

Exploring Nutrition Literacy and Knowledge among a National Sample of School Nutrition Managers

Jamie Zoellner, PhD, RD; Deborah Carr, PhD, RD

Please note that this study was published before the implementation of Healthy, Hunger-Free Kids Act of 2010, which went into effect during the 2012-13 school year, and its provision for Smart Snacks Nutrition Standards for Competitive Food in Schools, implemented during the 2014-15 school year. As such, certain research may not be relevant today.

ABSTRACT

Purpose/Objectives

The purpose of this national study was to describe nutrition literacy levels and nutrition knowledge among school nutrition (SN) managers, and explore if barriers to seeking SN information, perceived role in school wellness, and confidence in SN decision making varied by nutrition literacy and knowledge scores.

Methods

An expert panel consisting of seven SN professionals contributed to the development of the survey instruments for the national study. A random sample totaling 700 SN directors, equally stratified by USDA region, was selected for this study. A total of 199 SN directors responded to the request for participation and subsequently administered 728 SN managers' surveys. Chi-square, one-way ANOVA, MANCOVA and Pearson Correlation tests were used to examine survey data.

Results

The majority of SN managers (72.2%) had adequate nutrition literacy skills as measured by an adapted version of a previously validated instrument based on interpreting a food label. For the 10 nutrition knowledge statements, results indicate that knowledge was more compromised including 22.7% with low nutrition knowledge (0-5 questions correct), 45.0% with limited nutrition knowledge (6-7 questions correct), and 32.3% with adequate nutrition knowledge (8-10 questions correct). Nutrition literacy/knowledge scores varied significantly by the type of school and years worked in current position. No meaningful significant relationships were identified among knowledge and literacy scores and the barriers, roles, confidence scales.

Applications to Child Nutrition Professionals

This study provides a foundation to explore the causes and consequences associated with nutrition literacy within the context of child nutrition programs. Since SN managers make daily decisions regarding the provision of food to young children, it is critical to assure training agencies are providing opportunities for these managers to develop the skills necessary to locate, comprehend, and apply complex nutrition information for the children they serve.

INTRODUCTION

While the causes and consequences associated with diminished health literacy skills have received a great deal of attention in recent years, no known studies have attempted to define or examine concepts related to health literacy from the perspective of school nutrition (SN) staff. Healthy People 2010 defines health literacy as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (US Department of Health and Human Services, 2000). Health literacy is visibly on our

nation's health agenda (American Medical Association, 2005; Institute of Medicine, 2004). In the context of health care, the consequences of low health literacy are well documented for the US population and include poorer health knowledge (Davis et al., 2001; Williams, Baker, Parker, & Nurss, 1998), poorer health status (Baker, Parker, Williams, Clark, & Nurss, 1997; Schillinger et al., 2002), more hospitalizations (Baker et al., 2004; Baker, Parker, Williams, & Clark, 1998), and higher health care costs (Friedland, 1998; Weiss & Palmer, 2004). While the majority of health literacy studies have been conducted using a patient-centered population within a clinical health care setting (Berkman et al., 2004), there is also a need to explore issues and outcomes related to health literacy across other settings and population groups, including food and nutrition staff functioning within the school setting.

Since issues surrounding health literacy are thought to be context specific, several definitions related to health literacy have emerged. For example, nutrition literacy has been defined as "the degree to which individuals have the capacity to obtain, process, and understand basic nutrition information needed to make appropriate dietary decisions" (Zoellner, Connell, Bounds, Crook, & Yadrick, 2009). While this nutrition literacy study focused on an individual's ability to make appropriate dietary decisions for their own health, it is feasible to suggest that the components of nutrition literacy may also have direct relevance in the context of the SN environment, especially among SN staff who make daily decisions regarding the provision of food to young children. Therefore, research is needed to characterize and examine concepts related to nutrition literacy within the context of SN staff. Seeking nutrition standards, interpreting food labels, understanding the dietary demands of special needs children health conditions, and making appropriate and informed decisions regarding diet and meal components involve nutrition literacy skills. It is, therefore, important to define and examine the implications of nutrition literacy in the SN environment.

The educational background and certification status of SN managers vary greatly within and among schools; nevertheless, these SN managers are expected to function under a wide range of functional areas and are required to possess a multitude of complex knowledge and skill competencies (Cater & Carr, 2004). Based on these defined research-based competencies, it is evident that SN managers play a critical role in the SN environment and the food choices made by children, and should possess a certain level of nutrition literacy skills. Considering the documented poor health outcomes associated with limited literacy in the health care setting, it is also of interest to explore and establish how nutrition literacy may be defined and measured within the context of the SN environment. The first step is to define constructs of nutrition literacy within the SN environment and develop metrics to establish baseline measures of nutrition literacy. Establishing SN program outcomes associated with nutrition literacy levels is also important. Studies linking nutrition literacy levels with program outcomes could lead to the tailoring of education curriculum materials to support nutrition literacy skill development among SN managers. Developing nutrition literacy skills may subsequently lead to positive influences on overall program excellence.

The primary objectives of this national research study were to 1) define nutrition literacy within the context of the SN environment, 2) describe the nutrition literacy levels and nutrition knowledge of SN managers, and then determine if these variables differed significantly by demographic characteristics; and 3) explore if barriers to seeking SN information, perceived role in school wellness, and confidence in SN decision making/scenarios varied by nutrition literacy and knowledge scores.

METHODOLOGY

Survey Instruments

The Phase I expert panel agenda was developed to gather qualitative information leading to development of a national quantitative survey. The primary agenda items for this day and a half meeting included: 1) define nutrition literacy within the context of the school environment; 2) identify SN outcomes which may be associated with nutrition literacy; and 3) discuss appropriate data collection protocol for the national survey. As a result of the expert panel and with added guidance

from a consultant with distinguished experience in SN, the national survey morphed into two additional phases including Phase II: Questionnaire for School Nutrition Directors and Request for Participation in Phase III Survey and Phase III: Nutrition Awareness of School Nutrition Managers Survey.

The primary purpose of the Phase II questionnaire targeting SN directors was to solicit participation for the Phase III survey to be completed by the SN managers. The Phase II questionnaire was very brief, and consisted of: 1) willingness to participate in the Phase III survey and the number of surveys they were willing to administer; 2) nine statements on Likert-type scales whereby SN directors were asked to rate their SN managers on nutrition knowledge/awareness related topics; and 3) an estimation of approximately how many hours of nutrition education training are provided per year to SN managers employed in their school or district.

The Phase III survey targeted SN managers, and the content area covered seven general topic areas: 1) two introduction questions asking SN managers to rate their knowledge of the United States Department of Agriculture (USDA) meal requirements for SN programs and to rate their knowledge of the 2005 Dietary Guidelines for Americans; 2) eight questions related to how much attention is given to different sources of child nutrition information (e.g., professional magazines, the Internet, USDA, state agency, etc); 3) four barrier questions related to searching for nutrition information regarding child nutrition issues; 4) 10 knowledge questions pertaining to child nutrition issues; 5) five nutrition label reading questions, as adapted from the Newest Vital Sign (Weiss et al., 2005); 6) 10 questions regarding perceived role in school wellness and perceived confidence in SN decision making/scenarios; and 7) 11 demographic questions (see Tables 1-4 for examples of questions). The Phase III survey was formatted as a scannable survey.

Prior to administration, the Phase II and III cover letters and instruments were pilot tested in a group of nine SN directors, including five who participated in the expert panel. The purpose of the pilot test was to receive feedback on the cover letters and surveys regarding the instructions, content, wording and format. Based on feedback, a few minor revisions were made, such as clarification on the cover letters and wording changes on the survey instrument.

Study Design and Data Collection

This three-phase research study was approved by The University of Southern Mississippi's Institutional Review Board. For the Phase I expert panel, seven SN professionals, one from each USDA region, were sampled and invited to attend the expert panel meeting. Of these seven professionals, six had the title Director of Nutrition Services and one had the title of Food Service Supervisor. The discussion session was moderated and co-moderated by two researchers, with assistance from a secondary support staff to capture comments on a flip chart.

The study sample for Phase II was selected from the database of school districts maintained by Market Data Retrieval, a company which specializes in the school market. A random sample totaling 700 SN directors was selected for this study. The sample was equally stratified by USDA region with all states represented. A cover letter explaining the purpose of the research and a brief one-page questionnaire was mailed. A self-addressed, postage-paid return envelope was provided for each participant to return the completed survey.

Each SN director who replied to Phase II and agreed to participate in Phase III was then sent the requested number of surveys along with a letter detailing instructions for administering Phase III surveys to SN managers. Specially, SN directors were instructed to provide oversight when administering the surveys to the SN managers. This step ensured the managers did not receive assistance from others or utilize available resources, and was necessary to promote accuracy of the nutrition knowledge and label reading questions. To protect confidentiality of their survey responses, SN managers were instructed to seal their completed survey in a self-addressed, postage-paid envelope to be mailed directly to the National Food Service Management Institute (NFSMI). A cover letter for the SN manager also accompanied each Phase III survey to explain the purpose of the research and the uses of the data obtained from the research.

Data Analyses

For the Phase I expert panel, the lead moderator summarized responses at the end of day one. At the beginning of day two, a brief summary report was provided to the panel, and they suggested several changes and verified that the comments accurately represented the discussion. Upon completion of the entire expert panel meeting, the qualitative data was summarized. The summaries were then reviewed, thematically coded into categories, and confirmed by the co-moderator.

For Phases II and III, descriptive statistics including frequencies, means, and standard deviations were used to summarize all responses. For the Phase III SN manager survey, surveys with greater than 30% missing data were excluded from the analyses. Three scores were created to indicate the number of correct responses on the nutrition literacy, nutrition knowledge, and combined nutrition literacy plus nutrition knowledge scales. These scores were analyzed and evaluated both as continuous and categorical scores. Chi-square and one-way ANOVA tests were used to examine associations of demographic and school characteristics with survey responses. In order to explore the relationships among nutrition literacy and knowledge scores and other survey responses, the Phase III SN manager survey items were combined to create three separate scales that measured a unidimensional construct: 1) perceived barriers regarding nutrition information (4 items); 2) perceived role in school wellness (3 items); and 3) perceived confidence in SN (8 items). Cronbach's alphas were used to evaluate the internal consistency of these three scales. Relationships among knowledge/literacy scores and the three scales created above were evaluated using partial Pearson correlations. Since the nutrition literacy/knowledge scores varied significantly by the type of school and years worked in current position, these covariates were accounted for in the partial correlation tests. These categorical covariates were dummy coded for analysis. Statistical significance is reported at $p < 0.05$. All statistical analyses were performed using SPSS version 15.0.

RESULTS AND DISCUSSION

Phase I: Expert Panel

The expert panel provided a considerable amount of information that was influential in drafting the national survey instruments and methodology for administration. A few examples of how the constructs of nutrition literacy were defined in the school environment include self-confidence of managers to obtain information, knowing correct and incorrect directions to take to get information, basic understanding of dietary guidelines, production techniques that enhance or destroy nutritional quality, and reading food labels including serving size and ingredient list. School outcomes which may be associated with the nutrition literacy skills of SN managers' responses were thematically categorized as production, program, staff, and student or community outcomes. The expert panel also provided valuable insights into strategies for encouraging the SN director to have their SN managers participate in the survey process and for describing the SN directors' role to proxy or oversee completion of the survey by the SN managers.

Phase II: Questionnaire for School Nutrition Directors and Request for Participation in Phase III Survey

Of the 700 mailed questionnaires, a total of 199 SN directors responded, for a response rate of 28%. SN directors were asked to rate their SN managers on nutrition knowledge/awareness related topics on a 5-point Likert Scale (1=poor, 5=very good). Use of appropriate portion control tools ranked the highest at 4.3 (SD=0.8), followed by knowledge of USDA meal requirements for school nutrition at 4.2 (SD=0.9), knowledge to make appropriate menu substitutions at 4.0 (SD=0.9), skills to read labels for allergy containing information at 3.6 (SD=1.1), knowledge of the 2005 Dietary Guidelines at 3.4 (SD=1.0), ability to communicate nutrition information to staff, students and faculty at 3.3 (SD=1.1), and skills to locate trustworthy nutrition information to make daily child nutrition decisions at 3.2 (SD=1.1).

The SN directors were also asked to rate the perceived nutrition knowledge of the SN managers, employed in the school district, using a 10-point scale (1=poor, 10=very good). The average response was 6.8 (SD = 1.8). The final question rated by SN directors included, "From your perspective, rate your level of agreement regarding the following statement: On-site SN managers in

our school district are regarded as nutrition experts.” The mean response of 5.5 (SD = 2.3) on this 10-point scale (1=strongly disagree; 10=strongly agree) was relatively neutral.

Of the 199 respondents in Phase II, 154 agreed to participate in the Phase III survey, titled Nutrition Awareness of School Nutrition Managers, and requested a total of 1,600 manager surveys. Another 13 respondents in Phase II failed to indicate if they were or were not willing to participate, so each of these directors were sent 5 manager surveys. In total, 167 survey packets were mailed to SN directors containing a total of 1,665 surveys.

Phase III: Nutrition Awareness of School Nutrition Managers Survey

Of the 1,665 surveys mailed, a total of 763 were returned for a response rate of 45.8%. Excluding surveys with greater than 30% missing data reduced the sample size by 35, resulting in a total of 728 included in the Phase III analyses. All USDA regions were represented. Of the 728 respondents, 64% were Serve Safe Sanitation certified, 37% were SNA certified, 7% were State Department of Education certified, and 1% were SNS credentialed. The majority of these SN managers (68.7%) had a high school degree or less. Table 1 shows the demographic and school characteristics of the survey respondents, and also illustrates significant difference for the mean nutrition literacy plus nutrition knowledge score across the demographic and school characteristics. As indicated, nutrition literacy/knowledge scores varied significantly by the type of school and years worked in current position. SN managers working in elementary schools and working in their current position for greater than 20 years had lower nutrition literacy/knowledge scores, as compared to those working in other types of schools and those in their current position for less than 20 years. At the elementary level, meals are planned and served according to reimbursable standards, with limited alternative food choices. The lack of options and substitutions may explain the reduced nutrition awareness among SN managers employed at elementary schools. There may be a greater level of opportunity for nutrition discussions to occur at the middle school level or higher where a greater degree of options are provided. The lower nutrition literacy/knowledge scores among SN managers working in their current position for greater than 20 years indicates that even those who have a long standing history with SN programs may be challenged with a full understanding and awareness of nutrition standards. It is therefore critical for SN programs to perform internal assessments and pinpoint strengths and weaknesses, allowing for constructive feedback and the tailoring for professional development.

Table 1. *Relationship among Demographic Characteristics of School Nutrition Managers and Nutrition Literacy and Knowledge Scores (n = 763)*

Characteristic	Number (%) of respondents ^a	Total nutrition literacy/knowledge score (15 questions) Mean (SD) ^b	p-value
First Language at Home			0.09
English	710 (95.4)	10.56 (2.46)	
Not English	12 (1.6)	9.33 (3.22)	
Level of Education			0.51
Less than a high school diploma or GED	17 (2.3)	9.29 (2.95)	
High school graduate or GED	494 (66.4)	10.46 (2.48)	
Associate degree	85 (11.4)	10.96 (2.30)	

Baccalaureate degree	27 (3.6)	11.22 (2.56)	
Graduate credits or degree	70 (9.4)	10.56 (2.41)	
Other	20 (2.7)	NA	
			0.18
0 hours	81 (10.9)	10.35 (2.60)	
1-2 hours	108 (14.5)	10.77 (2.27)	
3-4 hours	147 (19.8)	10.42 (2.50)	
5-6 hours	88 (11.8)	11.06 (2.27)	
7 hours or more	296 (39.8)	10.42 (2.57)	
Years worked in school nutrition programs			0.08
Less than 12 months	12 (1.6)	9.00 (3.07)	
1 to 5 years	96 (12.9)	10.31 (2.63)	
6 to 10 years	177 (23.8)	10.78 (2.24)	
11 to 15 years	167 (22.4)	10.63 (2.30)	
16 to 20 years	118 (15.9)	10.86 (2.35)	
Greater than 20 years	157 (21.1)	10.38 (2.70)	
Years worked in current position			0.05
Less than 12 months	71 (9.5)	10.28 (2.64)	
1 to 5 years	253 (34.0)	10.67 (2.36)	
6 to 10 years	182 (24.5)	10.54 (2.33)	
11 to 15 years	112 (15.1)	10.63 (2.53)	
16 to 20 years	54 (7.3)	11.22 (1.96)	
Greater than 20 years	59 (7.9)	9.78 (3.17)	
Approximate student enrollment			0.06
Less than 200	36 (4.8)	10.97 (1.73)	
200-400	131 (17.6)	10.17 (2.65)	

401-600	205 (27.6)	10.54 (2.58)
601-800	143 (19.2)	10.26 (2.54)
800-1000	74 (9.9)	10.91 (2.40)
Greater than 1000	139 (18.7)	10.92 (2.29)
Type of school where you work		0.01
High School	120 (16.1)	11.05 (2.23)
K-12	37 (5.0)	10.81 (1.75)
Middle or Junior High School	144 (19.4)	10.78 (2.38)
Elementary	412 (55.4)	10.31 (2.60)

^aNumbers do not add to 100% because of missing responses

^bTotal correct response out of 15 questions, including 5 nutrition literacy questions and 10 nutrition knowledge questions.

Table 2 details the number (%) of correct responses for the five nutrition label reading questions from a pint of ice cream (as adapted from the Newest Vital Sign) and the 10 knowledge questions pertaining to child nutrition issues, whereas Table 3 illustrates the mean (SD) scores and number (%) of SN managers in each category for nutrition literacy and nutrition knowledge. As indicated, a higher percent (72.2%) of SN managers performed adequately on the nutrition labeling questions (4 to 5 of 5 questions correct), as compared to the nutrition knowledge questions (32.3%) (8 to 10 of 10 questions correct). However, one-half (>5 of 10 questions correct) of the nutrition knowledge questions were answered correctly by greater than 70% of the respondents.

Table 2. *Correct Responses for Nutrition Literacy and Nutrition Knowledge Questions among School Nutrition Managers*

Nutrition Label Reading Questions^a (Correct Answer)	
If you eat the entire container, how many calories will you eat? (A: 1,000)	626 (84.1)
If you are allowed to eat 60 grams of carbohydrate as a snack, how much ice cream could you have? (A: 1 cup)	628 (84.4)
Pretend that you are allergic to the following substances: Penicillin, peanuts, latex gloves, and bee stings. Is it safe for you to eat this ice cream? (A: No)	572 (76.9)
Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 grams of saturated fat each day, which includes one serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be eating each day? (A: 33 grams)	544 (73.1)
If you usually eat 2,500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving of the ice cream? (A: 10%)	538 (72.3)

Nutrition Knowledge Questions (Correct Answer)	No (%) Correct
What is the best method to maintain the nutrient content of frozen vegetables? (A: Steam them close to serving time)	713 (95.8)
Chicken nuggets, hamburgers, and fish are a good source of which of the following?(A: Protein)	709 (95.3)
A menu item is supposed to be baked, but it is fried instead. What does this do to the nutritional quality of the menu item? (A: Increases calories)	691 (92.9)
The portion size for a menu item is ½ cup. Which portion control tool do you use? (A: #8 scoop)	618 (83.1)
According to the MyPyramid, if an individual needs 2,000 calories a day, what amount of vegetables do they need per day? (A: 2-3 cups)	525 (70.6)
Most of the fats in your diet should be which of the following type? (A: Monounsaturated Fats)	482 (64.8)
A student is allergic to cow's milk. Which of the following ingredients would the child most likely be allergic to? (A: Whey)	336 (45.2)
How can you tell if a bread is a 100% whole grain product? (A: 1 st item in the ingredient list is whole-wheat flour)	325 (43.7)
According to the MyPyramid, at least_____of the grains individuals consume should be whole grains. (A: 50%)	271 (36.4)
You have broccoli on the menu, but broccoli is not available. You need to make a substitution based on a similar nutrient content. Which of the following goods would be the better substitution, based on nutrient content? (A: Carrots)	225 (34.3)

^aQuestions adapted from the Newest Vital Sign instrument which requires participants to read and interpret the nutrition facts panel on a pint of ice cream

Table 3. Mean Scores and Categories for Nutrition Literacy and Knowledge of School Nutrition Managers

	Mean score (SD)	Low nutrition literacy/ knowledge Number (%) of respondents	Limited nutrition literacy/ knowledge Number (%) of respondents	Adequate nutrition literacy/ knowledge Number (%) of respondents
Nutrition Label Reading Questions (5 questions) ^a	3.91 (1.32)	61 (8.2)	145 (19.5)	537 (72.2)

Nutrition Knowledge Questions (10 questions) ^b	6.62 (1.70)	169 (22.7)	335 (45.0)	240 (32.3)
Nutrition Label Reading + Nutrition Knowledge Questions (15 questions) ^c	10.53 (2.49)	75 (9.8)	381 (49.9)	306 (40.1)

^a Nutrition label reading categories: low nutrition literacy 0-1 questions correct, limited nutrition literacy 2-3 questions correct, and adequate literacy 4-5 questions correct

^b Nutrition knowledge questions categories: low nutrition knowledge 0-5 questions correct, limited nutrition knowledge 6-7 questions correct, and adequate nutrition knowledge 8-10 questions correct

^c Nutrition label reading + nutrition knowledge questions categories: low nutrition literacy/knowledge 0-6 questions correct, limited nutrition literacy/knowledge 7-11 questions correct, and adequate nutrition literacy/knowledge 12-15 questions correct

As indicated in Table 4, the Cronbach's alpha for each scale sufficiently achieved the standard threshold of 0.7. For the perceived barriers regarding nutrition information, the overall scale mean 3.33 (SD=1.15) and individual statements were between neutral and somewhat agree. If SN managers are somewhat frustrated during their search for nutrition information, somewhat concerned about the quality of the nutrition information, and feeling like identifying the information takes a lot of effort and that the information is difficult to understand, these barriers to obtaining nutrition information must be addressed. In their professional training and development, SN managers should be taught how to easily locate reliable sources of appropriate nutrition information related to child nutrition programs. In the context of improving nutrition literacy, addressing the barriers to obtaining information is the first construct which must be considered.

As indicated by a mean score of 4.57 (SD = 0.68), respondents felt strongly that they played an important role in school wellness; however, the mean confidence rating 3.76 (SD = 0.72) for making nutrition related decisions was notably lower. These findings imply that SN managers may desire to play a positive role in school wellness programs, but may lack the training and confidence to contribute. While the majority of SN managers have a high school degree or less and come in their position with little background in nutrition, they are internally recognizing barriers to obtaining information and lack of confidence to make nutrition decisions. Nevertheless, they desire to play a positive role in the SN program.

Table 4. *Perceived Barriers to Seeking Nutrition Information, Role in School Wellness, and Confidence in Making School Nutrition Decisions (n = 763)*

Characteristic	Mean (SD)	
Perceived barriers regarding nutrition information^a	0.78	3.33 (1.15)
It took a lot of effort to get the information you needed.		3.53 (1.31)
You were concerned about the quality of the information.		3.35 (1.40)
You felt frustrated during your search for the information.		3.28 (1.40)
The information you found was too hard to understand.		3.11 (1.24)

Perceived role in school wellness^a	0.84	4.57 (0.68)
		4.66 (0.73)
It is important for me to model health behaviors to school children.		4.63 (0.74)
I play an important role in school wellness.		4.42 (0.88)
Perceived confidence in school nutrition^b	0.88	3.76 (0.72)
How confident are you in dealing with food safety issues?		4.41 (0.71)
		3.95 (0.91)
		3.81 (0.92)
		3.72 (0.94)
		3.50 (0.99)
		3.48 (0.98)
If a student had an allergic reaction in the cafeteria, how confident are you to implement an Emergency Allergy Response Plan?		3.44 (1.16)

^aReported on a 5-point scale which included [1] strongly disagree, [2] somewhat disagree, [3] neither agree or disagree, [4] somewhat agree and [5] strongly agree

^bReported on a 5-point scale which included [1] not at all confident, [2] a little confident, [3] somewhat confident, [4] very confident and [5] completely confident

Relationships among knowledge/literacy scores and the three scales created above (barriers, roles, confidence) were evaluated using partial Pearson correlations, whereby the type of school and years worked in current position were accounted for in the partial correlation tests. These analyses revealed no meaningful significant correlations. MANCOVA tests were also used to explore the relationships among knowledge/literacy categories and the three scales (barriers, roles, confidence) while accounting for school and years worked in current position. Similarly, no meaningful significant correlations resulted.

The managers also ranked their confidence in seeking child nutrition information and attention given to different child nutrition sources. On a 5-point scale (1=*not at all confident*, 5=*completely confident*), overall confidence in seeking nutrition information was low to neutral 2.79 (SD=0.98), which supports the findings indicated above. Respondents were asked to rate "How much attention you give to each of these source as it relates to child nutrition" on a 5-point Likert scale (1=*not at all*, 5=*a lot*). Respondents gave the most attention to nutrition information from local SN directors 2.80 (SD=0.55), from other SN managers 2.05 (SD=0.87), and from USDA 1.95 (SD=0.83). Less attention was given to professional magazines or articles 1.86 (SD=0.86), state agency 1.83 (SD=0.91), state or national School Nutrition Association meetings 1.76 (SD=1.02), health care providers 1.58 (SD=0.96), and the Internet 1.39 SD= (0.91). This indicated that state agency and other training agencies need to funnel nutrition information through the director. There was no significant difference among attention to different sources of nutrition information and nutrition literacy or nutrition category.

When the respondents were asked to rate “My knowledge of the USDA meal requirements for SN programs” on a 5 point Likert scale (1=*poor*, 5=*very good*) the mean was relatively high at 3.97 (SD=0.86). Whereas the mean when asked to rate “My knowledge of the 2005 Dietary Guidelines for Americans” was lower at 3.33 (SD=1.00).

Finally, respondents were asked to indicate their roles in providing students and teachers with nutrition information both in the cafeteria and in the classroom. More respondents (63.6%) indicated that they provided nutrition information to students in the cafeteria, as compared to providing nutrition information in the classroom (9.4%). Furthermore, providing information to students was comparatively higher than providing information to teachers both in the cafeteria (31.2%) and in the classroom (7.9%).

CONCLUSIONS AND APPLICATION

Since the emerging field of health and nutrition literacy is in its infancy and primarily limited to a clinical health care setting, this study provides a foundation to explore the causes and consequences associated with nutrition literacy within the context of child nutrition programs.

The expert panel provided valuable information targeting nutrition literacy of SN managers. Emerging themes related to focused attention on nutrition literacy skills among SN managers included increase SN managers’ ownership of SN programs, improve the professional image of the programs, promote the programs as being part of the educational experience, lead to better marketed programs, empower and increase confidence among managers and staff, increase staff retention, increase creativity and promote the dissemination of innovative nutrition messages, and could promote a healthier SN staff.

Capacity to obtain basic nutrition information is the first element of nutrition literacy. It was important to discover that both the SN directors and SN managers rated statements pertaining to obtaining nutrition information as relatively neutral on a 5-point scale. Furthermore, SN managers reported some barriers to obtaining nutrition information. Capacities to comprehend and apply nutrition information are the other elements of nutrition literacy. It was important to discover that the majority of SN managers (72.2%) had adequate nutrition literacy skills as measured by an adapted version of a previously validated instrument based on interpreting a food label. For the 10 nutrition knowledge statements developed through this research process, results indicate that knowledge was more compromised, including 22.7% with low nutrition knowledge (0-5 questions correct); 45.0% with limited nutrition knowledge (6-7 questions correct); and 32.3% with adequate nutrition knowledge (8-10 questions correct). Nutrition literacy/knowledge scores differed significantly by the type of school and years worked in current position.

Through this study, it is apparent that SN managers feel they play an important role in school wellness. Although the production and selection of nutritious food options play a tremendous role in school wellness, the SN managers may lack the training and confidence to contribute to school wellness at a level they desire. Finally, contrary to the research hypotheses, there were no relationships among nutrition literacy and/or knowledge scores of SN managers and barriers to seeking child nutrition information; perceived role in school wellness; or confidence in SN decision making/scenarios.

Several education and training implications can also be derived from this study. In today’s SN program environment, nutrition excellence is mandatory. While the traditional SN manager continues to have responsibilities related to food production and the quality of services, their roles have also expanded to include expectations that they are key resources for the nutritional quality related to children. Therefore, it is critical that state agencies, USDA, and other training professionals work to reduce the barrier associated with locating and comprehending complex nutrition information, and also explore ways to make reliable sources of nutrition information that are pertinent to the needs of SN managers easily accessible. Local school districts need to recognize the important influence SN managers have regarding the well-being of children. Subsequently, local school districts should increase their level of commitment towards providing these SN managers with an appropriate level of professional development, which includes supporting professional development opportunities

outside of the work day. Finally, while SN managers may feel confident in making decisions related to issues such as food safety, there is a need to increase their confidence in providing nutrition education to children and in being a nutrition resource for teachers. This implies that managers need a strong nutrition knowledge foundation, so they could apply the nutrition information through production, delivery, and education with a greater degree of confidence.

The primary limitation of this research is the inherent response bias associated with conducting survey research. Those SN directors more involved and concerned with professional development needs of the SN managers may have been more likely to respond to the survey, which could impact results and interpretation. Furthermore, although the response rate to Phase III was relatively high (45.8%), the initial response rate to the Phase II survey (28%) was somewhat low. Another limitation of this study was the inability to directly measure child nutrition program outcomes that may be associated with the nutrition literacy skills of SN managers. The perceptions measured (including perceived barriers to seeking nutrition information, role in school wellness, and confidence in making SN decisions) may not accurately reflect key outcomes as indicated by the expert panel (including production, program, staff, student and community outcomes). Similar to traditional health literacy studies within clinical populations that study disease management outcomes and health care costs, if a more direct measure of SN program outcomes had been assessed the relationship of these outcomes with the nutrition literacy level of SN managers may have been more apparent.

While there are numerous suggestions for future research, the two most evident recommendations are the need to continue to develop and refine a framework for exploring nutrition literacy/knowledge and the associated outcomes within the context of the SN environment; and the need to explore issues related to nutrition literacy/knowledge among others involved in SN programs, such as staff members.

ACKNOWLEDGEMENTS

This publication has been produced by the National Food Service Management Institute – Applied Research Division, located at The University of Southern Mississippi with headquarters at The University of Mississippi. Funding for the Institute has been provided with federal funds from the U.S. Department of Agriculture, Food and Nutrition Service, to The University of Mississippi. The contents of this publication do not necessarily reflect the views or policies of The University of Mississippi or the U.S. Department of Agriculture, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

The information provided in this manuscript is the result of independent research produced by NFSMI and is not necessarily in accordance with U.S. Department of Agriculture Food and Nutrition Service (FNS) policy. FNS is the federal agency responsible for all federal domestic child nutrition programs including the National School Lunch Program, the Child and Adult Care Food Program, and the Summer Food Service Program. Individuals are encouraged to contact their local child nutrition program sponsor and/or their Child Nutrition State Agency should there appear to be a conflict with the information contained herein, and any state or federal policy that governs the associated Child Nutrition Program. For more information on the federal Child Nutrition Programs please visit www.fns.usda.gov/cnd.

REFERENCES

American Medical Association. (2005). *Understanding health literacy: Implications for medicine and public health*: AMA press.

Baker, D. W., Gazmararian, J. A., Williams, M. V., Scott, T. L., Parker, R. M., Green, D., et al. (2004). Health literacy and use of outpatient physician services by Medicare Managed Care enrollees. *Journal of General Internal Medicine*, 19, 215-220.

Baker, D. W., Parker, R. M., Williams, M. V., & Clark, W. S. (1998). Health literacy and the risk of hospital admission. *Journal of General Internal Medicine*, 13, 791-798.

Baker, D. W., Parker, R. M., Williams, M. V., Clark, W. S., & Nurss, J. R. (1997). The relationship of patient reading ability to self-reported health and use of health services. *American Journal of Public Health*, 87(6), 1027-1030.

Berkman, N., DeWalt, D., Pignone, M., Sheridan, S., Lohr, K., Lux, L., et al. (2004, January). Literacy and Health Outcomes. Summary, Evidence Report/Technology Assessment No. 87: (Prepared by RTI International-University of North Carolina Evidence-based Practice Center under Contract No. 290-02-0016).

Cater, J., & Carr, D. (2004). Competencies, knowledge and skills of effective school nutrition managers. Retrieved March 9, 2010, from http://www.olemiss.edu/depts/nfsmi/Information/competencies_managers_rev03.pdf

Davis, T., Dolan, N., Ferreira, M., Tomori, C., Green, K., Sipler, A., et al. (2001). The role of inadequate health literacy skills in colorectal cancer screening. *Cancer Investigation*, 19, 193-200.

Friedland, R. (1998). Understanding health literacy: New estimates of the costs of inadequate health literacy. Washington, DC: National Academy on an Aging Society.

Institute of Medicine. (2004). Health literacy: A prescription to end confusion. Washington, DC: The National Academies Press.

Schillinger, D., Graumbach, K., Piette, J., Wang, F., Osmond, D., Daher, C., et al. (2002). Association of health literacy with diabetes outcomes. *Journal of the American Medical Association*, 288(4), 475-481.

US Department of Health and Human Services. (2000, November). Health Communication (Chapter 11). Healthy People 2010. Washington, DC: Government Printing Office.

Weiss, B., Mays, M., Martz, W., Merriam Castor, K., DeWalt, D., Pignone, M., et al. (2005). Quick assessment of literacy in primary care: The Newest Vital Sign. *Annals of Family Medicine*, 3, 514-522.

Weiss, B., & Palmer, R. (2004). Relationship between health care costs and very low literacy skills in a medically needy and indigent Medicaid population. *Journal of the American Board of Family Medicine*, 17(1), 44-47.

Williams, M. V., Baker, D. W., Parker, R. M., & Nurss, J. R. (1998). Relationship of functional health literacy to patients' knowledge of their chronic disease: A study of patients with hypertension and diabetes. *Archives of Internal Medicine*, 158, 166-172.

Zoellner, J., Connell, C., Bounds, W., Crook, L., & Yadrick, K. (2009). Nutrition literacy status and preferred nutrition communication channels among adults in the Lower Mississippi Delta. *Preventing Chronic Disease* 6(4)

BIOGRAPHY

Zoellner is an Assistant Professor for the Department of Human Nutrition, Foods and Exercise at Virginia Polytechnic Institute and State University located in Blacksburg, VA. **Carr** is a Researcher for the Applied Research Division of the National Food Service Management Institute located in Hattiesburg, MS.