4)	5.3 (2.1)	3.1 (2.1)	4.1 (2.4)
Food insecurity						
Never or rarely	3.4 (2.3)	4.3 (2.2)	4.0 (2.4)	5.0 (2.0)	2.9 (2.0)	4.0 (2.3)
Sometimes to very often	3.6 (2.3)	5.2 (2.1)	4.1 (2.3)	5.6 (1.9)	2.3 (1.9)	4.4 (2.2)
Provider education						
Some high school or high school graduate	2.7 (2.2)	3.6 (2.2)	3.6 (3.4)	NA (<i>n</i> = 1)	2.6 (2.0)	3.6 (2.2)
Trade school or some college	3.2 (2.2)	4.5 (2.3)	4.0 (2.4)	5.0 (2.4)	2.8 (2.0)	4.4 (2.3)
Bachelor or graduate degree	3.9 (2.3)	4.7 (2.1)	4.1 (2.3)	5.3 (1.8)	3.1 (1.8)	3.9 (2.2)
Provider's race/ethnicity						
Non-Hispanic White	3.4 (2.3)	4.4 (2.3)	4.0 (2.4)	5.2 (2.0)	2.8 (2.0)	4.0 (2.3)
Hispanic or minority race	3.8 (2.0)	4.9 (2.3)	4.1 (2.2)	5.8 (1.1)	3.0 (1.2)	4.4 (2.7)

Note. *M* = mean; *SD* = standard deviation; NA = not applicable.

^aShaded cells have small cell counts so changes related to these categories should be interpreted cautiously.

^bThis mean nutrition summary score is based on the eight items that were included in both the 2010 and 2016 survey; thus, summary scores presented in this table should not be compared with summary scores presented in Table 1.