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### ABSTRACT

Approximately 15 million children under age 6 are in childcare settings, offering childcare providers an opportunity to influence children's dietary intake. Childcare settings vary in organizational structure – childcare centers (CCCs) vs. family childcare homes (FCCHs) – and in geographical location – urban vs. rural. Research on the nutrition-related best practices across these childcare settings is scarce. The objective of this study is to compare nutrition-related best practices of CCCs and FCCHs that participate in the Child and Adult Care Food Program (CACFP) in rural and urban Nebraska. Nebraska providers (urban  $n = 591$ ; rural  $n = 579$ ) reported implementation level, implementation difficulty and barriers to implementing evidence-informed food served and mealtime practices. Chi-square tests comparing CCCs and FCCHs in urban Nebraska and CCCs and FCCHs in rural Nebraska showed sub-optimal implementation for some practices across all groups, including limiting fried meats and high sugar/ high fat foods, using healthier foods or non-food treats for celebrations and serving meals family style. Significant differences ( $p < .05$ ) between CCCs and FCCHs also emerged, especially with regard to perceived barriers to implementing best practices. For example, CCCs reported not having enough money to cover the cost of meals for providers, lack of control over foods served and storage problems, whereas FCCHs reported lack of time to prepare healthier foods and sit with children during mealtimes. Findings suggest that policy and public health interventions may need to be targeted to address the unique challenges of implementing evidence-informed practices within different organizational structures and geographic locations.

### 1. Introduction

With global obesity rates rising, (Abarca-Gómez et al., 2017; Lobstein et al., 2015; Roberto et al., 2015) improving nutrition-related best practices in childcare settings is the focus of national policies (Institute of Medicine, 2011) and interventions (Ammerman et al., 2007) for preventing childhood obesity. (Gunter et al., 2012; Birch,

1999) Currently in the United States (U.S.), around 15 million children under 6 years are in some type of childcare or non-parental care. (Care, 2017) Children spend an average of 33 h per week and consume up to five meals and snacks daily in childcare. (Laughlin, 2005) Thus, childcare offers an ideal setting for impacting children's dietary intake and preventing obesity.

Childcare organizational structures in the U.S. vary, (Laughlin,

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2005) with 80% of children in either childcare centers (CCCs) or family childcare homes (FCCHs). (Mamedova et al., 2015) Although CCCs and FCCHs both require licensure within Nebraska, these two settings differ in organizational structure. For instance, FCCHs care for no more than 12 children with a mixed age group, with fewer to no additional staff where typically the FCCH owner is the provider. (Nebraska Department, 2013) CCCs, on the other hand, are often bigger facilities with multiple classrooms with children separated by age and can care for more than 13 children. (Nebraska Department, 2013) State-licensing determines childcare settings' maximum capacity based on the available space and staff; the number of children in care must not exceed the maximum licensed capacity. (Nebraska Department, 2013; Nebraska Department, 2013) FCCH providers more often prepare the food themselves, whereas food preparation in CCCs is more commonly catered or prepared by food service personnel. (Natale et al., 2014) In 2017, Nebraska CCCs cared for more children (N = 61,498) than FCCHs (N = 22,315). (U.S. Department of Health and Human Services, 2018)

Research across several states in the U.S. suggests that the distinctive characteristics of CCCs and FCCHs may influence the implementation of evidence-informed nutrition best practices regarding food served and mealtime practices in childcare. When FCCH and CCC mealtime practices were compared in Florida in 2013, a self-reported survey showed FCCHs served more fruits but less low-fat milk compared to CCCs. (Natale et al., 2014) Wisconsin and Minnesota CCCs reported implementing more nutrition best practices than FCCHs through self-reported surveys in 2017. (Nanney et al., 2016) There is some evidence of similar differences in nutrition practices between CCCs and FCCHs outside of the US. For example, in Canada in 2016, Martyniuk et al. used the Environment and Policy Assessment and Observation tool to observe of the nutrition environment and reported lower scores in FCCHs than CCCs. Similarly in the United Kingdom (UK) in 2005, FCCHs (known as childminders) were significantly less likely to serve children fruits and vegetables than CCCs or nurseries. (Moore et al., 2005) These findings show that the implementation of nutrition best practices vary by organizational structure (FCCH, CCC) and underscore the need for future research regarding the determinants of nutrition best practices.

In addition to organizational structure, it is important to focus on Child and Adult Care Food Program (CACFP) participating childcare settings. CACFP is a federally-funded program that provides financial reimbursement for nutritious foods and beverages to childcare programs who serve low-income children. (United States Department of Agriculture Food and Nutrition, 2019) Low-income children are shown to be at risk of greater health disparities and obesity. (Singh et al., 2010) In the US, ~175,000 licensed child care programs participate in CACFP serving more than 4.2 million children daily. (Rosso and Henchy, 2016) CACFP-participating childcare programs are required to meet meal pattern standards regarding foods served to the children (CACFP, 2017). The updated (2017) CACFP national requirements for the participating childcare programs include serving both fruits and vegetables during lunch and supper, serving only 1% or low-fat milk and not serving grain-based desserts, high-sugar yogurt, sugary breakfast foods, and juices more than once per day (CACFP, 2017). Previous studies in California, Georgia and Illinois have shown that CACFP participation is related to serving healthier foods in childcare; (Liu et al., 2016; Ritchie et al., 2012) limited information is available regarding adherence to other nutrition-related best practices. (Dev et al., 2014; Maalouf et al., 2013) Further, there is limited research in Nebraska regarding the implementation of nutrition-related best practices in CACFP participating CCCs and FCCH in Nebraska.

Research has shown that rural communities may experience challenges to the accessibility of food (Hardin-Fanning and Rayens, 2015; Liese et al., 2007) and there are noteworthy disparities in childhood obesity rates. Children in rural areas have 26% higher odds of being classified as obese as compared with urban children. (Foster et al.,

2015) Moreover, given the lower population density in rural areas, rural CCCs and FCCHs tend to have lower child-to-adult ratios compared to urban CCCs and FCCHs. (Maher et al., 2008) Despite these known differences, rural childcare settings remain underrepresented in the literature. This is particularly important in a state like Nebraska for two reasons: 1) a greater portion of the state is rural (76 of its 93 counties), and 2) there are more FCCHs (n = 2151) than CCCs (n = 719) across the state and the majority of childcare providers in rural areas are FCCHs. (Mamedova et al., 2015)

The objective of this study was to compare the impact of childcare organizational structure (CCC or FCCH) and geographic location (urban or rural) within Nebraska on implementation level, difficulty and barriers of implementing evidence-informed nutrition best practices. Taking these distinguishing characteristics into account is the formative step for developing targeted interventions for improving the childcare environment and preventing obesity.

## 2. Methods

### 2.1. Study design

This cross-sectional study employed a self-administered survey sent through surface mail. The University of Nebraska-Lincoln Institutional Review Board approved this study. A power analysis was conducted to determine the sample size needed to achieve 90% power to detect a small effect (0.15) with a significance level of 0.05 in a chi-square analysis with 1 degree of freedom. Results of the power calculation indicated a required sample size of 467.

### 2.2. Sampling and recruitment strategies

Between January and April 2017, 3014 licensed childcare programs in Nebraska, identified by the Nebraska Department of Health and Human Services, were invited to participate. Survey packets included a cover letter explaining the objectives of the research, the questionnaire booklet, a \$1 cash incentive, and a postage-paid reply envelope. Packets were mailed to childcare programs on January 4, 2017. After one week, a reminder postcard was mailed to all non-responders. After three weeks, a second survey packet (excluding the \$1 incentive) was sent to remaining non-responders. Finally, non-responders were contacted by phone between March 15 and April 10, 2017.

The childcare director or provider most familiar with the childcare program's nutrition practices completed the survey regarding the foods served and mealtime practices in the preschool (2–5-year-old) classroom(s) of their program.

### 2.3. Measure

This study used the 'Healthy Children, Healthy State' questionnaire, an 86-item paper survey. Survey items were drawn from existing surveys with childcare providers in the U.S. (Nanney et al., 2016; Ammerman et al., 2007; Whitaker et al., 2009) An interdisciplinary advisory committee comprising early childhood education, nutrition, and policy experts, and survey methodologists reviewed all items. To ensure face validity, cognitive testing was conducted with three FCCH and CCC providers. (Willis, 1999) The final questionnaire was comprised of items relevant to implementing nutrition best practices, (Lobstein et al., 2015) implementation difficulty, and barriers related to serving foods and beverages as well as mealtime practices. (U.S. Department of Health and Human Services, 2018; Maalouf et al., 2013) A copy of the survey is available at <https://unl.box.com/s/ift28mug8nadkvked57w34sslweeqafk>.

In this study, counties were used as a basis for rural–urban designation into one of three-categories of metropolitan, micropolitan, and rural. (Lin and Qu, 2016) For the purpose of the analysis and consistent with other literature, micropolitan ( $\geq 10,000$  residents; n = 10

counties) and rural counties (< 10,000 residents; n = 74 counties) were combined to be able to compare differences across rural (micro-politan and rural) and urban ( $\geq 50,000$  residents; n = 2 counties) (Natale et al., 2014; Frampton et al., 2014). Participants were asked to indicate if they participated in CACFP and if they were a CCC or FCCH by choosing a “yes” or “no” response.

#### 2.4. Statistical analysis

All analyses were conducted using IBM Statistical Package for the Social Sciences (SPSS) version 24. To assess implementation difficulty for each best practice there were four possible responses in the survey including: “Not at all difficult”, “A little difficult”, “Kind of difficult”, or “Very difficult”. Providers responding “a little”, “kind of”, and “very” difficult were combined to determine the percentage of the childcare providers reporting implementation difficulty “difficult to do or potentially do” for each best practice. Descriptive statistics were calculated to determine the percentages and chi-square tests were used to examine differences in nutrition best practices, implementation difficulty and barriers between CCCs and FCCHs in urban areas and CCCs and FCCHs in rural areas.

### 3. Results

A total of 1592 (54.6% response rate) questionnaires were completed. For the current study, only CACFP-participating CCCs and FCCHs were included. The study sample included a total of 1170 CACFP-participating childcare programs with 591 programs in urban (CCC = 119, FCCH = 472) and 579 (CCC = 81, FCCH = 498) from rural Nebraska. The demographic characteristics of the sample are described in Table 1.

#### 3.1. Serving foods and beverages across CCCs and FCCHs in urban and rural areas

Table 2 shows the percentages and differences in serving foods and beverages between CCCs and FCCHs in urban and rural areas. Overall, the majority (> 90%) of childcare programs irrespective of the geographic location reported implementing best practices regarding serving fruits and vegetables at least one time/day and serving skim or 1% milk to children. All childcare programs reported sub-optimal implementation (80% or less) of the following best practices: serving fried meats less than one time per week or never and using either healthy foods or non-food treats for holidays and special events. With the exception of rural CCCs, childcare programs also reported sub-optimal implementation of not serving sugary drinks and high sugar/fat food less than one time/week. In addition, all childcare programs reported high actual or perceived implementation difficulty (26% or more) for: serving high sugar/high fat foods less than one time per week or never, serving whole grain foods at least once a day, serving lean or low fat meat or meat alternatives, and using either healthy foods or non-food treats for holidays and special events.

The most frequently selected barriers across all childcare settings were: children would not like the taste of healthier foods, limited time to shop, and not enough money to cover the cost of serving healthier meals and snacks. Notably, not having enough money for healthier foods is experienced significantly more by urban FCCHs, rural CCCs and rural FCCHs than urban CCCs. Further, significantly more CCCs reported barriers such as limited space for food storage and lack of control over the delivered foods than FCCHs. More details about the reported barriers are listed in Table 3.

#### 3.2. Meal time practices across CCCs and FCCHs in urban and rural areas

Table 4 lists the percentages of implementation and implementation difficulty of meal time practices across CCCs and FCCHs in urban and

rural areas. A majority of providers (> 90%) across all childcare programs reported implementation of the following mealtime best practices: providers praise children for trying new or less preferred foods, talking with children about healthy foods at mealtime, and allowing children to decide when they are full. All childcare programs, irrespective of the context, reported sub-optimal implementation (80% or less) of the following practices: providers eating only the food being served to children, eating together with children, having children help set and clear the table, not praising children for finishing their food or cleaning their plates, asking children if they are hungry before serving more, and not using preferred foods to try less preferred foods. Although significantly more CCCs than FCCHs were serving meals family style, all groups reported sub-optimal implementation of this practice. Relatedly, all CCCs and FCCHs reported high implementation difficulty (26% or more) in the following: sitting with children during meals, eating together with children, having children help with setting and clearing the table, eating only what are served to children, serving meals and snacks family style, and not using preferred foods to try less preferred foods.

Table 5 shows the barriers for implementing mealtime best practices. Significantly more CCCs reported the following as barriers to implementing meal time best practices compared to FCCHs: not enough money to cover the cost of serving meals and snacks to providers, providers not liking the taste of healthy foods, and mealtimes with children were stressful. Conversely, FCCHs experienced the following barriers significantly more than CCCs: not having enough time to sit with children and not having enough providers to sit with children.

### 4. Discussion

Findings highlight the similarities and differences in childcare provider implementation of evidence-informed nutrition best practices and barriers owing to the organizational structure (CCCs and FCCHs) and geographic location (urban and rural) of childcare settings. A majority (90%) of providers reported high implementation of nutrition best practices related to serving fruits and vegetables at least one time/day and serving skim or 1% milk to the children and allowing children to decide how much they wanted to eat. These findings are consistent with previous studies showing that participation in CACFP is associated with serving nutritious meals and snacks in childcare settings. (Ritchie et al., 2012; Dev et al., 2013) However, for some nutrition best practices there was sub-optimal implementation across all settings. For example, all settings did not meet best-practices for serving fried meats and high sugar/high fat foods and sugar sweetened beverages only once a week or less. These findings are consistent with previous studies showing that CACFP-funded sites are more likely to serve fruits canned in syrup and non-CACFP sites are more likely to serve candy bars and sweetened drinks. (Ritchie et al., 2012) Further, in UK, only 22% of nurseries reported not serving sugary drinks and flavored milk to children. (Neelon et al., 2015) An audit of 46 Australian childcare service menus found that none provided the recommended number of servings of vegetables, 59% provided the recommended servings of meat and all provided discretionary foods high in fat, sodium and sugar, which are recommended to be limited. (Yoong et al., 2014) Finally, in Dutch childcare centers children consumed many sweet snacks and drinks. (Gubbels et al., 2015)

One way to examine the lack of implementation of nutrition best practices is to identify barriers. Providers reported that barriers to serving healthy foods were cost, lack of time, and children not liking the taste of healthier foods. Cost has been consistently reported as a barrier to serving healthier foods to children by CACFP participating CCCs (Hughes et al., 2010) and FCCHs. (Lindsay et al., 2015; Tovar et al., 2016; Zaltz et al., 2018) In FCCHs offering healthier food choices to children increased food purchasing costs. (Monsivais and Johnson, 2012) Further, more non-CACFP participating CCCs reported cost as a barrier than CACFP-participating CCCs, (Zaltz et al., 2018) suggesting

**Table 1**

Demographic characteristics by geographic location (urban, rural) and organizational structure (Child Care Center [CCC] vs. Family Child Care Home [FCCH]) (N = 1170).

	Urban		Rural	
	CCC (n = 119) Mean or % (SD)	FCCH (n = 472) Mean or % (SD)	CCC (n = 81) Mean or % (SD)	FCCH (n = 498) Mean or % (SD)
Average Number of Children in the Program				
0–23 months	15.77(10.265)	2.27(1.191)	15.70(11.954)	2.49(1.320)
24–35 months	14.76(10.189)	2.20(1.236)	11.30(8.384)	2.48(1.559)
3–5 years	28.58(18.474)	3.09(1.672)	23.33(18.605)	3.60(2.043)
Older than 5 years	18.21(16.213)	2.30(1.893)	18.00(25.184)	2.33(1.783)
Average Number of Children per Racial Background				
American Indian or Alaskan Native	1.68(2.698)	0.20(0.632)	6.58(26.056)	0.37(1.256)
Asian	2.32(2.871)	0.26(0.632)	0.63(0.929)	0.09(0.402)
Black or African American	10.79(16.846)	1.46(2.653)	2.15(2.695)	0.29(0.765)
Native Hawaiian or Pacific Islander	0.47(1.181)	0.09(0.407)	0.33(0.926)	0.10(0.789)
White or Caucasian	48.64(46.985)	6.74(2.809)	52.42(40.579)	8.66(3.477)
Mixed Race	8.32(7.369)	1.32(1.698)	6.22(9.526)	0.99(1.615)
Other	4.31(7.445)	0.38(1.638)	3.71(8.818)	0.21(1.122)
Average Number of Providers	17.31(11.391)	1.31(1.389)	14.90(12.379)	1.34(1.003)
Program Schedule (%)				
Half-day	0.8	0.2	0	0
Full-day	68.1	79.2	72.8	77.1
Both half and full day	26.1	15.7	22.2	20.3
Other	1.7	2.3	1.2	1.2
Food Prepared on Site (%)				
Yes	62.2	98.3	87.7	98.8
No	22.7	0.8	1.2	0.2
Both yes and no	15.1	0.8	11.1	1.0
Responsible for Menu Planning (%)				
Owner of childcare program	20.17	62.08	38.27	64.06
Director or site supervisor/manager	41.18	3.6	49.38	3.61
Family childcare provider	0	45.97	2.47	46.99
Cook or chef	36.97	0.42	50.62	1.61
Catering company	25.21	0	1.23	0.40
Dietician	3.36	0	6.17	0.40
Parent/guardians provide food for their children	1.68	1	0	0
Go NAP SACC Participation (% yes)	44.5	9.3	32.1	12.7
Nebraska Step Up to Quality (% yes)	43.7	5.5	32.1	11.8
National Association for the Education of Young Children (NAEYC) (% yes)	21.0	5.3	7.4	6.0
Meals Provided in the Program (% yes)				
Breakfast	97.5	97.0	93.8	98.0
Lunch	98.3	98.3	100.0	99.0
Dinner	21.0	27.8	22.2	25.9
Mid-morning snack	38.7	52.1	46.9	54.8
Mid-afternoon snack	95.0	98.1	98.8	99.0
Evening snack	16.0	18.4	8.6	10.6

that the federal reimbursement for healthier foods may facilitate CACFP providers to implement nutrition best practices. It is interesting that although all present study sites were participating in CACFP, food cost was selected as the most prevalent barrier suggesting a need for future studies to understand this barrier. These challenges are not confined to the US. In the UK, both nursery staff and child minders have reported high food costs as a limiting factor for providing healthy foods to children. (Moore et al., 2005) Further, in Canada, a majority (80%) of menu planners reported considering the cost of the food items and children's likes and dislikes as vital factors for menu planning. (Romaine et al., 2007) These include food service staff challenges with modifying recipes, inadequate access to updated menu planning resources, lack of training opportunities, and incorrect assumptions by food service staff that menus and recipes adhere to nutrition guidelines.

Similar to previous studies, (Zaltz et al., 2018; Cotwright et al., 2018; Lee et al., 2018) providers in the present study also selected children not liking the taste of healthier foods as the most prevalent barrier to serving healthier meals and snacks. It is typical for children to be hesitant to try new foods (Beauchamp and Mennella, 2009; Ventura

and Worobey, 2013) and to have a natural preference for sweet and salty foods with high fat content. (Ventura and Worobey, 2013) Thus, providers may be trying to cater to children's taste preference in their selection of meals and snacks. Policies that promote responsive feeding practices such as provider role modeling, family style dining and sensory exploration can encourage children's healthier food choices and improve dietary intake. (Benjamin Neelon and Briley, 2011) For example, children are willing to try new and healthier foods when providers are sitting and eating together with them, enthusiastically modeling eating healthier foods, engaging them in food-based sensory exploration and supporting self-regulation by allowing children to serve themselves. (Benjamin Neelon and Briley, 2011) There is also some evidence that practicing family style dining can help reduce food waste. (Brannen et al., 1997) Given that cost and children's food preferences were reported as the most prevailing barriers, additional studies are needed to determine the impact of the updated CACFP meal pattern regarding restricting added sugars and fried foods on-site and implementing responsive feeding practices on food cost, children's dietary intake and food wastage.

**Table 2**  
 Percentage of child care providers implementing best practices on serving foods and beverages and reporting implementation difficulty (difficult to do or potentially do) for each best practice by geographic location (urban, rural) and organizational structure (Child Care Center [CCC] vs. Family Child Care Home [FCCH]) (N = 1170).

Best Practices for Serving Foods and Beverages	Urban (n = 591)				Rural (n = 579)			
	Implementation of Best Practices "Yes"		Implementation Difficulty "Difficult to do or potentially do"		Implementation of Best Practices "Yes"		Implementation Difficulty "Difficult to do or potentially do"	
	CCC (n = 119)%	FCCH (n = 472)%	$\chi^2$	FCCH (n = 472)%	CCC (n = 81)%	FCCH (n = 498)%	$\chi^2$	FCCH (n = 472)%
1. Serve fruit at least one time/ day	99.2	100	3.965	1.8	100.0	99.8	0.163	4.4
2. Serve vegetables at least one time/day	99.2	99.8	1.105	3.7	100.0	99.2	0.656	4.6
3. Prepare cooked vegetables without fat or butter	98.3	93.8	3.601	8.1	93.7	95.4	0.421	10.8
4. Serve skim or 1% milk	96.6	98.5	1.815	2.0	97.5	99.8	6.922	3.8
5. Serve high fiber, whole grain at least once/ day	89.9	87.4	0.546	26.4	87.7	84.3	0.605	28.9
6. Serve only unflavored skim or 1% milk	87.1	92.2	3.017	4.6	93.8	94.3	0.031	5.6
7. Serve lean or low fat meat	85.6	79.7	2.144	34.0	75.0	78.2	0.415	2.651
8. Never serve sugary drinks	75.6	79.1	0.690	9.6	84.0	80.6	0.497	11.4
9. Serve fried meats less than one time per week or never	71.2	79.6	3.854	12.8	73.8	78.5	0.890	30.4
10. Serve high sugar/fat food less than one time per week or never	68.9	71.6	0.345	30.7	83.8	66.4	9.661	40.3
11. Use either healthy foods or non-food treats	66.9	54.3	6.172*	46.5	60.8	53.9	1.294	52.1

Notes: Chi square analysis using 2x2 contingency table; \*p < .05, \*\*p < .01, n.a. not applicable due to more than 25% of cells have count less than 5.

**Table 3**

Barriers to implementing best practices in serving foods and beverages by geographic location (urban, rural) and organizational structure (Child Care Center [CCC] vs. Family Child Care Home [FCCH]) ( $N = 1170$ ).

Barriers to Providing Healthier Meals and Snacks to Children in Child Care	Urban( $n = 591$ )			Rural( $n = 579$ )		
	CCC( $n = 119$ )%	FCCH( $n = 472$ )%	$\chi^2$	CCC( $n = 81$ )%	FCCH( $n = 498$ )%	$\chi^2$
1. Limited space for food storage	31.1	12.4	24.343 **	27.2	16.3	5.604 *
2. Limited time to shop more than once/ week	29.9	36.9	1.966	37.0	39.6	0.196
3. Not enough money to cover the cost of serving healthier meals and snacks	28.8	40.8	5.692 *	44.4	48.7	0.497
4. Children would not like the taste of healthier meals and snacks	28.6	37.2	3.073	32.1	40.1	1.822
5. Lack of control over the delivered foods	27.1	3.7	66.046 **	18.5	5.2	18.542 **
6. Lack of the time to prepare healthier foods	16.1	24.6	3.817 *	26.3	22.9	0.421
7. Other areas have higher priority than nutrition at this time	13.6	7.6	4.165 *	8.6	5.4	1.337
8. Many different recommendations to follow	12.6	18.0	1.939	18.5	23.0	0.819
9. Parents do not support serving healthier foods	9.2	9.8	0.039	10.1	12.7	0.425
10. Lack of the knowledge to prepare healthier foods	8.4	5.0	2.107	9.9	4.4	4.324 *
11. Lack of support from other providers	6.8	3.7	2.174	8.8	3.9	3.750 *
12. Unsure which foods can be reimbursed by CACFP	5.9	8.4	0.850	6.3	11.9	2.111
13. Lack of availability of healthy foods in my area	4.2	3.2	0.268	18.5	21.6	0.393

Notes: Chi square analysis using 2x2 contingency table; \* $p < .05$ , \*\* $p < .01$ .

A novel finding of the present study is that while CCC and FCCH providers in urban and rural areas who successfully implemented similar practices and experienced comparative implementation difficulty, reported different barriers for serving healthy foods to children. For example, barriers such as not enough space to store food and lack of control over the types of meals and snacks delivered were reported specifically by CCCs in both urban and rural areas compared to FCCHs. The structure of CCCs, where there are more children and staff compared to FCCH, could contribute to food storage becoming a concern. Also, FCCH providers more often prepare the food themselves, whereas food preparation in CCCs is more commonly catered or prepared by food service personell. (Natale et al., 2014) In this study, a majority of FCCH providers reported preparing food on site and being responsible for menu planning as compared to CCCs. This finding also points to the strength of FCCH providers who have a more direct control of what foods they will serve children than teachers in larger centers. Future studies are needed with food catering agencies and centralized kitchen staff to understand the processes (e.g. food procurement and distribution) that impact implementing the updated CACFP meal patterns.

Regardless of program structure or location, all childcare settings reported sub-optimal implementation of certain responsive feeding practices, particularly providers eating the same foods together with children and implementing family style dining where children serve themselves and select their own portions. The National Academy of Medicine, Academy of Nutrition and Dietetics, and CACFP (CACFP, 2017; Liu et al., 2016; Ritchie et al., 2012; Benjamin et al., 2008) recommend responsive feeding practices because they encourage children to try healthier foods and support children's self-regulation in eating. Although, significantly more urban CCCs (43%) were implementing family style dining than urban FCCH (23%), the level of implementation of this recommend practice was even lower in CCCs (36%) and FCCH (20%) in rural areas. Furthermore, in a previous study in Nebraska regarding Nutrition and Physical Activity Self-Assessment in Child Care (Go NAP SACC), FCCHs did not exceed minimum standards for implementing family style dining at post-intervention, (Dev et al., 2018) suggesting challenges to its implementation.

Barriers to implementing responsive feeding practices were different for CCCs and FCCHs, and again, these may be attributed to their structural aspects. For example, CCC providers perceived mealtimes as stressful which may be because they care for a greater number of children. Previous studies have indicated that child-to-adult ratios in CCCs are higher compared to FCCHs, especially in urban areas. (Maher et al., 2008) In addition, urban and rural CCCs reported that the cost to

cover providers' meals and snacks was a barrier as CCCs employ multiple staff. However, cost for providers' meals was not reported as a concern for FCCHs, that usually only have one staff who is typically the owner. Yet, FCCH providers reported not having enough time to sit with children and not having enough providers as their top barriers to implementing responsive feeding practices. Finally, consistent with a previous study, (Nanney et al., 2016) significantly more CCCs reported that providers do not like the taste of healthy foods served in childcare as compared to FCCHs. This may be also attributed to lack of control over the food served in CCCs than FCCHs. CCC providers have previously reported barriers related to hands-on implementation of family style dining such as messes, resource intensive and misconceptions regarding CACFP policies. (Dev et al., 2014)

Present study findings regarding lower implementation of family style dining in FCCHs than CCCs, may be attributed to a mixed age group of children with varying developmental skills for practicing self-service during mealtime. Given that present study providers selected children's food preferences as a top barrier to serving healthy foods to children, future studies can determine the impact of responsive feeding on encouraging children's healthier food choices in childcare. In addition, future research is needed to determine whether nutrition policies around providers' food consumption influence providers' implementation of responsive feeding practices and dietary intake of children.

Another example of limited implementation was that majority of participating providers reported not using healthy foods or non-food treats to celebrate birthdays and other holidays. Previously, childcare providers have reported parental resistance and parents bringing unhealthy foods for children during celebrations as barriers to implementing this best practice. (Sisson et al., 2012; Dev et al., 2017) The updated CACFP meal pattern now includes regulations that grain-based desserts can no longer count for reimbursement towards the whole grain component. Leveraging external policies helps improve childcare practices and communication with parents (Lindsay et al., 2015; Rosenthal et al., 2013) to promote child nutrition. (Lin and Qu, 2016) Future studies are needed to determine the impact of the updated CACFP meal pattern on availability of high sugar foods during celebrations in childcare settings.

These findings have important implications for CACFP policy makers and practitioners. Having mandated requirements has shown to improve the quality of foods served in CACFP participating childcare. (Ritchie et al., 2012) Interestingly, CCCs reported not having enough money to cover the cost of serving meals to providers as a barrier for implementing responsive feeding practices. When providers eat the



**Table 4**  
 Percentage of child care providers implementing mealtime best practices and reporting implementation difficulty (difficult to do or potentially do) for each best practice by geographic location (urban, rural) and organizational structure (Child Care Center [CCC] vs. Family Child Care Home [FCCGH]) (N = 1170).

Meal Time Best Practices	Urban(n = 591)		Rural(n = 579)	
	Implementation of Best Practices "Yes"		Implementation of Best Practices "Yes"	
	CCC(n = 119)%	FCCGH(n = 472)% $\chi^2$	CCC(n = 81)%	FCCGH(n = 498)% $\chi^2$
1. Providers praise children for trying new or less preferred foods	98.3	99.6	100.0	99.2
2. Providers talk with children about healthy foods at mealtime	97.5	96.1	82.5	96.3
3. Providers allow children to decide when they are full during meals	94.1	91.8	97.5	93.4
4. Providers sit with children during meals and snacks	90.70	79.7	88.8	78.5
5. Providers enthusiastically role model eating healthy foods served at mealtimes	90.6	90.5	92.5	90.9
6. Providers ask children if they are full before removing their plates	86.4	91.0	83.8	92.7
7. Children help with setting and clearing the table during mealtimes	79.7	67.7	68.4	70.5
8. Providers do not use food to calm upset children or encourage appropriate behavior	72.6	70	66.3	66.1
9. Providers use children's preferred foods to try less preferred foods <sup>a</sup>	67.2	60.7	77.5	71.8
10. Providers eat together with children during mealtimes	66.1	65.4	70.9	61.6
11. Providers ask children if they are hungry before serving more food	50.9	41.5	50.0	61.8
12. Providers do not praise children for finishing food or cleaning their plates	47.9	47.7	39.2	35.8
13. Providers eat only the foods and beverages being served to children during mealtimes	43.0	23.6	50.6	57
14. Meals and snacks are served family style where children always choose and serve most or all the food themselves			36.3	20.9

  

Meal Time Best Practices	Urban(n = 591)		Rural(n = 579)	
	Implementation Difficulty "Difficult to do or potentially do"		Implementation Difficulty "Difficult to do or potentially do"	
	CCC(n = 119)%	FCCGH(n = 472)% $\chi^2$	CCC(n = 81)%	FCCGH(n = 498)% $\chi^2$
1. Providers praise children for trying new or less preferred foods	6.9	3.6	5.1	4.5
2. Providers talk with children about healthy foods at mealtime	10.3	8.0	12.8	10.2
3. Providers allow children to decide when they are full during meals	8.0	9.3	14.9	12.4
4. Providers sit with children during meals and snacks	27.5	37.7	31.2	42.4
5. Providers enthusiastically role model eating healthy foods served at mealtimes	18.9	13.2	29.3	10.5
6. Providers ask children if they are full before removing their plates	7.1	5.9	8.3	6.0
7. Children help with setting and clearing the table during mealtimes	32.7	35.9	36.6	40.7
8. Providers do not use food to calm upset children or encourage appropriate behavior	12.5	5.6	12.3	4.7
9. Providers use children's preferred foods to try less preferred foods <sup>a</sup>	87.7	88	85.5	88.3
10. Providers eat together with children during mealtimes	31.1	47.4	39.7	49.0
11. Providers ask children if they are hungry before serving more food	10.7	6.6	19.1	8.8
12. Providers do not praise children for finishing food or cleaning their plates	23.9	17.1	28.8	21.7
13. Providers eat only the foods and beverages being served to children during mealtimes	41.9	39.0	51.3	35.4
14. Meals and snacks are served family style where children always choose and serve most or all the food themselves	55.6	59.9	51.4	62.1

Notes: Chi square analysis using 2x2 contingency table; <sup>a</sup>p < .05, <sup>\*\*</sup>p < .01, <sup>fn.a.</sup> not applicable due to more than 25% of cells have count less than 5.

**Table 5**

Barriers to Implementing Best Meal Time Practices by geographic location (urban, rural) and organizational structure (Child Care Center [CCC] vs. Family Child Care Home [FCCH]) (N = 1170).

Barriers to Implementing Meal Time Best Practices	Urban(n = 591)			Rural(n = 579)		
	CCC(n = 119)%	FCCH(n = 472)%	$\chi^2$	CCC(n = 81)%	FCCH(n = 498)%	$\chi^2$
1. Not enough money to cover the cost of serving meals and snacks to providers	23.7	11.7	11.089 **	24.7	14.5	5.339 *
2. Mealtimes with children are stressful	19.7	13.5	2.836	25.3	11.9	10.375 **
3. Providers have dietary restrictions	16.8	19.2	0.351	20.0	13.5	2.357
4. Providers do not have time to sit with children during meals	16.0	37.6	20.004 **	24.1	38.0	5.763 *
5. Providers do not like the taste of healthy foods served at the childcare program	11.0	4.9	6.053 *	13.8	3.9	13.443 **
6. Not enough providers to sit with children during meals	8.4	29.3	21.994 **	17.3	24.9	2.216
7. Providers are uncertain how to handle children who are hesitant to try new foods	7.6	6.9	0.083	9.9	8.6	0.152
8. Providers are unsure how to encourage children's healthy eating	4.2	5.4	0.278	11.1	5.1	4.506 *

Notes: Chi square analysis using 2x2 contingency table; \* $p < .05$ , \*\* $p < .01$ .

same foods as children, it presents opportunities for providers to model healthy eating and encourage children to try the foods. (Hughes et al., 2007) Taken together, the benefits and sub-optimal implementation of responsive feeding practices underscore the need for USDA and state agencies to consider providing alternate funding opportunities for childcare providers to implement family style dining, including materials and staff meals for role modeling. Further, CACFP can continue disseminating targeted training and resources and address barriers based on the childcare type and geographic location to support health equity.

#### 4.1. Limitations and strengths

This study should be interpreted in light of its limitations and strengths. First, the use of self-report renders our data susceptible to social desirability bias. In the cover letter the participants were assured that this survey is not an assessment about whether the childcare setting is meeting certain standards but the participant responses will help in tailoring resources and training for implementing nutrition best practices. Yet, we acknowledge that it is possible that respondents have scored themselves in a way that presents their program in a more positive light. Further, the survey was completed by a CCC director or FCCH provider who was most familiar with the childcare program. Future studies should consider multiple data sources (childcare staff such as teachers, cooks, food catering agency) and methods (observation, interviews). This study was conducted before the new CACFP meal pattern was implemented. Given the enhanced vegetable, whole grain, and reduced sugar CACFP requirements, costs are predicted to increase (Lin et al., 2017) and thus barriers presented in this study may underestimate concerns regarding finances. The sample included Nebraska CACFP participating childcare which limits the generalizability of findings. Finally, because we do not have demographic data on the programs that did not return the survey, we cannot conduct a statistical comparison between responders and non-responders to ensure that the current sample is representative of the broader population. However, the present study sample is representative of the distribution of CCC and FCCH childcare programs in both urban and rural Nebraska.

These limitations notwithstanding, this study has its strengths. The data is a state-wide representative sample of CCCs and FCCHs, as well as less studied, and hard to access rural providers. Additionally, although we did not conduct an experimental study, we conducted separate analyses for both program types (FCCHs, CCCs) and geographic location (urban, rural), eliminating the potential confounding effects that these two factors may contribute. Finally, in addition to assessment of best practices, we also examined implementation difficulty and barriers for implementing best practices across varying childcare settings.

## 5. Conclusion

The present study provides a preliminary account of the impact of organizational structure and geographic location by characterizing the implementation of evidence-informed nutrition best practices in a sample of CCCs and FCCHs located in urban and rural Nebraska. Results corroborate previous studies which documented similarities and differences between CCCs and FCCHs. (Natale et al., 2014; Tandon et al., 2012; Kim et al., 2012; Trost et al., 2009) Present study findings yielded novel insights regarding an important gap in knowledge regarding differences and similarities in the implementation of nutrition best practices in childcares in urban and rural areas. Together, our findings suggest that policy and public health interventions be targeted to the unique challenges of implementing evidence-informed practices within different organizational structures and geographic locations.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2019.101021>.

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