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**Developing a Best Nutritional Practices Survey
for Early Childhood Care Providers:
Item Reliability Tests and Subscale Construction**

28 December 2017

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Introduction

As part of a federal Child and Adult Care Food Program (CACFP) training grant, states are required to evaluate how effective their trainings on the new federal meal plan have been. Team Nutrition at the Kansas State Department of Education was one of the fortunate agencies to receive a grant.

In Kansas, Team Nutrition trains sponsors who, in turn, train their providers of early childcare services. Sponsors support providers who provide nutritional services administered by the states and funded by the federal government. Because the Kansas Team Nutrition is using a train-the-trainers model, Team Nutrition felt it was important to gather evidence of improved nutritional practices, as required by the new federal meal plan, at the provider level. To do so systematically, we decided to create, test, improve, and administer, a yearly survey of all Kansas providers.

Our aims were to develop a best practices instrument that would:

1. evaluate any trainings provided by KSDE's Team Nutrition, especially the trainings provided through the federal grants of the Child and Adult Care Food Program (CACFP),
2. tell us if the training Team Nutrition gave to sponsors was improving adherence to the new meal plan at the provider level,
3. systematically gather information about the needs of providers,
4. identify areas where Team Nutrition could improve or better target its trainings, and
5. build tools and processes to periodically gather insights from providers.

Two nutrition experts on KSDE's nutrition team, Emily Brinkman and Tessa Adcock, with the help of a KSDE social scientist, Tony Moss, designed and scored the first draft of the survey.

In addition to our own inventions, our workgroup considered, borrowed, and modified questions from other public instruments like the *Idaho CNP Foundation for Change-Team Nutrition Project*, the *Missouri Eat Smart Nutrition Self Assessment*, *Go NAP SACC Self-Assessment Instrument*, and the Minnesota Department of Education's *Mealtime Assessment for Child Care Centers*.

This document examines the reliability of our *Best Nutritional Practices Survey*. The evaluation model cited by the CACFP grant, the *Framework for Program Evaluation in Public Health*, puts forward an ideal of integrated information systems that support:

1. systematic measurement,
2. evaluations that guide program improvements, and

3. improvements in public health, especially preventive ones.¹

We hope to create a reliable survey instrument that produces feedback loops that are integrated with our regular administrative data. Theoretically, integrating program evaluation data with administrative data should reduce the reporting burden on providers. It should also give program administrators a clearer picture of needed program and training improvements.

Adjustments made after the pretest

In February 2017, we were able to perform a pretest of our survey. We compiled a data set of all current food service providers participating in publically funded food service programs (n = 3,554). We were able to acquire the email addresses of 3,387. Of these, we randomly selected 186 to whom we emailed our pretest. Seventy responded to our pretest, giving the pretest a response rate of 37.6 percent.

Where appropriate, we applied reliability tests to the subscales we had constructed. Based on the reliability analysis of the pretest, the workgroup modified, removed, and added items to the survey. We improved the reliability of our subscales and expanded their score distributions.

Wider distributions are likely to be more sensitive, and thus, more likely to capture improvements in best practices associated with trainings and other interventions. For example, we expanded the number of items in the attitude subscale from five to ten. In the pretest's five-point subscale, the distribution of scores ran from 14 to 20 with a median of 18. The ten-point subscale expanded the distribution to a range running from 4 to 40 with a median of 38.

Unfortunately, we had time for only one pretest and one round of improvements to the survey. We will make a small number of improvements before administering the second wave in 2018. A section with pending improvements is at the end of this document. Perhaps other state nutrition teams will adopt and further improve this instrument, or parts of it.

As of this writing, the sensitivity of our *Best Practices* survey is unknown. We will not know if it is sensitive enough, or how sensitive it is, in capturing significant differences in providers' responses to training until after the second survey, in 2018, when we compare and merge the results of the first survey with those of the second.

Response rate

The seventy providers who responded to our pretest were excluded from our first survey, which, in late March 2017, we sent out to 3,317 providers. We closed the survey on March 27, 2017 with 1,419 responses, a 42.8 percent response rate.

¹ Centers for Disease Control and Prevention. *Framework for program evaluation in public health*. MMWR 1999; 48 (No. RR-11). See the Forward by Jeffrey Koplan, and pages 1 through 3 of the introduction, especially the section *Integrating Evaluation with Routine Program Practice* on page 3.

In 2018, and again in 2019, we plan to use the subscores and the overall score from the surveys as dependent variables in regressions to measure the influence of various nutrition trainings and interventions. We expect sub-score scales will help direct our attention to specific areas associated with lower scores. We are also using subsets of items from the *Best Practices* survey in our pre- and post-training evaluation forms taken at individual trainings. By linking these instruments, we hope to make broader inferences about the influence of specific trainings and about where to direct our training investments.

Provider suggestions from open-ended responses

There were two open-ended questions at the end of the 2017 survey:

future training:² What child nutrition topics interest you for future training opportunities?

suggestions: Do you have any suggestions or comments for Kansas Team Nutrition and KSDE Child Nutrition & Wellness?

The responses offer insights into providers' concerns, and suggestions for possible improvements to the survey, and possible improvements to the program. For example, in questions about **water availability**, our survey did not include water bottles assigned to individual children as an option. In the **suggestions** section, several respondents pointed out this omission.

After the second survey in March, 2018, perhaps there will be time to perform a text analysis of providers' opened-ended responses. Text analyses classify and quantify the concerns of respondents. For now, a simple reading identified the following providers' concerns. Where appropriate, some comments have been re-phrased as questions.

costs: Fresher fruits and vegetables cost more, especially in small, very rural communities. They also cost more in preparation time. How can these costs be overcome? Can reimbursement tiers be eliminated? How much does the price sensitivity of the providers effect their choices of foods to serve children?

food waste: When is food waste excessive? What can be done to reduce it?

attrition and lower participation due to costs: Do some providers leave or avoid participation in public food programs due to higher costs, regulations, paper work, or opposition to the meal plan?

training needs: What are effective strategies for getting fussy eaters to try healthier choices? What about aversions to particular food textures and colors? Can more multicultural food options be provided? What if family food habits contradict the meal plan? What are effective strategies for working with families accustomed to junk foods and individual

² Survey items are given short labels, like **future training**, in bold letters. The actual wording of the survey item comes next. Where appropriate, we report the scoring scale or the frequency the item was selected by respondents.

grazing, not family-style, eating? What are effective strategies for overcoming staff aversions and resistance to the new CACFP meal plan? Is training measurably more effective if it involves hands-on practice directly with providers? Would more sponsors attend trainings if they were held on weekends? Can KSDE's nutrition team provide some trainings directly to providers and measure if they are more effective than training offered through sponsors? Are there more "kids in the kitchen" activities Team Nutrition can teach the field?

food fads and controversies: What are the facts about gluten-free foods? What are the real differences between power-bars, cookies, pop-tarts, and donuts? What are healthy fats and what are unhealthy fats? Are there healthy sugars and unhealthy sugars?

child development and food introductions: What are best practices for preventing food allergies? At what ages and in what quantities should nuts, honey, and other foods be introduced? Are there specific recommendations about early food habits and avoiding later health problems like obesity and diabetes?

infant nutrition: What are the appropriate foods, quantities, and ages for introducing particular foods to infants? What if the infants are still being breastfed?

Subscale 1: Attitudes

In this subscale, we are trying to measure the conscientiousness, beliefs, and self-confidence that support the application of the new meal plan.

The 10 items had 4-point scale responses and 1,403 to 1,413 responses per item. Below, we identify each item with **an item name in bold**, the item's wording as it was in the survey, and *(the way the item was finally scored including any recoding)*. Items were usually scored on four-point scales. Higher scores indicate better attitudes or practices supportive of the new CACFP meal plan and lower scores indicate less healthy practices or attitudes, or attitudes and practices at odds with the new CACFP meal plan.

role models: Positive role modeling (sitting with children, eating with children, discussing foods, and encouraging children to eat) will influence what foods children are willing to try. *(agree = 4, somewhat agree = 3, somewhat disagree = 2, disagree = 1)*

confident implement: I feel confident that I can implement the requirements of the new CACFP Meal Pattern. *(agree = 4, somewhat agree = 3, somewhat disagree = 2, disagree = 1)*

ed. impact: Providing nutrition education to children will have NO impact on their overall health. *(agree = 1, somewhat agree = 2, somewhat disagree = 3, disagree = 4)*

have knowledge: I have the appropriate level of knowledge to teach nutrition education to children in my care. *(agree = 4, somewhat agree = 3, somewhat disagree = 2, disagree = 1)*

eat healthy: If people eat healthy foods most of the time, they will have fewer health problems in the future. (*agree = 4, somewhat agree = 3, somewhat disagree = 2, disagree = 1*)

families expect: Parents/families expect that their children will be served healthy foods. (*agree = 4, somewhat agree = 3, somewhat disagree = 2, disagree = 1*)

I eat veg: I make sure I eat plenty of fruits and vegetables myself. (*agree = 4, somewhat agree = 3, somewhat disagree = 2, disagree = 1*)

comfortable: I feel comfortable passing information on to parents/families about good nutrition practices. (*agree = 4, somewhat agree = 3, somewhat disagree = 2, disagree = 1*)

confident provide: I feel confident that I can provide a healthy nutrition environment for the children who attend this childcare program. (*agree = 4, somewhat agree = 3, somewhat disagree = 2, disagree = 1*)

motivated: I am motivated to make sure the children here have healthy choices available. (*agree = 4, somewhat agree = 3, somewhat disagree = 2, disagree = 1*)

About 25 respondents stopped answering questions after completing the **motivated** question, and did not continue to the next section, which begins with a question about whether menus are posted.

The pairwise correlations between items are in the table below.

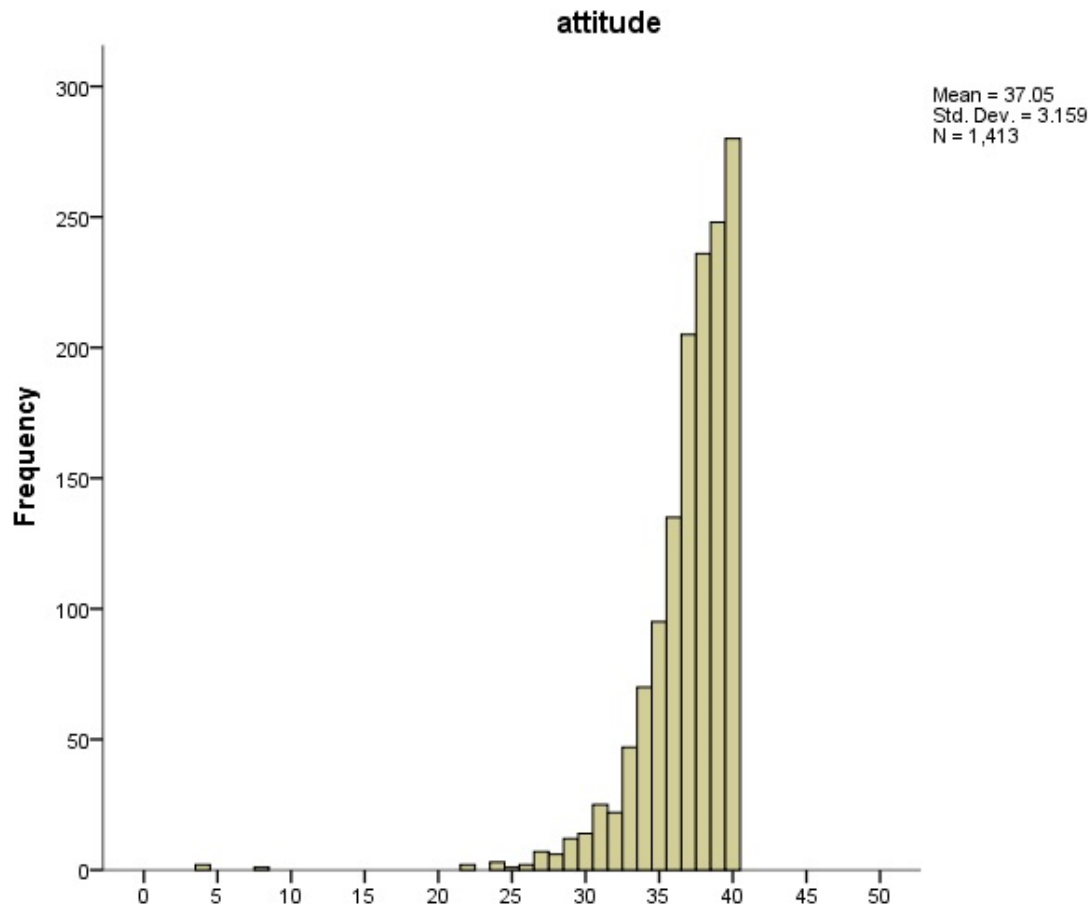
Inter-item Correlations										
	role models	confidence	ed. impact	have knowledge	eat healthy	families expect	I eat veg	comfortable	confident provide	motivated
role models	1									
confidence	0.22	1								
ed. impact	0.25	0.16	1							
have knowledge	0.09	0.20	0.07	1						
eat healthy	0.14	0.13	0.16	0.21	1					
families expect	0.24	0.21	0.14	0.09	0.11	1				
I eat veg	0.19	0.21	0.12	0.26	0.18	0.19	1			
comfortable	0.20	0.31	0.20	0.22	0.10	0.20	0.26	1		
confident provide	0.21	0.34	0.14	0.27	0.15	0.25	0.19	0.27	1	
motivated	0.26	0.26	0.20	0.15	0.12	0.28	0.21	0.26	0.44	1

The diagonal of ones are items' perfect correlations with themselves. A zero correlation between two item pairs would indicate that they have no relationship at all. A negative correlation tells us that as one item increases, the other decreases.

Other than the correlation between the **motivated** and the **confident provide** items, there are relatively low correlations between the items. Ideally, we do not want items that have near-zero correlations. Near-zero correlations would suggest that some items were not measuring the same construct or a related concept, in this subscale, attitudes. Nor do we want items with high correlations, approaching one. Very high correlations would suggest that some items are measuring the same thing and are redundant. These middling-low correlations are acceptable. Because we are not measuring a single, clear concept, but rather a mix of conscientiousness, beliefs, and confidence, we should expect relatively low correlations.

Aggregating the items into an attitude subscale, we have broadened the range of respondents' scores, but, as in the pretest version, we have a truncated higher end (see the histogram below). This means that our subscale scores should be able to distinguish between gradients of those with comparatively poorer attitudes, but we will not be able to distinguish between those at the high-end of the distribution, with various gradients of conscientiousness, beliefs, and confidence in their nutritional knowledge. Since we hope to identify where trainings are needed, this is acceptable, but it may pose a ceiling problem. It limits how much providers can show

improvements in this subscale. We may need to add an item or items that provide a negative gradient at the high end of the scale in order to avoid this ceiling effect.



In the pretest instrument, the five items we used in the attitude subscale had a relatively low inter-item reliability. Their internal consistency, as measured by Cronbach's alpha³, was only 0.42. With the addition of five more items in the first survey, the Cronbach's alpha for the attitude subscale rose to 0.68. This is slightly lower than the 0.70 level generally considered acceptable. To keep the number of items as low as possible, the subscale could be improved by replacing some items with better ones, particularly those that add a higher negative gradient. This improvement will probably have to wait until after the evaluation of the three-year training grant is complete.

We are also using the more conservative, non-standardized version of Cronbach's measure of reliability.⁴ The standardized version would place us over the 0.70 threshold.

³ Cronbach's non-standardized alpha = $((N * c) / (v + ((N - 1) * c)))$ where N = the number of items (10 in the attitude scale), c = the inter-item covariance, and v = the mean variance of the items. For the attitude subscale, this would be $((10 * 0.050) / (0.287 + ((10 - 1) * 0.050))) = 0.68$. Because it takes into account the differing variances of each included item, the non-standardized alpha is a more conservative measure than the standardized alpha.

⁴ Gliem and Gliem (2003) defined these categories for interpreting Cronbach's alpha: > 0.9 excellent reliability; > 0.8 good; > 0.7 acceptable; > 0.6 questionable; > 0.5 poor; and < 0.5 unacceptable. See Gliem, J. A. and Gliem, R. R.

There are some calculations that help identify which items are contributing to subscales and which should be removed. We can compare the contribution that each item makes to the attitude subscale's reliability by removing each item and observing what happens to the Cronbach's alpha statistic (see the last column below).

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
role models	33.41	6.34	0.37	0.16	0.65
confidence	33.50	6.04	0.41	0.20	0.64
ed. impact	33.60	5.75	0.29	0.11	0.68
have knowledge	33.58	6.24	0.32	0.16	0.66
eat healthy	33.61	6.18	0.27	0.09	0.67
families expect	33.45	6.36	0.33	0.14	0.66
I eat veg	33.70	5.71	0.37	0.16	0.65
comfortable	33.53	5.93	0.42	0.20	0.64
confident provide	33.31	6.62	0.44	0.29	0.65
motivated	33.30	6.64	0.43	0.27	0.65

How do we interpret the other columns in this table? The first column tell us what the average subscale score would be if the item were excluded from the scale. The second tells us what would happen to the subscale variance if the item were excluded. Ideally, no single item should have a disproportionately large influence on the subscale mean or its variance, so the numbers in each of these two columns should be roughly comparable to the other items in their respective columns. The third column, Corrected Item-Total Correlation, is the correlation between the score on the individual item and the sum of the scores on the remaining items. For example, the item **confident provide** has the largest correlation at 0.44, which means it has a comparatively strong relationship with the other items. By comparison, the **eat healthy** item, with a correlation of 0.27, has the weakest correlation with the rest of the items in the subscale.

The fourth column also indicates the strength or weakness of each item to the rest of the subscale, but it does so in a different way. The item is used like a dependent variable and the remaining items like predictor or independent variables. The Squared Multiple Correlation can be interpreted like an r-squared in a regression. The larger it is, the more of the variance in the individual item that can be explained by the other variables. For example, we can see that for the item **confident provide**, about 0.29 or 29 percent of its variance can be predicted or explained by the other items in the subscale. Only about .09 or 9 percent of the variance in responses to the **eat healthy** item can be explained by the other items.

All of these item statistics are guides to help us judge if an item is consistent and contributing to the subscale we are constructing. If there are not theoretical reasons that argue for a variable's inclusion, if it does not appear to have a relationship with the other variables, for example, if the

(2003). [Calculating, interpreting, and reporting Cronbach's alpha reliability coefficients for Likert-type scales](#). 2003 Midwest Research to Practice Conference in Adult, Continuing, and Community Education.

corrected item-total correlation is below 0.3, an item may be a candidate for removal or replacement.⁵

We also conducted a factor analysis to see test if our assumption of multiple related concepts in this subscale—conscientiousness, beliefs, and self-confidence—was confirmed. A factor analysis (varimax rotation, correlation method), explained about half of the variance. It identified three underlying factors that seem to overlap with our conceptual definition of the attitudes subscale. We do seem to be measuring three underlying constructs.

With so few items, naming factors is precarious and impressionistic, but the first factor might be *useful confidence* and drew from these items: **confident provide, motivated, confident implement**. The second factor might be called *positive beliefs*, or perhaps *comfortable role model*, and drew from these items: **role models, ed. impact, families expect**, and **comfortable**. The third might be called *healthy nutritional self-care* and drew from **have knowledge, I eat veg**, and **eat healthy**. Though there are multiple concepts in our attitude subscale, they are supportive of the new meal plan so we expect they will accurately measure training and implementation of the new meal plan.

Subscale 2: Mealtime Environments

In this subscale, we are attempting to measure practices that show an understanding and adherence to the new meal plan. We are not seeking to measure a single construct or underlying concept, but we are putting diverse concepts under an umbrella scale we are calling mealtime environments. We should expect that some items will not correlate well, and that some items will measure distinctive concepts.

In the pretest, there were nine items in this subscale. Though the nine items had a Cronbach's alpha of 0.66, the workgroup removed two of the nine mealtime environment questions, leaving the seven below.

menus: Current menus are posted for staff and parents to view. (*rarely or never = 1, some of the time = 2, most of the time = 3, all of the time = 4*)

adults eat: While children are present, adults eat foods or drink beverages that are not offered to the children. (*all of the time = 1, most of the time = 2, some of the time = 3, rarely or never = 4*)

family style: Meals are served family style (children serve themselves any part of the meal with limited help). (*rarely or never = 1, some of the time = 2, most of the time = 3, all of the time = 4*)

socialize: Children have time to socialize at meal time. (*rarely or never = 1, some of the time = 2, most of the time = 3, all of the time = 4*)

⁵ De Vaus, D. (2014). *Surveys in Social Research*, 6th edition, Routledge.

set table: Children help set the table. (*rarely or never = 1, some of the time = 2, most of the time = 3, all of the time = 4*)

adults talk: Adults talk with children about trying and enjoying healthy foods. (*rarely or never = 1, some of the time = 2, most of the time = 3, all of the time = 4*)

treat reward: Giving children a food treat to reward good behavior is an effective way to manage children while they are in my care. (*agree = 1, somewhat agree = 2, somewhat disagree = 3, disagree = 4*)

After pre-testing, and dropping two items, negative correlations between items disappeared (see table below). The Cronbach's alpha also dropped one-tenth to 0.56. Adding one or two items to this scale may help us better define gradients in adherence to the environments suggested by the new meal plan. One of the items we removed after the pretest, *Television viewing is allowed during meals and snack times*, had very little diversity in responses. Perhaps a question with some positive counter-weight might give us more gradients, e.g., *Watching television shows like Sesame Street is okay during snack time* or the addition of some other question that differentiated levels of adherence to the new meal plan.

Inter-item Correlations							
	menus	adults eat	family style	socialize	set table	adults talk	treat reward
menus	1						
adults eat	0.07	1					
family style	0.38	0.09	1				
socialize	0.12	0.06	0.18	1			
set table	0.24	0.12	0.45	0.18	1		
adults talk	0.16	0.14	0.18	0.21	0.27	1	
treat reward	0.05	0.08	0.10	0.08	0.02	0.05	1

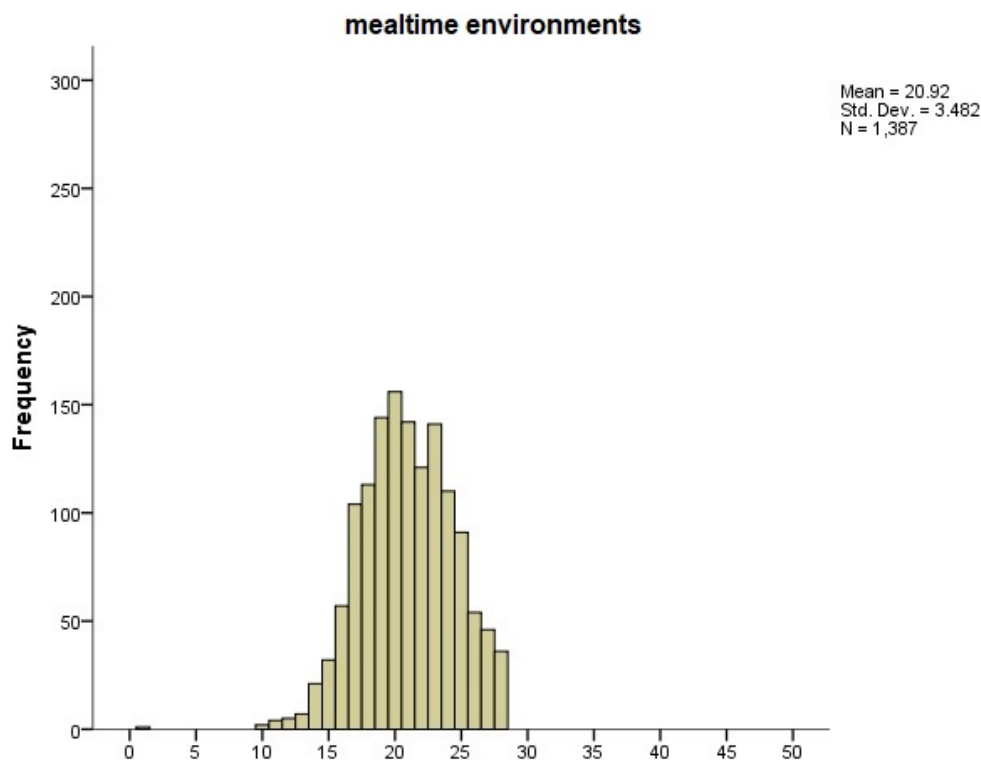
Notice that some item pairs have very low correlations, especially with the last item, **treat reward**. Near-zero correlations suggest that items are not measuring the same underlying construct, or related concepts. Again, because we are measuring adherence to the new meal plan, mixing diverse concepts is okay, but it does complicate interpretation of item correlations and inter-item statistics.

How do the items compare in their relative contributions to the food environments subscale?

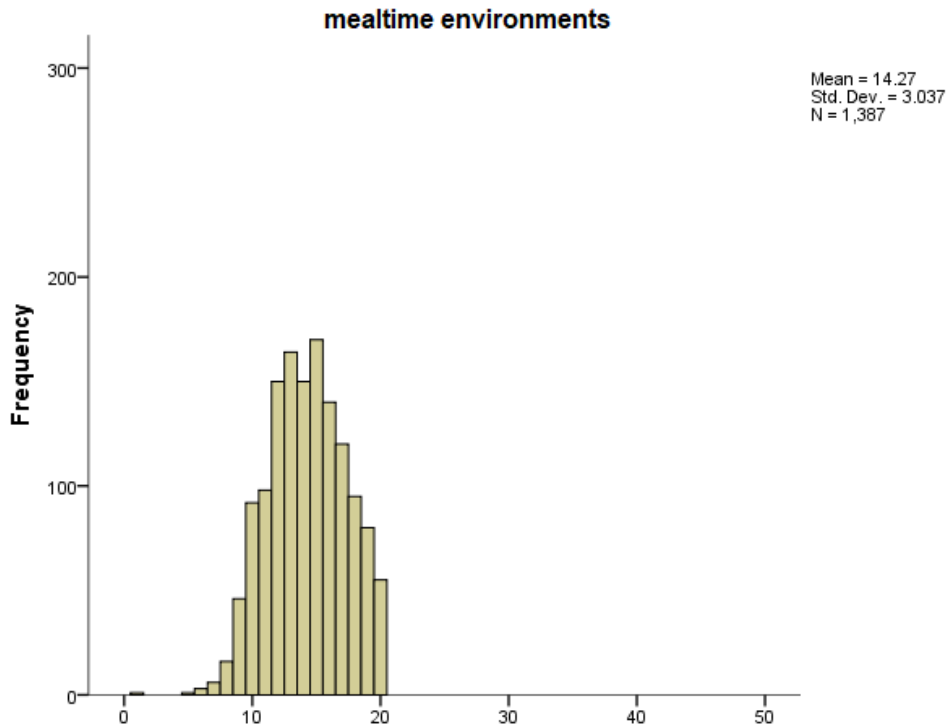
Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
menus	18.27	7.62	0.33	0.16	0.51
adults eat	17.51	10.35	0.16	0.03	0.56
family style	18.94	7.63	0.48	0.29	0.43
socialize	17.37	10.14	0.25	0.08	0.54
set table	18.57	8.15	0.42	0.25	0.47
adults talk	17.55	9.85	0.30	0.12	0.52
treat reward	17.81	10.08	0.10	0.02	0.59

One of the items, **treat reward**, just as in the pretest, produces a higher alpha if it is removed from the subscale. In the pretest, systematically excluding four non-contributing questions one at a time—including the **adults eat**, and the **treat reward** items—resulted in a slightly higher reliability of 0.676. Should these items be removed? How much contribute to the variance in our subscale?

Based on the current seven questions, the distribution of the **environs** subscale looks like this:



If we were to remove the **adults eat** and the **treat reward** variables, the variance declines but only slightly.



So as not to change the comparability of the three planned surveys, we will want to keep these items for the next three years, but in a second pretest, we may want to add one or two environmental items that promise to measure understanding and adherence to the new meal plan *and* improve the variance, especially at the top of the scale.

A factor analysis of the items in this scale identified two factors explaining 44 percent of the variance. The first factor was composed of **family style**, **set table**, **menus**. Could it be some form of social reciprocity? Again, with so few items, we are guessing. The second item was composed of **adults talk**, **set table**, and **socialize**.

Subscale 3: Unhealthy Offerings

The goal for this subscale, and its companion, healthy offerings, was to measure actual food and beverage offerings as reported by providers. The former is a short list of offerings that the new meal plan discourages while the latter is a longer list of offerings it encourages.

Here are the three unhealthy items:

sodas: In the average week, sugar sweetened beverages, such as flavored drink mix, fruit drinks, soda, sports drinks, etc. are served: (*5 times or more = 1, 3 or 4 times = 2, 1 or 2 times = 3, rarely or never = 4*)

tots: In the average week, my program offers fried or pre-fried potatoes (French fries, tater tots, and hash browns that are pre-fried, sold frozen, then prepared in the oven). (*5 times or more = 1, 3 or 4 times = 2, 1 or 2 times = 3, rarely or never = 4*)

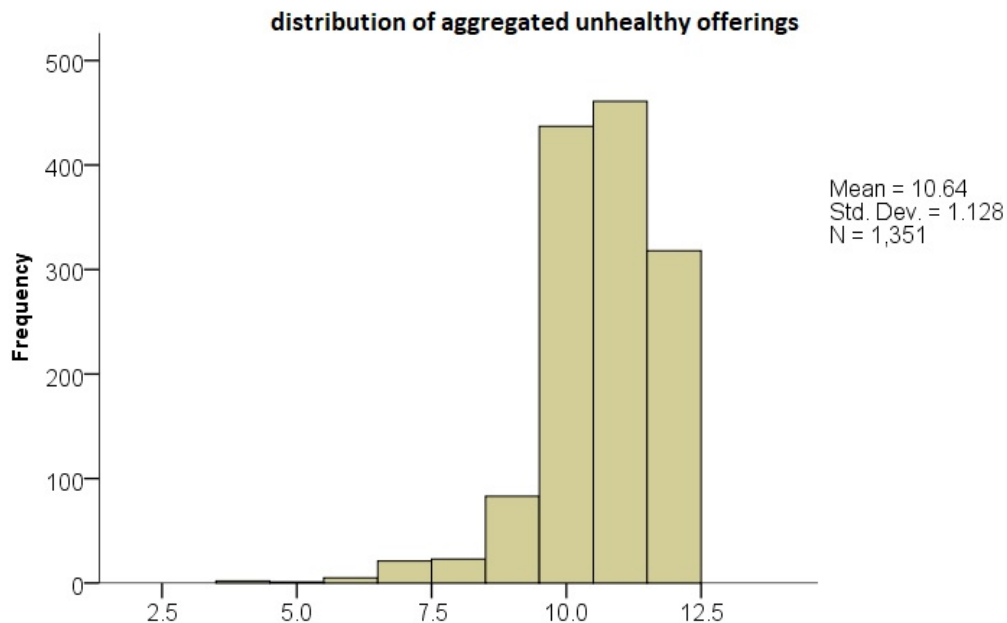
fat meat: In an average week, how many times are each of the following foods offered? Processes & Breaded Meat (chicken nuggets, chicken patties, fish sticks, hot dogs, lunch meats, sausage, bacon, ham, etc). (*5 times or more = 1, 3 or 4 times = 2, 1 or 2 times = 3, rarely or never = 4*)

Inter-Item Correlation Matrix			
	sodas	tots	fat meat
sodas	1		
tots	0.13	1	
fat meat	0.14	0.31	1

The Cronbach's alpha for the three is 0.43—not bad for three items, but with room for one or two more items.

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
sodas	6.76	0.86	0.17	0.03	0.47
tots	7.15	0.51	0.32	0.10	0.20
fat meat	7.49	0.42	0.33	0.11	0.19

The distribution of the aggregated items looks like this:



Subscale 4: Healthy Offerings

Here are the ten items:

cheese: In the average week, my program offers low-fat or reduced fat, natural cheeses (not including processed cheese product). (*rarely or never* = 0, *1 or 2 times* = 0.5, *3 or 4 times* = 1.0, *5 times or more* = 1.5)

The following five items were preceded with this same question, “In the average week, how many times are each of the following foods offered?”

dark green: Dark Green Vegetables (romaine lettuce, spinach, broccoli, kale, etc). (*0 (zero)* = 1, *1 (one)* = 2, *2(two)* = 3, *3 (three)* = 4, *4 (four)* = 5, *5+ (five or more)* = 6)

orange veg: Red & Orange Vegetables (carrots, red peppers, sweet potatoes, tomatoes, etc). (*0 (zero)* = 1, *1 (one)* = 2, *2(two)* = 3, *3 (three)* = 4, *4 (four)* = 5, *5+ (five or more)* = 6)

beans: Beans & Peas (legumes) (black beans, pinto beans, lentils, etc). (*0 (zero)* = 1, *1 (one)* = 2, *2(two)* = 3, *3 (three)* = 4, *4 (four)* = 5, *5+ (five or more)* = 6)

starchy: Starchy Vegetables (potatoes, corn, green peas, etc) (*0 (zero)* = 1, *1 (one)* = 2, *2(two)* = 3, *3 (three)* = 4, *4 (four)* = 5, *5+ (five or more)* = 6)

other veg: Other Vegetables (cucumbers, green beans, iceberg lettuce, celery, etc). (*0 (zero)* = 1, *1 (one)* = 2, *2(two)* = 3, *3 (three)* = 4, *4 (four)* = 5, *5+ (five or more)* = 6)

lean meat: In an average week, my program offers low-fat meat or meat alternatives (skinless, baked or broiled chicken or fish; 93% or higher lean turkey, beef, pork, poached eggs, beans, etc). (*rarely or never = 1, 1 or 2 times = 2, 3 or 4 times = 3, 5 times or more = 4*)

wholegrain: In the average week, my program offers whole grain-rich foods (whole-wheat bread, crackers, or pasta; oatmeal, brown rice, or whole-grain cereals): (*never = 1, rarely = 2, sometimes = 3, often = 4*)

One item, **water availability**, was a summary of five items that reported when and where water is offered—when children ask, during breaks, indoors, outdoors, and other ways. As noted above, responses on the open-ended **suggestions** pointed out that we had excluded individually-assigned bottled water as an option. This omission may have damaged the reliability of this item.

local foods: My program incorporates seasonal and locally produced foods and beverages into meals. (*2 times per week or more = 3, once per week = 2, 2 times per month = 1, once per month or less = 0*)

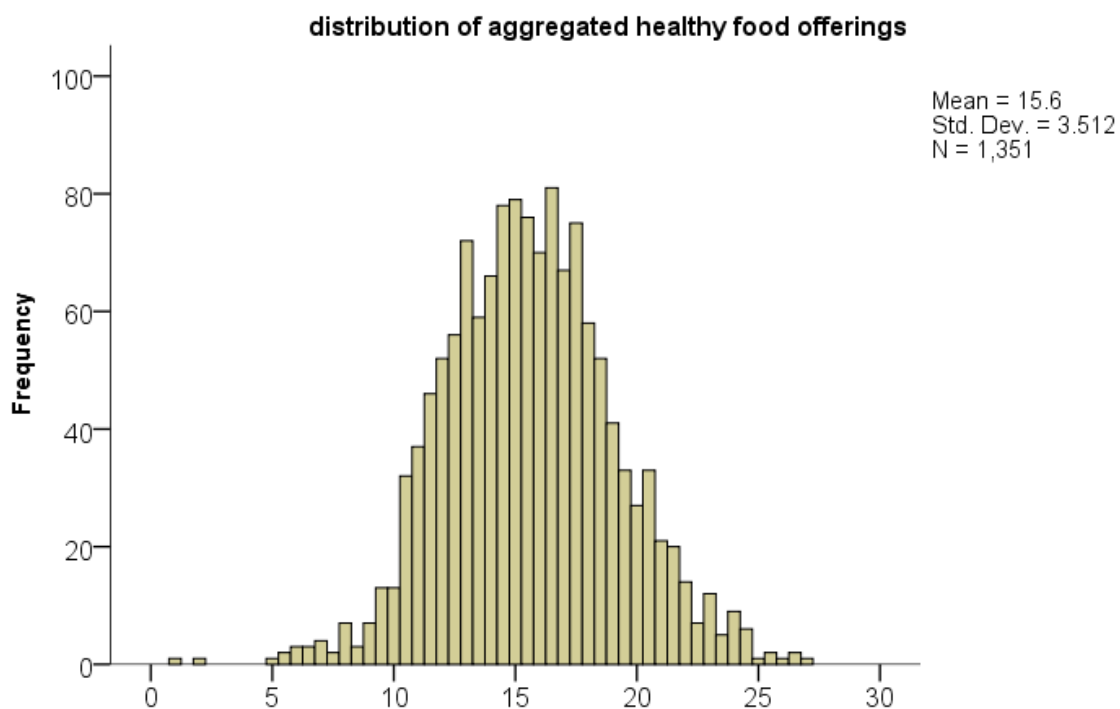
The item-by-item correlations are:

Inter-Item Correlation Matrix										
	cheese	dark green	orange veg	beans	starchy	other veg	lean meat	wholegrain	water availability	local foods
cheese	1									
dark green	0.25	1								
orang veg	0.23	0.63	1							
beans	0.24	0.51	0.52	1						
starchy	0.13	0.20	0.34	0.28	1					
other veg	0.19	0.44	0.53	0.38	0.39	1				
lean meat	0.22	0.36	0.35	0.29	0.11	0.29	1			
wholegrain	0.09	0.22	0.17	0.13	0.01	0.14	0.24	1		
water availability	0.05	0.02	0.03	0.02	0.04	0.09	0.07	0.06	1	
local foods	0.18	0.22	0.19	0.16	0.02	0.18	0.21	0.11	0.04	1

The Cronbach's alpha is 0.7. Except for **water availability**, the items correlate well. The item statistics below also suggest that **water availability** is not adding much to this subscale. Unless it can be composed better, and pretested, it could probably be removed from the survey with little effect.

Item-Total Statistics					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
cheese	15.18	11.00	0.32	0.11	0.68
dark green	14.62	9.21	0.59	0.48	0.63
orang veg	14.50	9.40	0.61	0.52	0.63
beans	14.96	9.88	0.51	0.35	0.65
starchy	14.60	10.62	0.28	0.20	0.68
other veg	14.47	9.53	0.53	0.37	0.64
lean meat	13.10	9.34	0.43	0.21	0.66
wholegrain	12.05	10.83	0.23	0.08	0.69
water availability	14.60	11.21	0.08	0.01	0.71
local foods	13.98	8.68	0.26	0.09	0.73

Aggregating the healthy food items, we get a full distribution, which will help us distinguish between providers across this spectrum:

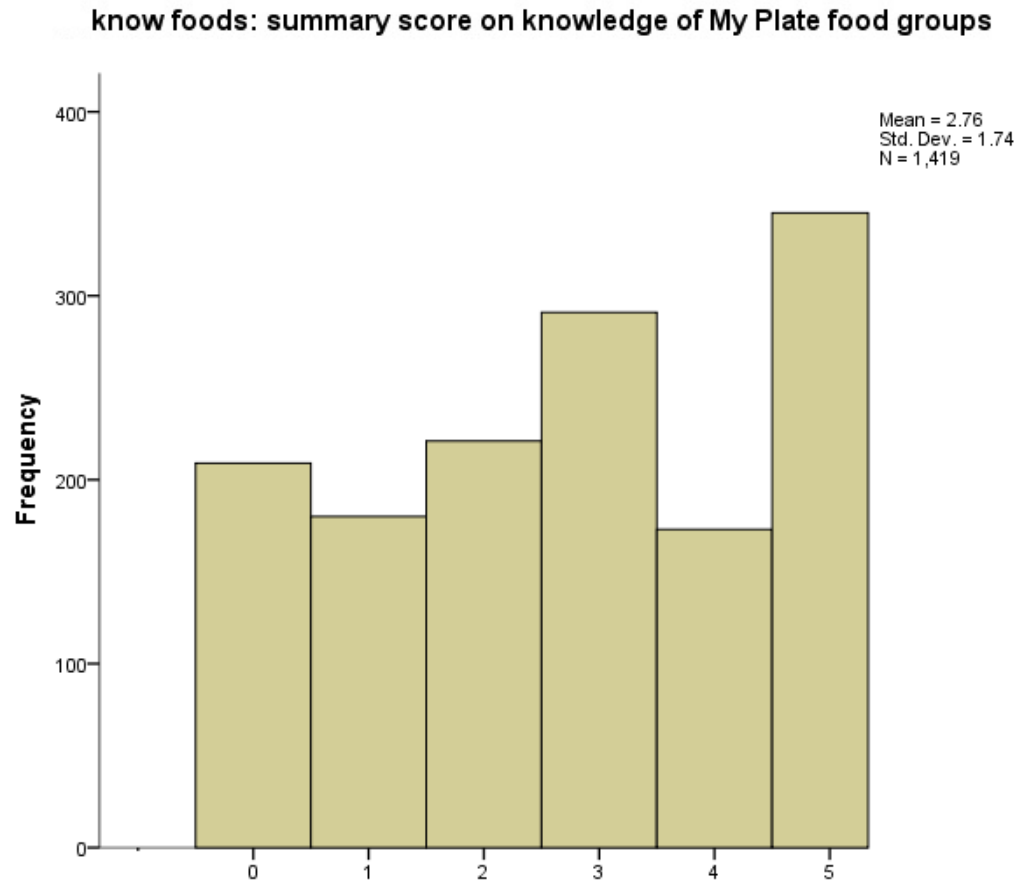


Subscale 5: Provider Knowledge

We included only one question to measure knowledge specific to the new meal plan. We placed the following responses under the question, What food groups make up a balanced MyPlate meal? (check all that apply).

water	21 percent selected this distractor.
veggies vegetables	90 percent selected this correct answer.
sugars added sugars	Only 7 respondents selected this distractor.
grains	88 percent selected this correct answer.
dairy	71 percent selected this correct answer.
milk	48 percent selected this distractor.
protein	82 percent selected this correct answer.
meat	40 percent selected this distractor.
legumes	19 percent selected this distractor.
fats & oils	15 percent selected this distractor.
fruits	87 percent selected this correct answer.

To construct a summary measure for respondents' knowledge, we coded these items differently than other summary scores. Correct responses were coded to equal one and incorrect responses were coded as negative ones. This yielded a wider distribution that, in the few cases where the respondent chose more distractors than correct answers, resulted in seven respondents getting negative summary scores. The negative scores were recoded as zeros. The resulting distribution gives us five levels of knowledge about the My Plate food groups from a single question.



Subscale 6: Materials Used by Providers

We assume that Team Nutrition materials are associated with greater adherence to the new meal plan. The resulting checklist tells us if Team Nutrition materials are being used, and how much they are being used. From this first survey, we know that each of the materials below has a positive and significant correlation with a *Best Practices* score. Later, after the second survey, we should be able to test if particular materials are associated with improved *Best Practices* scores.

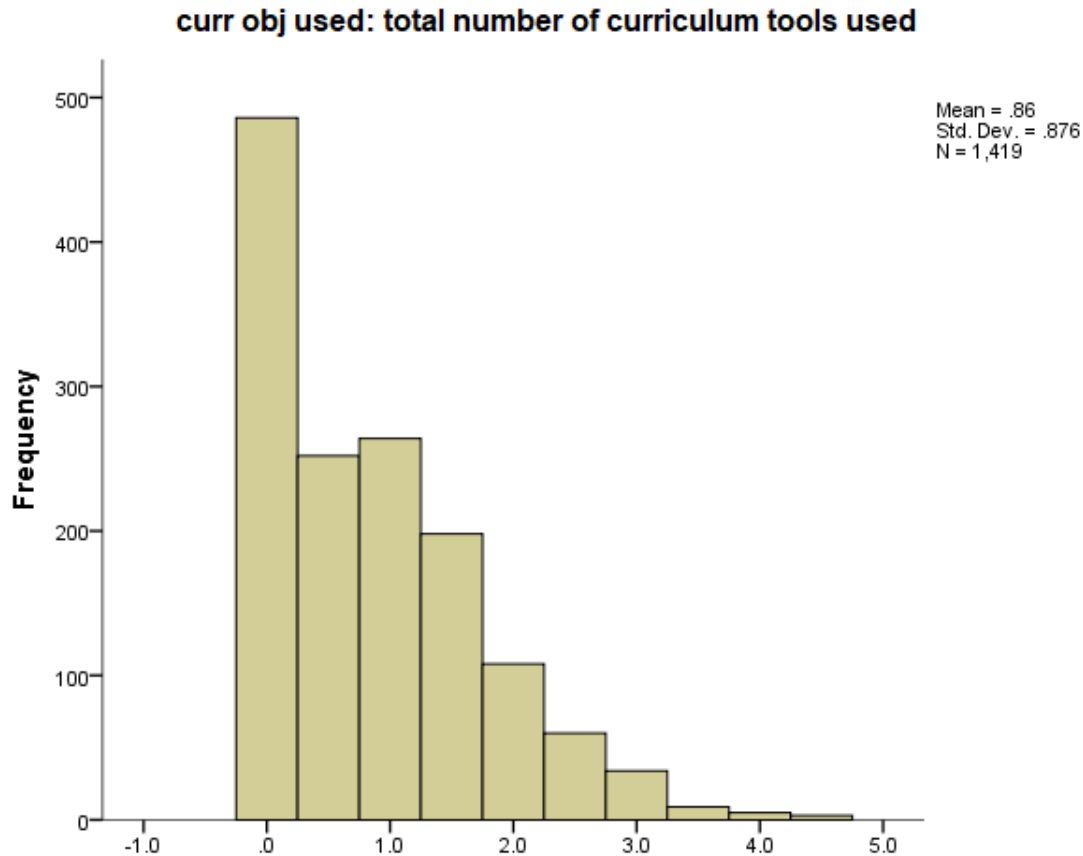
The following checklist of items were preceded by this statement: I have used the following Team Nutrition education materials:

bldg blocks	Building Blocks for Fun and Healthy Meals (<i>12.5 percent report using this</i>).
discover my plate	Discover My Plate (<i>31.2 percent report using this</i>)
grow it try it	Grow It, Try It, Like It gardening curriculum (<i>23 percent report using this</i>)

try day	Make Today a Try-Day in CACFP (<i>7.3 percent report using this</i>)
my plate	MyPlate for Kids (<i>39.5 percent report using this</i>)
nibbles	Nibbles for Health: Nutrition Newsletters for Parents of You (<i>4.2 percent</i>)
recipes	Recipes for Healthy Kids: Cookbook for Child Care Centers (<i>13.3 percent</i>)
stickers	Team Nutrition Stickers (<i>5.1 percent report using this</i>)
two bites	The Two-Bite Club (<i>21.7 percent report using this</i>)

The use of Team Nutrition materials runs from hardly used at all—Nibbles for Health was used by only 60 out of 1,419 respondents—to middling-low—MyPlate for Kids was used by 560 or 39 percent of respondents. If our sample is representative of the field, none of the materials offered by Team Nutrition are being used by a majority of providers.

Because this is checklist, not a scale with underlying concepts, it isn't appropriate to do reliability statistics. Should we expect the use of more materials to be associated with better nutritional practices? We do. After constructing our all the subscales here, we removed this materials subscale from the summary score and tested the correlations of the materials above to the adjusted summary *Best Practices* score. Every material listed above significantly correlated with positive correlations in the rest of the *Best Practices* survey, while the lack of using any of the materials correlated negatively with the *Best Practices* summary score.



Subscale 7: Communication with Families

In our survey, there were twenty-one items that could have contributed to this subscale.

offer ed: How often do you offer education on child nutrition topics to the families you serve? (in-person conversations, classes, brochures, tip sheets, a program newsletter, website, or bulletin boards.) (*6 times per year or more = 3, 4 or 5 times per year = 2, 2 or 3 times per year = 1, rarely or never = 0*)

A series of selections followed this statement: Please check all types of family nutrition education that your program provides:

none number of respondents selecting this option: n = 297

in-person education session n = 361

brochures n = 430

tip sheets n = 479

program **newsletter** n = 365

website n = 184

bulletin n = 380

family wellness **event** n = 124

invite parents to **participate** in the child care meal time with their child(ren) n = 350

other n = 104

A second set of items followed this question: Which of the following forms of communication do you use with the families you serve? (Check all that apply)

none n = 34

Facebook n = 704

email n = 543

Twitter n = 14

Instagram n = 29

website announcements n = 91

phone calls n = 933

Skype n = 4

text message n = 1,050

other n = 253

As with the materials subscale above, we are not measuring underlying constructs. We are simply creating a list with a summative scale. Correlation and reliability tests are not appropriate.

Several of the communication mediums had very few users---only 4 providers used Skype, only 14, Twitter. Due to their low incidence, the **Twitter**, **Instagram**, **website** announcements, and **Skype** items were removed. This left twelve of the twenty-one candidate items in the subscale.

Subscale 8: Educating Children about Nutrition

These items are in this subscale:

lesson freq: My program teaches planned nutrition education lessons to the children in my care: (*12+ times per year = 3, 10 to 11 times per year = 2.5, 8 to 9 times per year = 2, 6 to 7 times per year = 1.5, 4 to 5 times per year = 1, 2 to 3 times per year = 0.5, 0 to 1 time per year = 0*)

informal talk: Adults talk with children informally about healthy eating: (*almost always = 4, often = 3, sometimes = 2, rarely or never = 1*)

objects used freq: Posters, books, or games are used to encourage healthy nutrition habits. (*2 times per month or more = 1.5, once per month = 1, 6 to 8 times per year = 0.5, rarely or never = 0*)

The next nine items followed this statement: The following items are used to encourage healthy nutrition habits (check all that apply):

no objects number of respondents selecting this option: n = 121

posters n = 501

books n = 1,000

games n = 497

songs n = 698

cooking activities n = 745

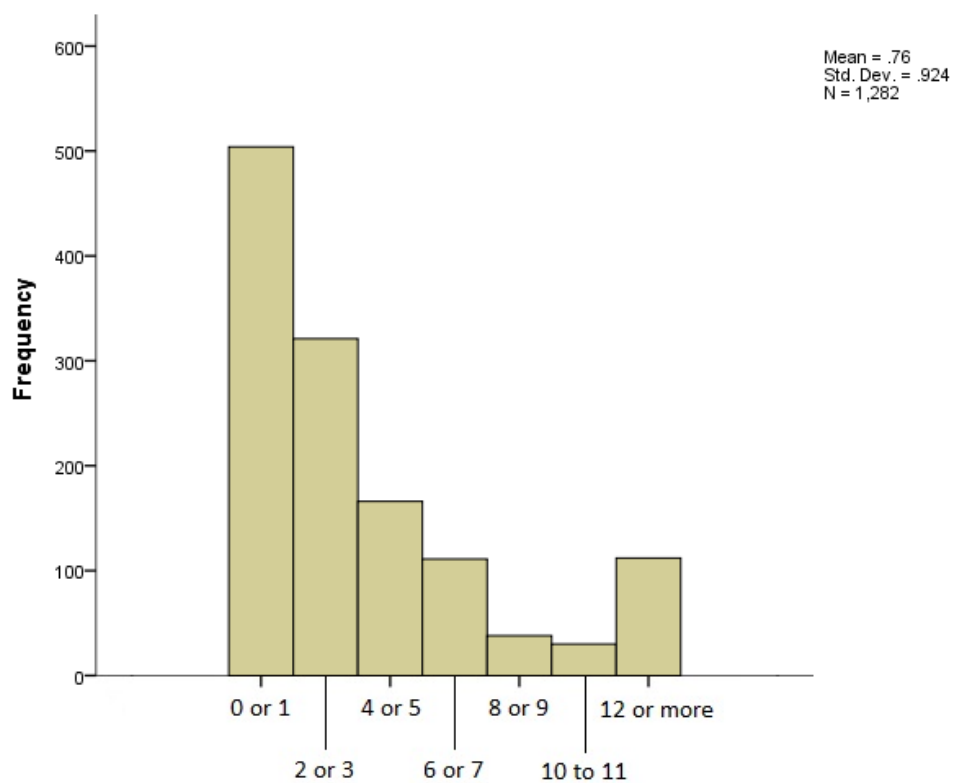
taste testing activities n = 695

gardening n = 539

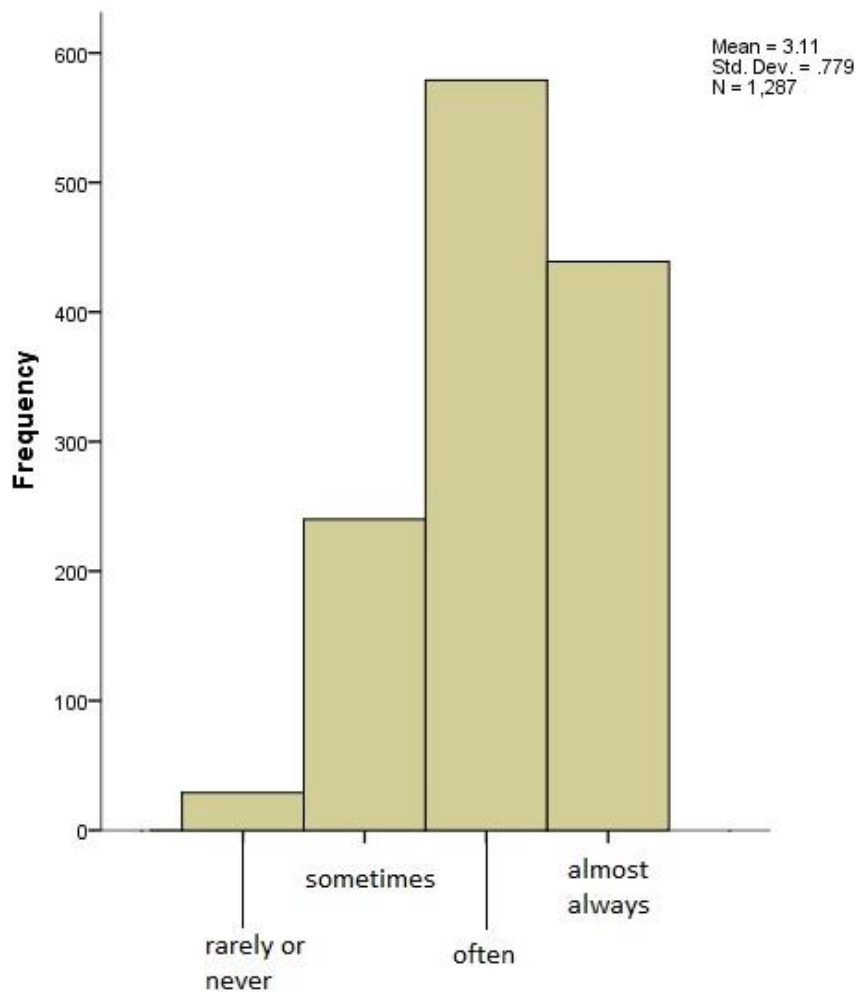
other n = 66

The responses to the first two questions, **lesson freq** and **informal talk**, suggest a preference for informal discussions rather than formal lessons:

My program teaches planned nutrition education lessons



Adults talk with children informally about healthy eating:



Because of their very low frequency, the **no objects** item and the **other** item were removed from this subscale.

Do the subscales correlate as expected?

Now that we have identified the more reliable items and created subscales, we can create a summative score by combining the subscales. We can also check for face validity—do the subscales correlate with summary measures in the way we expect them to?

Pearson Correlations Between Subscales and Summative Scale										
	attitude	mealtime environs	unhealthy offerings	healthy offerings	provider knowledge	materials used	communicat e	nutrition education	training frequency	summative score (total)
attitude	1									
mealtime environs	.299**	1								
unhealthy offerings	.173**	0.053	1							
healthy offerings	.240**	.187**	0.049	1						
provider knowledge	0.044	.076**	.055*	-0.024	1					
materials.used	.164**	.284**	.149**	.275**	.211**	1				
communicate	.262**	.433**	.077**	.305**	.082**	.418**	1			
nutrition education	.288**	.449**	.135**	.332**	.346**	.534**	.585**	1		
training frequency	.125**	.159**	0.008	.259**	.296**	.352**	.266**	.523**	1	
summative score (total)	.549**	.649**	.146**	.553**	.418**	.538**	.715**	.809**	.509**	1
**. Correlation is significant at the 0.01 level (2-tailed).										
*. Correlation is significant at the 0.05 level (2-tailed).										

Examining the correlations table above, we see that the greater number of trainings, training frequency, correlates positively and significantly with all subscales except **unhealthy offerings**. In other words, the more trainings a provider has received, the more likely the provider:

- has a positive attitude,
- offers a better mealtime environment,

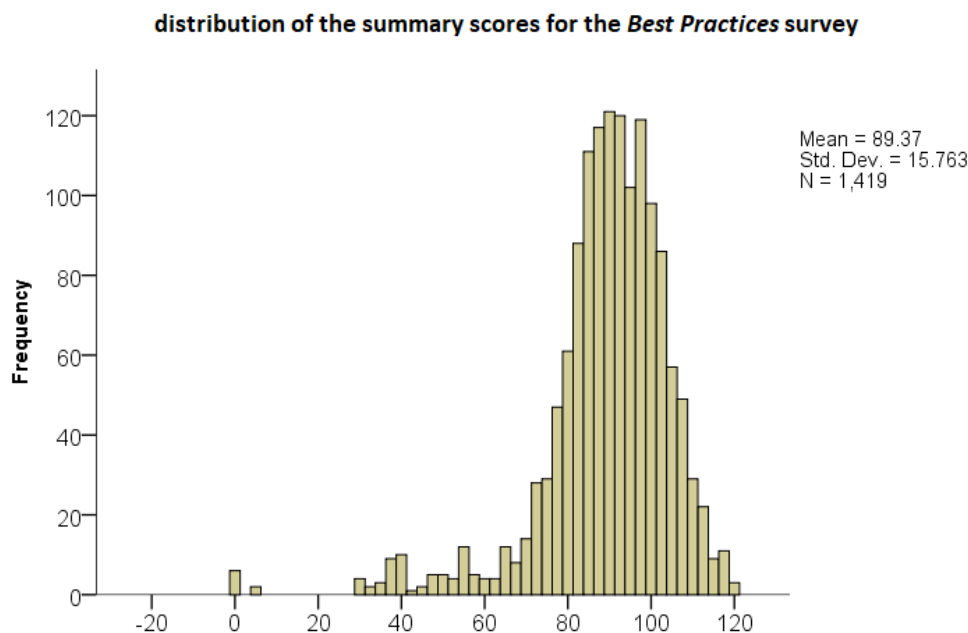
- offers a greater variety of foods compliant with the new CACFP meal plan,
- has greater knowledge of a balanced meal,
- is using nutrition education materials,
- is communicating with parents,
- is offering more nutrition education to children, and
- is scoring higher on the new *Best Practices* survey.

Most of the news from the correlation table is good, but there is also a negative correlation between the **provider knowledge** subscale and **healthy offerings**. What is this negative correlation telling us? More **provider knowledge** of a balanced meal is associated with a slightly lower score on the **healthy offerings** subscale. It may be that the knowledge question is too narrow, so it does not distinguish between respondents very well.

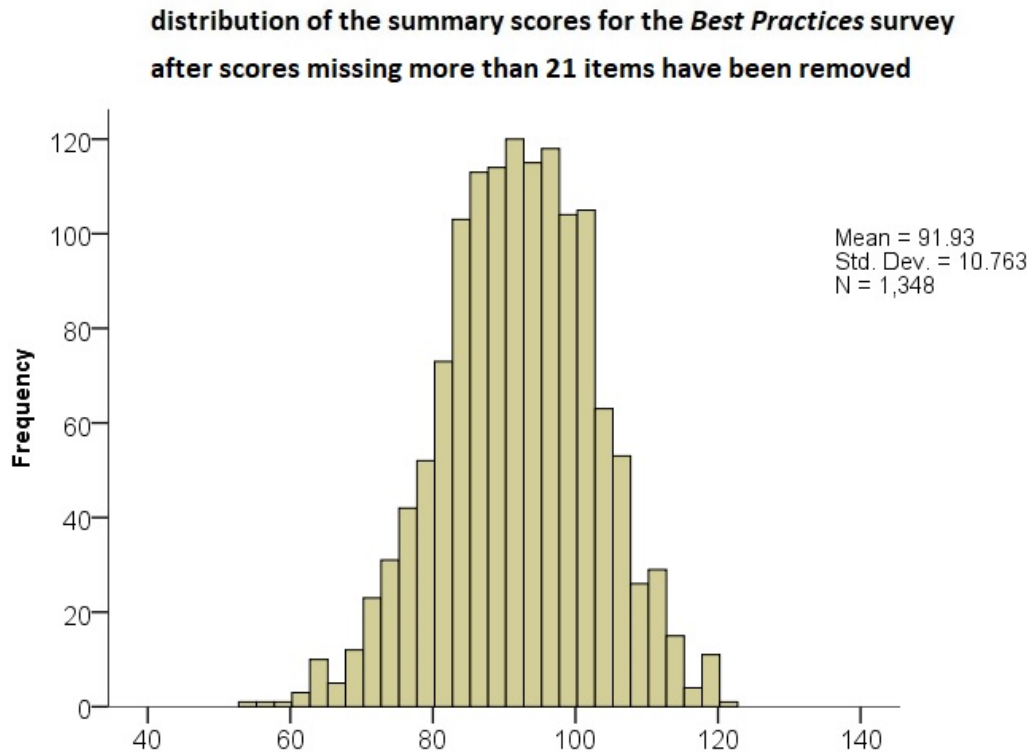
The way the **unhealthy offerings** items are coded may also cause some confusion. The items are coded so that lower frequencies of unhealthy foods receive higher scores while more frequent offerings of unhealthy foods receive lower positive scores. The small positive correlations between **unhealthy offerings** and **provider knowledge** or **nutrition education** may be telling us that these **unhealthy offerings** are offered infrequently.

Distribution of Raw Scores

The chart below shows the distribution of the summative score based on the combined subscales.



The distribution curve approaches normal, but there is a stump at zero and a long tail to the left. These are records with large numbers of skipped items. To improve the measures in the survey, we removed the 71 records with more than 21 skipped items. This yields this distribution:



This wide distribution should allow us to identify which providers are most adhering to the new meal plan, and which least so. It would be helpful to have longer gradients on both slopes, but getting them would add items, lengthen the survey, and lead to more skipped items and lower response rates.

Recommended Improvements Before the 2nd Survey

1. Consider recoding the three items in the **unhealthy offerings**. Currently, these three items are coded and scored like this: (*5 times or more* = 1, *3 or 4 times* = 2, *1 or 2 times* = 3, *rarely or never* = 4). Even those providers who are most frequently serving these foods are given a positive 1. This makes the correlations in the summary table above difficult to interpret. If we applied the following scoring, (*5 times or more* = -2, *3 or 4 times* = -1, *1 or 2 times* = 0, *rarely or never* = 2), the resulting correlations and scoring might be more consistent with intuitive understanding.
2. Update the population frame. Remove sponsors' and providers' emails who have withdrawn from participation and add those who have joined since the last survey. Update any changed emails among current program participants. Can we put in place an

automatic way to update these, through one of our regular administrative communications with the field?

3. Remove or repair the **water availability** item.
4. In a 2018 pretest, consider testing two or three knowledge items that measure knowledge specific to the new meal plan.
5. Consider adding one or two items to a 2018 pretest that will ease the ceiling effect in the attitudes subscale. These items may be difficult to design. They should be able to distinguish between those who have generally positive attitudes—on the high side of conscientiousness, supporting beliefs, self-confident about nutrition, and with healthy nutritional self-care. These items probably should be constructed on a negative gradient rather than a positive one.
6. In a pretest, consider testing one or two items for the mealtime environments subscale. These two should be able to make subtle distinctions between the most supportive mealtime environments and those less so.
7. In the 2nd wave, in the *Best Practices* survey, add questions about participation in Team Nutrition activities, e.g. Did you participate in local food and gardening initiative? In meal plan training? Make sure we are gathering any data necessary to longitudinally link records, e.g. current emails in responses and in our provider directory.