

Exploring Nutrition Literacy and Knowledge Among School Nutrition Managers



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National Food Service Management Institute The University of Mississippi

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MISSION

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VISION

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**EXPLORING NUTRITION LITERACY AND KNOWLEDGE AMONG
SCHOOL NUTRITION MANAGERS**

EXECUTIVE SUMMARY

Research is needed to characterize and examine concepts related to nutrition literacy within the context of school nutrition (SN) staff. Seeking nutrition standards; interpreting food labels; understanding the dietary needs of children, including those with special needs; and making appropriate 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 primary objectives of this three-phase national research study included the following: (1) to define nutrition literacy within the context of the SN environment; (2) to describe the nutrition literacy levels and nutrition knowledge of SN managers and determine if these variables differed significantly by demographic characteristics; and (3) to explore if barriers to seeking SN information, perceived roles in school wellness, and confidence in SN decision making/scenarios varied by nutrition literacy and knowledge scores.

For the Phase I expert panel, seven SN professionals, one from each USDA region, were invited to attend a day and a half meeting to discuss issues associated with nutrition literacy in the SN environment. The expert panel offered insightful views for defining the constructs of nutrition literacy (capacities to obtain, comprehend, and apply nutrition information) as it relates to the school environment. The panel also identified school outcomes which may be associated with the nutrition literacy skills of SN managers, and the responses were categorized as production, program, staff, and student or community outcomes. Furthermore, the panel discussed appropriate data collection protocol for the national survey, including the logistics of

administering the survey to SN managers. In summary, the expert panel provided a considerable amount of information that was influential in drafting the survey instruments and methodology for administration.

The study sample for Phase II was selected from the data base 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 total of 199 SN directors responded to the SN director questionnaire, for a response rate of 28%. When asked to rate their SN managers on nutrition knowledge/awareness related topics using 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) and “skills to locate trustworthy nutrition information” ranked the lowest at 3.1 (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 a 10-point scale (1=*strongly disagree*; 10=*strongly agree*) was relatively neutral.

Each SN director who replied to Phase II and agreed to participate in Phase III was then sent the requested number of SN manager surveys along with a letter detailing instructions for administering Phase III surveys to SN managers. For Phase III, 167 survey packets were mailed to SN directors containing a total of 1,665 surveys. 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. 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. While all USDA regions were represented, there was inconsistent participation across the regions: Southeast (30%), Western (21%), Mid-Atlantic (14%), Mountain Plains (11%), Midwest (9%), Southwest (9%), and the Northeast (4%). Most of these SN managers (68.7%) had a high school degree or less.

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 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 greater than 20 years.

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

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. 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, the role has also expanded to include the expectation that the SN manager is a key resource for the nutritional quality related to children. Therefore, it is critical that state agencies, the USDA, and other training professionals reduce the barrier associated with locating and comprehending complex nutrition information and explore ways of making reliable sources of nutrition information easily accessible and pertinent to the needs of SN managers and the children and teachers they serve. Recommendations for future research include 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.

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, Healthy People 2010*). Health literacy is visibly on our nation’s health agenda, as evidenced by *Healthy People 2010*, the 2004 Institute of Medicine’s report *Health Literacy: A Prescription to End Confusion*, (Institute of Medicine, 2004) and the 2005 American Medical Association’s book *Understanding Health Literacy: Implications for Medicine and Public Health* (American Medical Association, 2005). In the context of health care, the consequences of low health literacy are well documented 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, a previous study that specifically focused on exploring health literacy within a nutrition context defined nutrition

literacy 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, In Press). 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 school food service 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 needs of special needs children, 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). The functional area pertaining to nutrition and menu planning is perhaps one of the most critical in terms of positively impacting the school foodservice environment and the food choices made by children. The competencies included under Functional Area 1: Nutrition and Menu Planning for SN managers are as follows:

- 1.1: Provides an atmosphere that ensures the purpose of the SN program to “safeguard the health and well-being of the nation’s children”;
- 1.2: Ensures all meals served in the SN program meet current nutritional standards and meal pattern requirements, including children with special diet needs;

- 1.3: Maintains nutritional integrity of the SN program through implementation of dietary guidelines for Americans;
- 1.4: Plans and provides menus that encourage student consumption; and
- 1.5: Establishes leadership role in providing nutrition education as part of the total school education program.

Based on these defined research-based competencies, it is evident that SN managers play an important role in providing nutritionally well-balanced meals to school-aged 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.

Research Objectives

The primary objectives of this national research study were to:

- Define nutrition literacy within the context of the SN environment;
- Describe the nutrition literacy levels and nutrition knowledge of SN managers, and then determine if these variables differed significantly by demographic characteristics; and

- Explore if barriers to seeking SN information, perceived role in school wellness, and confidence in SN decisions making/scenarios varied by nutrition literacy and knowledge scores.

METHOD

Research Plan

This research project was conducted in three phases. In Phase I, an expert panel of school nutrition (SN) professionals was convened to discuss issues associated with nutrition literacy in the SN environment. The expert panel provided a considerable amount of information that was influential in drafting the survey instruments and methodology for administration. The survey instruments were then reviewed by a panel of SN directors for readability and clarity. In Phase II, a national sample of SN directors were surveyed regarding participation of their managers in the Phase III survey. Each SN director who replied to Phase II questionnaire and agreed to participate in Phase III was then sent the requested number of SN manager surveys along with a letter, detailing instructions for administering the surveys to SN managers.

Phase I

Expert Panel

For the Phase I expert panel, seven SN professionals, one from each USDA region, were sampled and invited to attend a day and a half meeting to discuss issues associated with nutrition literacy in the SN environment. The expert panel agenda was developed to address the research related objectives, to promote interactive discussions, and to gather qualitative information leading to the development of a national quantitative survey. In brief, this day and a half meeting began by providing participants with background information related to health and nutrition literacy and by giving an overview of SN manager's key competencies related to health and nutrition literacy skills. The primary agenda items included the following: (1) defining nutrition literacy within the context of the school environment; (2) identifying SN outcomes which may be associated with nutrition literacy; and (3) discussing appropriate data collection protocol for the

national survey, including the logistics of administering the survey to SN managers. The discussion session was moderated and co-moderated by two National Food Service Management Institute, Applied Research Division (NFSMI, ARD) researchers, with assistance from a secondary support staff to capture the participants' comments on a flip chart. 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. Results of the expert panel led to the development of both the questionnaire for directors and the survey for managers.

Review Panel

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.

Phase II

School Nutrition Director Questionnaire

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 within their school or district. Specifically, the Phase II materials informed SN directors of the Phase III study, highlighted the important implication of SN managers participating in the Phase III survey, and provided important details regarding the procedures for administering and supervising the Phase III survey. The Phase II questionnaire was very brief and consisted of the following:

(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.

Sample and Survey Distribution

The study sample for Phase II was selected from the data base 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. Since the Phase II questionnaire was used to request participation in Phase III of this project, the Phase II questionnaire included identifying names and mailing addresses to ensure accurate mailing of the Phase III SN manager survey.

Phase III

School Nutrition Manager Survey

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; (3) four barrier questions and one confidence-related question 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. The Phase III survey was formatted as a scannable survey.

Sample and Survey Distribution

Each SN director who replied to Phase II and agreed to participate in Phase III was sent the requested number of surveys along with a letter detailing instructions for administering the Phase III survey to SN managers. The 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 NFSMI, ARD. 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.

Informed Consent

This three-phase research study was approved by The University of Southern Mississippi's Institutional Review Board.

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

from day one. Upon completion of the expert panel meeting, the qualitative data was summarized by the lead researcher. The summaries were then reviewed and thematically coded into categories, which were subsequently used to develop a Phase II SN director questionnaire and the Phase III SN manager survey.

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 and three scores were created to indicate the number of correct responses on the nutrition literacy scale (0-5 correct responses), number of correct responses on the nutrition knowledge scale (0-10 correct responses), and a combined nutrition literacy plus nutrition knowledge scale (0-15 correct responses). These scores were analyzed and evaluated both as continuous and categorical scores (low nutrition literacy/knowledge, limited nutrition literacy/knowledge, and adequate nutrition literacy/knowledge). Chi-square and one-way ANOVA tests were used to examine associations of demographic (first language at home, hours of in-service training, education level, years in SN, and years in current position) and school (student enrollment and type of 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 survey instruments and methodology for administration. After being educated on background information related to health and nutrition literacy, the panel discussed the importance of targeting nutrition literacy of school nutrition (SN) managers. The first point of discussion centered around outcomes that could result from focused attention on nutrition literacy skills among SN managers. Emerging themes 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.

Then the panel was asked to brainstorm on how nutrition literacy may be defined within the context of the school environment. As illustrated in Table 1, the expert panel offered insightful views for defining the constructs of nutrition literacy (capacities to obtain, comprehend, and apply nutrition information) as it relates to the school environment.

Table 1

Nutrition Literacy Defined in the Context of the School Environment

Nutrition Literacy Construct	Interpretation within the Context of the School Environment
Capacity to obtain basic nutrition information	Self-confidence of staff to obtain information Where they would go for information, including Internet sources Knowing correct and incorrect direction to take to get information Communication within the department State and national associations Barriers to obtaining information, including time and apathy Know where to go for food allergy information Know when and where to seek information Focus on information Dietary allowances
Capacity to comprehend and apply basic nutrition information	Understand offer vs. serve Basic understanding of dietary guidelines What constitutes a “food group” within the context of school lunch Understand components of “traditional” school lunch Production techniques that enhance/destroy nutritional quality Food sources of macro vs. micronutrient Know the required meal patterns Appropriate substitutions Reading food labels, including ingredient lists and serving size Understand food allergies and dangers in making false claims and not reading Use correct portioning tools when measuring ingredients Understand how many items equal a serving

(Table 1 continues)

*Table 1 (continued)**Nutrition Literacy Defined in the Context of the School Environment*

Nutrition Literacy Construct	Interpretation within the Context of the School Environment
Additional information	Understanding that nutrition information is constantly updated Link between what is selected and what children eat Knowing when to refer to someone else Feedback from service of meals

Next, the panel was asked to identify school outcomes which may be associated with the nutrition literacy skills of SN managers. As illustrated in Table 2, the responses were categorized as production, program, staff, and student or community outcomes.

Table 2

Outcomes Associated with the Nutrition Literacy Level of School Nutrition Managers

Theme	Outcomes Associated with Nutrition Literacy
Production outcomes	Quality of preparation Cooking techniques Less waste Development of new recipes; increase healthier alternative options
Program outcomes	Well-marketed programs Increased reimbursable meal counts More cooperation from administration More support funding/funding for School Lunch Program Programs are included or integrated into a part of the curriculum Coordinated school SN staff become part of curriculum team, learn to speak education talk

(Table 2 continues)

*Table 2 (continued)**Outcomes Associated with the Nutrition Literacy Level of School Nutrition Managers*

Theme	Outcomes Associated with Nutrition Literacy
Staff outcomes	<p>Increased self confidence and empowerment</p> <p>Increase creativity</p> <p>More informed staff</p> <p>Managers view their job as a “career”; more dedication to the program</p> <p>Employees could change their behaviors and have better health</p> <p>Employees would benefit from a good meal at school</p>
Student outcomes	<p>Increase diet quality of students, including consumption of fruits and vegetables</p> <p>Transfer of positive behaviors</p> <p>Increase expectations of students</p> <p>Increase participation</p>
Community outcomes	<p>Elevated perception of value of program</p> <p>Advocacy in the community</p> <p>Resources for teachers</p> <p>Collaborative partnerships</p>

Throughout the course of the expert panel, three other important topics emerged. First was the recurrent concern of the negative connotations associated with using the word “literacy.” Second was the repeated theme that promoting nutrition literacy skills among SN staff is closely tied with empowering the staff to take greater pride and ownership of their important role in child nutrition programs. The third important issue was the large discrepancy in the definition, skill set, educational requirements, and job responsibilities of SN managers across different schools. These findings also helped shape the language and content of the national survey.

Appropriate data collection protocol for the national survey was also discussed, including the logistics of administering the survey to SN managers. Establishing accurate baseline measures of nutrition literacy required the SN managers to complete the survey without assistance from others or available resources. The expert panel 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. Overall outcomes of the expert panel led to survey question development and survey administration methodologies for the Phase II Questionnaire for School Nutrition Directors and Request for Participation in Phase III Survey and the Phase III Nutrition Awareness of School Nutrition Managers Survey.

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%. Table 3 illustrates the mean response rates for seven statements, where SN directors were asked to rate their SN managers on nutrition knowledge/awareness related topics using a 5-point Likert Scale (1=*poor*, 5=*very good*). "Use of appropriate portion control tools" ranked the highest. "Knowledge of USDA meal requirements" ranked higher than "knowledge of the 2005 Dietary Guidelines." "Skills to locate trustworthy nutrition information" ranked the lowest.

Table 3

School Nutrition Directors' Ratings of the Nutrition Knowledge and Awareness of Their School Nutrition Managers

Nutrition Knowledge or Awareness Related Topics	Mean (SD)^a
Use of appropriate portion control tools (n=181)	4.3 (0.8)
Knowledge of USDA meal requirements for SN (n=182)	4.2 (0.9)
Knowledge to make appropriate menu substitutions (n=180)	4.0 (0.9)
Skills to read food labels for allergy containing ingredients (n=177)	3.6 (1.1)
Knowledge of the 2005 Dietary Guidelines (n=180)	3.4 (1.0)
Ability to communicate nutrition information to staff, students, and faculty (n=181)	3.3 (1.1)
Skills to independently locate trustworthy nutrition information to make daily child nutrition decisions (n=176)	3.2 (1.1)

^a 1=*poor*, 2=*fair*, 3=*average*, 4=*good*, 5=*very good*
Sample size differs across questions due to missing responses

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 a 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 five manager surveys. In total, 167 survey packets and 1,665 surveys were mailed to the SN directors.

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. While all USDA regions were represented, there was inconsistent participation across the regions: Southeast (30%), Western (21%), Mid-Atlantic (14%), Mountain Plains (11%), Midwest (9%), Southwest (9%), and the Northeast (4%). Of the 728 respondents, 64% were Serve Safe Sanitation certified, 37% were certified by the School Nutrition Association, 7% were State Department of Education certified, and 1% held the School Nutrition Specialist credential. The majority of these SN managers (68.7%) had a high school degree or less. Table 4 shows the demographic and school characteristics of the survey respondents, and illustrates significant difference for the mean nutrition literacy plus nutrition knowledge scores 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 greater 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 4

Relationship Among Demographic Characteristics of School Nutrition Managers and Nutrition Literacy and Knowledge Scores (n=763)

Characteristic	Number (%) of respondents	Total nutrition literacy/knowledge score (15 questions) Mean (SD)^a	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 ^b			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)	N/A	

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

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

(Table 4 continues)

Table 4 (continued)

Relationship Among Demographic Characteristics of School Nutrition Managers and Nutrition Literacy and Knowledge Scores (n=763)

Characteristic	Number (%) of respondents	Total nutrition literacy/knowledge score (15 questions) Mean (SD)^a	p-value
Hours of in-service training for nutrition requirements			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 SN 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)	

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

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

(Table 4 continues)

Table 4 (continued)

Relationship Among Demographic Characteristics of School Nutrition Managers and Nutrition Literacy and Knowledge Scores (n=763)

Characteristic	Number (%) of respondents	Total nutrition literacy/knowledge score (15 questions) Mean (SD)^a	p-value
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)	
801-1000	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)	

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

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

Table 5 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 (Weiss et al., 2005), and the 10 knowledge questions pertaining to child nutrition issues, whereas Table 6 illustrates the means (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, as compared to the nutrition knowledge questions (32.3%). However, one-half of the nutrition knowledge questions were answered correctly by greater than 70% of the respondents.

Table 5

Correct Responses for Nutrition Literacy and Nutrition Knowledge Questions Among School Nutrition Managers

Questions^a (Correct Answer)	Number of Correct Responses (%)
Nutrition label reading	
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)

^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 5 continues)

Table 5 (continued)

Correct Responses for Nutrition Literacy and Nutrition Knowledge Questions Among School Nutrition Managers

Nutrition Label Reading Questions^a (Correct Answer)	Number of Correct Responses (%)
Nutrition knowledge	
What is the best method to maintain the nutrient content of frozen vegetables? (A: <i>Steam them close to serving time</i>)	713 (95.8)
Chicken nuggets, hamburgers, and fish are a good source of which of the following? (A: <i>Protein</i>)	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: <i>Increases calories</i>)	691 (92.9)
The portion size for a menu item is ½ cup. Which portion control tool do you use? (A: <i>#8 scoop</i>)	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: <i>2-3 cups</i>)	525 (70.6)
Most of the fats in your diet should be which of the following type? (A: <i>Monounsaturated Fats</i>)	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: <i>Whey</i>)	336 (45.2)
How can you tell if a bread is a 100% whole grain product? (A: <i>1st item in the ingredient list is whole-wheat flour</i>)	325 (43.7)
According to the MyPyramid, at least _____ of the grains individuals consume should be whole grains. (A: <i>50%</i>)	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: <i>Carrots</i>)	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 6

Mean Scores and Categories for Nutrition Literacy and Knowledge of School Nutrition Managers

	Mean Score (SD)	Low Nutrition Literacy/ Knowledge^a Number (%) of Respondents	Limited Nutrition Literacy/ Knowledge^b Number (%) of Respondents	Adequate Nutrition Literacy/ Knowledge^c Number (%) of Respondents
Nutrition label reading questions (5 questions)	3.91 (1.32)	61 (8.2)	145 (19.5)	537 (72.2)
Nutrition knowledge questions (10 questions)	6.62 (1.70)	169 (22.7)	335 (45.0)	240 (32.3)
Nutrition label reading + nutrition knowledge questions (15 questions)	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 nutrition 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 and 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 7, the Cronbach's alpha for each scale sufficiently achieved the standard threshold of 0.7. The mean (SD) for the individual statements and overall scales, including the perceived barriers to seeking nutrition information, role in school wellness, and confidence in making SN decisions, are provided.

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 of 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 to 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 7

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

Characteristic	Cronbach's Alpha for Scale	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)
It is my responsibility to encourage students to make healthy food choices.		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 SN ^b	0.88	3.76 (0.72)
How confident are you in dealing with food safety issues?		4.41 (0.71)
How confident are you in dealing with students having special food and/or nutrition needs?		3.95 (0.91)
For students with specific food allergies, how confident are you in knowing the foods to avoid?		3.81 (0.92)
How confident are you in making food substitutions based on nutrient content?		3.72 (0.94)

^a 1=strongly disagree, 2=somewhat disagree, 3=neither agree or disagree, 4=somewhat agree, 5=strongly agree

^b 1=not at all confident, 2=a little confident, 3=somewhat confident, 4=very confident, 5=completely confident
(Table 7 continues)

Table 7 (continued)

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

Characteristic	Cronbach's Alpha for Scale	Mean (SD)
How confident are you in your ability to provide nutrition information/resources to teachers?		3.50 (0.99)
How confident are you in your ability to provide nutrition education to students?		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)

^a 1=strongly disagree, 2=somewhat disagree, 3=neither agree or disagree, 4=somewhat agree, 5=strongly agree

^b 1=not at all confident, 2=a little confident, 3=somewhat confident, 4=very confident, 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 in the partial correlation tests. Similarly, no meaningful significant correlations resulted.

Table 8 illustrates ratings related to confidence in seeking child nutrition information and attention given to different child nutrition sources. Overall confidence in seeking nutrition information was low to neutral 2.79 (SD = 0.98), which supports the findings indicated above. Respondents give the most attention to nutrition information from local SN directors and other managers, and the least attention to health care providers and the Internet. 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 knowledge category.

Table 8

Confidence in Seeking and Attention to Sources of Child Nutrition Information (n=763)

Characteristic	Mean (SD)
Confidence in seeking child nutrition information ^a	
Overall, how confident are you searching for information regarding child nutrition issues?	2.79 (0.98)
How much attention to each source as it relates to child nutrition ^b	
From your local SN Director	2.80 (0.55)
From other SN Managers	2.05 (0.87)
From USDA	1.95 (0.83)
From professional magazines or articles	1.86 (0.78)
From your state agency	1.83 (0.91)
From state or national School Nutrition Association (SNA) meetings	1.75 (1.02)
From health care providers (doctors, nurses, dietitians)	1.58 (0.96)
On the Internet	1.39 (0.91)

^a 1=*not at all confident*, 2=*a little confident*, 3=*somewhat confident*, 4=*very confident*, 5=*completely confident*

^b 1=*not at all*, 2=*a little*, 3=*some*, 4=*a lot*

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

Finally, respondents were asked to indicate their roles in providing students and teachers with nutrition information 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 in the cafeteria (31.2%) and in the classroom (7.9%). When exploring the relationships among nutrition knowledge/literacy category and the role of providing students and teachers with nutrition information in the cafeteria and in the classroom, there were no meaningful significant Pearson Chi-Square results.

CONCLUSIONS AND RECOMMENDATIONS

Limitations

The primary limitation of this research is the inherent response bias associated with conducting survey research. Those school nutrition (SN) directors more involved and concerned with the professional development needs of 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 (including production, program, staff, student and community outcomes) as indicated by the expert panel. 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.

Research Study Conclusions

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. 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 decisions making/scenarios.

Education and Training Implications

Listed below are the education and training implications derived from this research.

- 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 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 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.
- 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.

Recommendations for Additional Research

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

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. D., DeWalt, D. A., Pignone, M.P., Sheridan, S. L., Lohr, K. N., Lux, L., Sutton, S. F., Swinson, T., & Bonito, A. J. (January 2004). *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. B., & Carr, D. (2004). Competencies, Knowledge and Skills of Effective School Nutrition Directors. Retrieved August 5, 2009, from <http://nfsmiweb01.nfsmi.olemiss.edu/documentlibraryfiles/PDF/20090310022657.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.

Institutes 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. *J Am Med Assoc*, 288(4), 475-481.

US Department of Health and Human Services. *Health Communication (Chapter 11). Healthy People 2010*. (November 2000). 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. *The 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. *Archives of Internal Medicine*, 158, 166-172.

Zoellner, J., Connell, C., Bounds, W., Crook, L., & Yadrick, K. (In Press). Nutrition Literacy Status and Preferred Nutrition Communication Channels among Adults in the Lower Mississippi Delta. *Preventing Chronic Disease*.



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