Exploring Nutrition Education Resources and Barriers, and Nutrition Knowledge in Teachers in California

Anna Marie Jones, PhD; Sheri Zidenberg-Cherr, PhD

ABSTRACT

Objective: To determine barriers to nutrition education, nutrition education resources used, and the relationship between nutrition knowledge and whether public school teachers in California teach nutrition in the classroom.

Methods: A total of 102 teachers in California participated in a Web-based survey about nutrition education barriers, resources used to plan nutrition lessons, and factors that would encourage inclusion of nutrition. A validated questionnaire was used to assess nutrition knowledge. Analyses included ordinary least-squares regression.

Results: Common barriers were lack of instructional time and unrelated subject. Teachers were unaware of many nutrition education resources. Nutrition knowledge was not associated with nutrition lessons but was positively associated with teaching high school ($\beta = 5.13$; $P < .05$) and female gender ($\beta = 6.78$; $P < .05$), and negatively associated with identifying as Hispanic or Latino ($\beta = -15.50$; $P < .001$).

Conclusions and Implications: Barriers of time and lack of unrelated subject matter are difficult to address but lack of awareness of resources indicates that promotion of existing resources may encourage teachers to provide nutrition education. Larger studies are needed to determine whether this holds true in a broader sample.

Key Words: nutrition knowledge, nutrition education, school nutrition, teachers (*J Nutr Educ Behav*. 2015;47:162-169.)

Accepted June 23, 2014. Published online September 23, 2014.

INTRODUCTION

With the rise in childhood obesity over the past few decades, schools have emerged as a primary target for interventions designed to slow or reverse this troubling trend.[1-3] Schools have been viewed as an ideal setting, in part because of the captive audience; children spend the majority of their waking hours in the classroom. The Institute of Medicine[3] recommended that schools be a focal point for obesity prevention, with sequential food literacy and nutrition science education as a key strategy. Expansion of nutrition education will require support from teachers because many will be tasked with providing it. However, teachers face many barriers to the inclusion of nutrition education that will need to be addressed to meet the goal of sequential nutrition education. According to the Social Ecological Model, there are several spheres of influence on behavior.[4] When it comes to teaching nutrition in the classroom, intrapersonal factors such as knowledge or beliefs about nutrition may be important determinants in whether nutrition is taught. Lack of nutrition knowledge and feeling unprepared to teach nutrition have been reported to be barriers to providing nutrition education, yet relatively few studies have examined relationships between nutrition knowledge and classroom nutrition education. Previous studies suggested that nutrition knowledge of teachers is positively associated with teaching nutrition and self-efficacy to teach nutrition, and that nutrition-related professional development increases nutrition knowledge.[5-8] However, there are gaps in the literature with regard to factors that may be associated with nutrition knowledge of teachers. Determining factors associated with nutrition knowledge in teachers may be helpful in tailoring nutrition education inservices and professional development to meet the needs of teachers. Resources used by teachers to plan lessons are another factor that may also be useful in designing nutrition professional development, by identifying possible gaps in awareness of available resources. Research in this area is limited; only a few studies have examined resources used by teachers to plan nutrition lessons. Those that assessed resources focused on individual school districts[9,10] or are more than a decade old and may not reflect recent trends.[11] The hypothesis of this study is that nutrition knowledge predicts teaching nutrition. The study had 3 main purposes: to determine barriers to nutrition education; to determine the nutrition education resources used by teachers; and to determine whether there is a relationship between

Center for Nutrition in Schools, Department of Nutrition, University of California, Davis, Davis, CA

Address for correspondence: Sheri Zidenberg-Cherr, PhD, Department of Nutrition, University of California, 1 Shields Ave, Davis, Davis, CA 95616; Phone: (530) 752-3817; Fax: (530) 752-8905; E-mail: sazidenbergcherr@ucdavis.edu

http://dx.doi.org/10.1016/j.jneb.2014.06.011

nutrition knowledge, whether nutrition is taught in the classroom, and to identify demographic, classroom, and school factors in a sample of public school teachers in California.

METHODS

Sample

The researchers selected a random sample of 24 school districts out of the 1,043 districts in California using the California Department of Education online database. District superintendents were contacted to request permission to contact schools and teachers about the study. In districts where there were ≤ 5 schools, all schools were contacted. In districts with > 5 schools, the authors randomly selected 5 schools to be contacted. Permission to contact teachers in their school was requested of principals through e-mail and phone calls. With the exception of districts in which the superintendent elected to forward study e-mails, if the authors did not receive permission from the principals, they did not contact teachers at those schools. Participation was solicited from all teachers at the schools, pre-kindergarten through 12th grade. There was no incentive offered to districts, schools, or teachers to participate in the survey.

Procedures

The questionnaire used in the survey contained questions about school and classroom information (including grade levels taught, subjects taught, hours of nutrition taught, and whether an instructional school garden was present), nutrition knowledge, and demographic information. The knowledge questionnaire was evaluated for internal consistency, construct validity, and test-retest reliability, as pre viously described,[12] and nutrition experts at University of California, Davis, reviewed additional questionnaire sections for content validity. In addition, the questionnaire asked about sources of personally used nutrition information and attitudes toward nutrition and nutrition information; however, results from this section of the questionnaire are not discussed here. To reduce respondent burden and minimize irrelevant questions, the researchers used skip logic to direct participants along question pathways based on responses provided to earlier questions; different questions were asked depending on the question pathway. A Web-based survey methodology using SurveyMonkey Gold (SurveyMonkey.com, LLC, Palo Alto, CA) was conducted between February and April, 2013. The tailored design method of Dillman et al[13] was followed. Teachers received an initial e-mail to inform them about the study and invite participation. One week later, an e-mail with a link to the Web-based questionnaire was sent. After another week had passed, a third e-mail was sent to serve as a thank-you to those who had completed the survey and a reminder to those who had not. Two weeks later, a final reminder e-mail was sent.

This study was reviewed by the University of California, Davis Institutional Review Board and was approved as an exempt study.

Data Analysis

Data were downloaded from the Web-based survey software as an SPSS data file and the authors used SPSS 21 for all analyses (IBM, Inc, Armonk, NY, 2012). The number of responses for each question varied owing to skip logic and incomplete questionnaires. Unless otherwise specified, data reported are calculated using all responses to individual questions, with the total number of responses specified. Ordinary least-squares (OLS) regression analyses were conducted to evaluate the relationship between nutrition knowledge score, whether nutrition education was taught in the classroom, other classroom and school-level variables (subjects taught, grade grouping taught, and whether nutrition was taught by another teacher), and demographic information. Participants were allowed to select > 1 response for subjects taught and race and ethnicity; all responses were included in the model. Only respondents who completed at least 50% of the knowledge questions were included in the nutrition knowledge analyses, and percent correct was calculated based on the number of questions on the measure. Only cases that had data for all variables were included in the regression analysis. Variables that were nonsignificant or explained < 5% of the variance in nutrition knowledge score were removed from the model. Outliers with studentized residuals of ≥ 2 were removed from the analysis.[14]

RESULTS

Of the 24 districts contacted, 8 superintendents agreed to allow district participation in the study. Two superintendents declined their district's participation and 9 districts did not respond to e-mail or phone requests; there was a lack of follow-up with 5 districts. Three districts had > 5 schools; 5 schools from these districts were randomly chosen. Of the 31 schools eligible to participate, the authors received permission to contact teachers at 20 schools in 8 districts. Responses were received from teachers in 6 districts and 16 schools. Based on the number of teachers at participating schools, approximately 450 teachers were contacted. However, a few superintendents and principals elected to forward study e-mails to teachers rather than allow study personnel to e-mail teachers directly, which may have resulted in fewer teachers being contacted than intended. Furthermore, spam filters may have prevented study e-mails from reaching teachers. When only teachers at schools with survey respondents are counted, the number of teachers contacted was approximately 380. All participating districts with survey respondents were located in northern or central California and had enrollments of < 4,000 students. Total response frequencies for each question varied; the maximum number of respondents was 102, yielding a response rate of 23% to 27%. The total number of respondents is reported in data tables with each question. Table 1 lists demographic and classroom characteristics of participants. When asked, "Do you teach nutrition lessons in your classroom?" 37% indicated they taught nutrition lessons (Table 1). Of those who taught nutrition, the most common response was 3–5 hours/semester.

Nutrition Education Barriers and Resources

Among those who did not teach nutrition, the most common barrier was

Table 1. Demographic and Classroom Characteristics of Teachers Who Participated in the Survey

	%
Gender (n = 76)	
Female	83
Male	17
Age, y (n = 73)	
20–29	7
30–39	14
40–49	38
50–59	27
60–69	14
Race and ethnicity (n = 77)	
Asian or Asian American	0
Black or African American	0
Hawaiian or Pacific Islander	0
Hispanic or Latino	16
Native American or Alaska Native	3
White or Caucasian	73
Other	5
Prefer not to answer	4
Grade grouping taught (n = 100)	
Elementary (K–5)	51
Middle (6–8)	18
High (9–12)	37
Subjects taught (n = 100)	
English language arts	54
Foreign languages	10
Health	15
History or social science	44
Home economics	4
Mathematics	47
Physical education	28
Science	40
Teaches nutrition (n = 102)	
Yes	37
No	63
Hours of nutrition taught (n = 37)	
Elementary (K–5)	
< 1	14
1–2	16
3–5	22
5–10	0
> 10	3
Not sure	0
Middle (6–8)	
< 1	3
1–2	0
3–5	3
5–10	0
> 10	5
Not sure	0
High (9–12)	
< 1	3
1–2	11
3–5	5
5–10	3
> 10	5
Not sure	8
Advanced degree (n = 76)	
None	48
Masters	24
Doctoral	1
Other	3

"lack of instructional time," with 54% of respondents marking "major reason" and 16% choosing "minor reason" (Table 2). The least common barrier was "I don't find it important to teach children nutrition," with 95% of respondents choosing "not a reason." When asked, "Would any of the following make it more likely that you would teach nutrition lessons in your classroom?" respondents indicated that "funding to purchase nutrition education supplies, curricula, or resources" would be most successful, with 47% choosing "a lot more likely" (Table 3). A large proportion also indicated that "leadership, initiative, and commitment from school and district administrators" would make them more likely to teach nutrition.

The resources most commonly used in planning nutrition lessons were Dairy Council education materials; 66% of respondents indicated that they frequently or sometimes used this resource (Table 4). Internet Web sites were also used by a majority of respondents who taught nutrition. The other resources listed were used far less frequently, and some were not familiar to respondents. Most had never heard of the Nutrition Competencies for California's Children[15] (84%) or the California Champions for Change[16] (81%).

Nutrition Knowledge of Teachers

Scores on the nutrition knowledge questionnaire ranged from 5 to 53 of a maximum possible of 58 (n = 85). The mean score was 35.6, or 61.4% correct, with an SD of 10.3. Only cases that had data for all variables were included in the regression analysis; 1 outlier was removed according to the criterion stated earlier (n = 67). The mean nutrition knowledge score was 37.5 for cases included in the regression analysis, with an SD of 9.7, minimum of 6, and maximum of 54. Table 5 presents the results of OLS regression examining the relationship between nutrition knowledge, teaching nutrition, school and classroom variables, and demographic variables. Whether nutrition was taught was not associated with nutrition knowledge. Of the variables included in the regression analysis, only 3 were significant at $P < .05$: teaches high school, female gender, and identifies as Hispanic or Latino. When other predictors are held constant, those who taught high school scored an average of 5.12 points higher compared with those who taught elementary or middle schools, women scored 6.78 points higher than men, and those who identified as Hispanic or Latino scored 15.49 points lower than those who did not identify as Hispanic or Latino on the nutrition knowledge questionnaire. The final model was expressed as: $\hat{y} = 25.82 + 5.12$ (teaches high school) + 6.78 (female gender) – 15.49 (identifies as Hispanic or Latino). The proportion of variance explained by this model was 42%.

DISCUSSION

The majority of respondents did not teach nutrition in their classrooms. Over 75% of the sample who taught nutrition taught < 5 h/semester. The School Health Policies and Programs Study reported similar results, with 3.4 h/class for students in elementary school, 4.2 h/class in middle school, and 5.9 h/class in high school.[17] The limited number of hours of nutrition education may have resulted in part from barriers limiting the inclusion of nutrition. Of the barriers included in the questionnaire, the 2 most prominent were lack of instructional time and teaching a subject unrelated to nutrition. Even when nutrition was taught in the classroom, it was limited to only a few hours per semester; it is likely that the reasons for this are similar to the reasons why teachers

Table 2. Barriers to Including Nutrition Education Among Teachers Who Did Not Teach Nutrition

	Major Reason (%)	Minor Reason (%)	Not a Reason (%)
Lack of instructional time (n = 54)	54	16	30
Nutrition does not relate to subject(s) I teach (n = 56)	32	27	41
Lack of appropriate resources (funding, supplies, or curricula) (n = 56)	32	29	39
I am given specific lesson plans and nutrition is not included in them (n = 55)	20	18	62
Nutrition is taught by someone else in my classroom or school (n = 56)	19	9	72
There is no required state testing program with nutrition-related questions (n = 55)	13	16	71
I do not know enough about nutrition to teach it. (n = 54)	11	33	56
Lack of coordination among administrators, school food service, and other teachers (n = 55)	11	24	66
Lack of support or leadership from administrators (n = 55)	9	27	64
Lack of reinforcement of nutrition messages throughout school (n = 55)	9	35	56
I do not find it important to teach children nutrition (n = 55)	0	6	95

Table 3. Self-Rated Likelihood That Resources and Support Would Increase Their Teaching Nutrition Among Teachers Who Did Not Teach Nutrition

	A Lot More Likely (%)	A Little More Likely (%)	No More Likely (%)
Funding to purchase nutrition education supplies, curricula, or resources (n = 58)	47	29	24
Leadership, initiative, and commitment from school and district administrators (n = 57)	44	33	23
Time to coordinate with administrators, school food service, and other teachers (n = 56)	38	32	30
Nutrition curricula aligned with subject standards (n = 57)	37	32	32
Reinforcement of nutrition messages throughout school (n = 58)	33	36	31
Teacher training or inservice to improve nutrition knowledge (n = 57)	21	42	37

indicated they did not teach nutrition at all: lack of time and incompatibility with subject matter. As other research has shown, increased focus on standardized testing has reduced the time teachers are able to spend on subjects not included on the state tests.[18,19] This speaks to the importance of standards-based nutrition curricula integrated into other subjects that would minimally affect the amount of time spent on other subjects.

Respondents were largely unaware of several resources that could be used to plan nutrition lessons. Among those who did not teach nutrition, lack of appropriate resources was identified as a barrier for more than half. Lack of awareness of resources in this study is consistent with a study of teachers in a large urban school district in the Midwest.[8] The authors reported health teachers in the study used dated textbooks, old handouts, and Internet resources to plan lessons and were unaware of resources available in the district, such as a health education lending library and the district nutrition curriculum. This may reflect an isolated lack of communication in this district, but the use of old, outdated resources suggests a lack of awareness of availability beyond resources specific to this district.

The results are inconsistent regarding the role of school and district administrators in encouraging nutrition education. Whereas a majority of those who do not teach nutrition indicated that commitment and leadership from administrators would make them more likely to teach it, the majority also indicated that lack of support was not a reason they did not teach nutrition. Lack of administrative support may not be the strongest barrier to nutrition education in this study, but leadership and commitment from school and district administrators may act to encourage nutrition education. However, it is important that administrators articulate support. A study of principals, teachers, and school nutrition directors reported that nearly all agreed that nutrition education should be a part of the school curriculum, and 93% of principals believed they encouraged providing nutrition

Table 4. Resources Used to Plan Nutrition Lessons by Teachers Who Teach Nutrition and Participated in the Survey

	Frequently Use (%)	Sometimes Use (%)	Heard of, But Never Use (%)	Never Heard of This Resource (%)
Dairy Council educational materials (n = 34)	36	30	9	27
Internet Web sites (n = 34)	29	41	18	12
Other teachers (n = 33)	18	36	30	15
Existing nutrition curriculum (n = 32)	16	13	19	53
Health textbooks (n = 30)	13	3	43	40
Newspaper articles (n = 33)	12	39	30	18
Health Education Content Standards for California Public Schools (n = 33)	9	6	39	46
Friends and family (n = 33)	9	33	39	18
Magazine articles (n = 31)	10	48	23	19
School food service or nutrition staff at school or district level (n = 34)	6	21	35	38
California Department of Education Nutrition Education Resource Guide (n = 31)	3	10	26	61
Nutrition Competencies for California's Children (n = 32)	3	0	13	84
Peer-reviewed scientific journal articles (n = 32)	3	13	38	47
School nurse (n = 34)	3	29	44	24
Local Cooperative Extension office (n = 32)	3	19	16	63
Registered dietitian at hospital or clinic (n = 32)	3	19	41	38
California Champions for Change (n = 32)	0	0	19	81
California Healthy Kids Resource Center (n = 32)	0	13	31	56
The Network for a Healthy California (n = 32)	0	0	28	72
Local public health department nutritionist (n = 32)	0	13	41	47
College class material (n = 32)	0	16	38	47

education.[20] However, more than half of teachers participating in this study did not think that the school principal encouraged nutrition education. Also in conflict were results regarding nutrition knowledge and likelihood of teaching nutrition. Among those who did not teach nutrition, more than half did not think lack of knowledge was a barrier to teaching nutrition, and nutrition knowledge questionnaire scores did not differ significantly between those who taught nutrition and those who did not. Despite this, over 60% indicated that professional development to improve nutrition knowledge would increase the likelihood they would teach nutrition. Professional development has been demonstrated in previous studies to encourage nutrition education. Results from a study of staff members at Michigan schools showed that professional development for teachers was considered one of the more helpful facilitators to nutrition education.[21] Health education, and by extension nutrition education in the classroom, has been associated with staff development in these areas.[19] In a study using data from the 2000 School Health Policies and Practices Study, researchers found that elementary, middle, and high school teachers who had received staff development in health instruction were 2.3 times more likely to teach nutrition in the classroom.[22,23] In addition, middle and high school teachers who had received staff development in nutrition within the past year were 1.8 times more likely to spend ≥ 4 classroom hours on nutrition and dietary behaviors.[19]

The average score on the nutrition knowledge questionnaire was 35.1 (61% correct) overall and 37.5 (63% correct) in those included in the OLS regression when controlling for grade grouping taught, gender, and ethnicity. Those who taught nutrition did not score significantly higher than those who did not, and overall the score was lower than would be ideal. The questionnaire included items about current dietary recommendations, nutrient content of foods, and diet and disease relationships, and it would be expected that educators who taught nutrition to students would have a better understanding of these areas. Those who taught high school scored significantly higher on the nutrition knowledge questionnaire than those who taught elementary or middle school. This may result from a difference in education, because there was much more variation in bachelor degree categories among those who taught high school compared with

Table 5. Predictors of Nutrition Knowledge Score Among Teachers Participating in the Survey (n = 67)

	Model	
	With All Variables	**Final Model**
Intercept	20.23 (6.65)	25.82 (5.01)
Nutrition education taught in classroom (n = 29)	−1.31 (2.37)	—
Subjects taught		—
English language arts (n = 41)	—	
Foreign language (n = 8)	0.95 (3.51)	
Health (n = 16)	3.91 (3.09)	
History or social science (n = 35)	−5.25 (2.91)	
Home economics (n = 5)	5.07 (4.48)	
Mathematics (n = 38)	5.36 (4.13)	
Physical education (n = 22)	1.37 (2.87)	
Science (n = 35)	1.69 (3.04)	
Grade grouping		
K–5 (n = 35)	—	—
6–8 (n = 12)	4.40 (3.59)	—
9–12 (n = 24)	9.14 (3.79)	5.13* (1.99)
Nutrition taught by another teacher (n = 17)	0.14 (2.42)	—
Female gender (n = 55)	6.55 (2.74)	6.78* (2.53)
Advanced degree (n = 27)	1.68 (2.22)	—
Race		
White or Caucasian (n = 56)	—	—
Native American or Alaska Native (n = 2)	4.76 (5.88)	—
Hispanic or Latino (n = 11)	−12.92 (2.83)	−15.50** (2.57)
R^2	0.54	0.42
F (degrees of freedom)	3.97** (15)	15.06** (3)

*$P < .05$, **$P < .001$.
Note: Data are regression coefficient estimates (SE estimates).

elementary school (data not shown). Women also scored higher on the knowledge questionnaire than men did. This was consistent with other research studies that reported that women tend to be more knowledgeable about nutrition.[24-26] Those who identified as Hispanic or Latino scored significantly lower on the nutrition knowledge questionnaire than those who did not. Few studies have examined differences in nutrition knowledge by ethnicity and race. Although 2 studies reported lower nutrition knowledge among Hispanic women compared with white women in one study and African American women in the other, the sample populations were exclusively low-income and differed considerably in educational attainment compared with the present study.[27,28] Education may also be related to nutrition knowledge, as is the case in the general population, although this was not the case in this sample. Studies comparing nutrition knowledge scores by education level combined bachelor and graduate degrees into a single category; it is possible the increase in nutrition knowledge plateaus at this point.[26-30]

Teaching nutrition is not associated with nutrition knowledge, but poor nutrition knowledge may be still present a barrier to nutrition education. Educators who were more interested in nutrition may have responded in greater numbers than those who were less interested, regardless of whether they taught nutrition as part of their lessons. This may have skewed the results toward higher knowledge scores than may exist in the general population of teachers in California who do not teach nutrition.

This study has several strengths and limitations. The main strength of this study was the use of a validated, reliable questionnaire to measure knowledge. The main limitation in this study is the potential for bias in the sample. The lack of a written procedure to handle poor response from superintendents and principals, combined with inconsistency of follow-up and self-selection bias at the level of superintendents, principals, and teachers, may have led to a biased sample. Because the only districts included in the study were small ones in northern and central California, the results may not be generalizable beyond the sample. Those who were more interested in nutrition may have been more likely to respond. This study only included small districts from northern and central California, so it was not possible to determine whether there was a relationship between district size and nutrition knowledge score. Reliance on self-reported data for hours of nutrition education in the classroom may result in an overestimation of nutrition knowledge and nutrition education in the classroom. Although the nutrition knowledge questionnaire had been previously validated, other sections of the questionnaire had only undergone content validity review by experts. Despite this, the availability of nutrition education in the classroom was still low even among those who teach nutrition education. Furthermore, the average score on the nutrition knowledge questionnaire was 61%, which demonstrates that nutrition knowledge may be inadequate, particularly if the sample skews toward those with higher knowledge owing to self-selection bias. Male gender and identifying as Hispanic or Latino were associated with nutrition knowledge in this sample, but these groups in the sample were comparatively small; this may have affected the results. The negative association between nutrition knowledge and identifying as Hispanic and Latino may also be attributable to the lack of cognitive testing of the questionnaire in this population. In addition, the small sample size may have limited the ability to detect differences; it is

possible that more variables would be predictive of nutrition knowledge score with a larger, more varied sample.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The results of this study reinforce existing data on barriers to nutrition education in the classroom and provide insight into nutrition knowledge of teachers. None of the teachers in the sample considered nutrition education to be unimportant, yet barriers were in place to prevent them from including it in their lessons. Combined with a lack of awareness and use of available resources by those who teach nutrition, this may indicate that outreach and marketing of existing resources are necessary. To encourage the inclusion of nutrition, barriers such as lack of instructional time and unrelated subject matter need to be addressed, perhaps through integration of nutrition into other subjects. Future studies should expand on these data by sampling a broader swath of districts to determine whether these findings hold true when using a larger, more varied sample. This study found a negative association between nutrition knowledge and identifying as Hispanic or Latino, but the results highlight the necessity of pilot-testing materials in the population in which the research is to be conducted.

ACKNOWLEDGMENTS

This project was funded in part by grant CRIS#CA_D_NTR-2060-H. The authors thank Deborah Fetter for assistance with study recruitment. This research study was conducted as part of the dissertation of Anna Jones.

REFERENCES

1. Koplan JP, Liverman CT, Kraak VI, eds. *Preventing Childhood Obesity: Health in the Balance*. Washington, DC: National Academy Press; 2005.
2. Briggs M, Mueller CG, Fleischhacker S. Position of the American Dietetic Association, School Nutrition Association, and Society for Nutrition Education: comprehensive school nutrition services. *J Am Diet Assoc*. 2010;110:1738-1749.
3. Glickman D, Parker L, Sim LJ, Cook HDV, Miller EA, eds. *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation*. Washington, DC: National Academies Press; 2012.
4. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological erspective on health promotion programs. *Health Educ Q*. 1988;15:351-377.
5. Fahlman M, McCaughtry N, Martin J, Shen B. Efficacy, intent to teach, and implementation of nutrition education increases after training for health educators. *Am J Health Educ*. 2011;42:181-190.
6. Telljohann SK, Everett SA, Durgin J, Price JH. Effects of an inservice workshop on the health teaching self-efficacy of elementary school teachers. *J Sch Health*. 1996;66:261-265.
7. Britten P, Lai MK. Structural analysis of the relationships among elementary teachers' training, self-efficacy, and time spent teaching nutrition. *J Nutr Educ*. 1998;30:218-224.
8. Soliah LA, Newell GK, Vaden AG, Dayton AD. Establishing the need for nutrition education: II. Elementary teachers' nutrition knowledge, attitudes, and practices. *J Am Diet Assoc*. 1983;83:447-453.
9. McCaughtry N, Martin JJ, Fahlman M, Shen B. Urban health educators' perspectives and practices regarding school nutrition education policies. *Health Educ Res*. 2012;27:69-80.
10. Graham H, Feenstra G, Evans A, Zidenberg-Cherr S. Davis school program supports life-long healthy eating habits in children. *California Agriculture*. 2004;58:200-205.
11. Stang J, Story M, Kalina B. Nutrition education in Minnesota public schools: perceptions and practices of teachers. *J Nutr Educ*. 1998;30:396-404.
12. Jones AM, Lamp C, Neelon M, et al. Systematic development of a questionnaire to measure nutrition knowledge in adults. *J Nutr Educ Behav*.
13. Dillman DA, Smyth JD, Christian LM. *Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method*. 3rd ed. Hoboken, NJ: Wiley & Sons; 2009.
14. Chatterjee S, Hadi AS. *Regression Analysis By Example*. Hoboken, NJ: Wiley and Sons; 2006.
15. Center for Nutrition in Schools, Department of Nutrition, University of California, Davis. Nutrition education competencies aligned with the California Health Education Content Standards. http://cns.ucdavis.edu/content/Competencies/NutrEdComp.pdf. Accessed March 20, 2014.
16. California Department of Public Health. Champions for Change. http://www.cachampionsforchange.cdph.ca.gov/en/index.php. Accessed March 20, 2014.
17. Kann L, Telljohann SK, Wooley SF. Health education: results from the School Health Policies and Programs Study 2006. *J Sch Health*. 2007;77:408-434.
18. Smith JM, Kovacs PE. The impact of standards-based reform on teachers: the case of "No Child Left Behind." *Teachers Teaching Theory Pract*. 2011;17:201-225.
19. Pederson PV. What is measured is treasured: the impact of the No Child Left Behind Act on nonassessed subjects. *Clearing House J Educ Strategies Issues Ideas*. 2007;80:287-291.
20. Lambert LG, Carr DH. Perceptions of elementary school nutrition education practices by school foodservice directors, teachers, and principals. *J Child Nutr Manage*; 2006:30. http://docs.schoolnutrition.org/newsroom/jcnm/06spring/lambert/index.asp. Accessed July 17, 2013.
21. Hammerschmidt P, Tackett W, Golzynski M, Golzynski D. Barriers to and facilitators of healthful eating and physical activity in low-income schools. *J Nutr Educ Behav*. 2011;43:63-68.
22. Jones SE, Brener ND, McManus T. The relationship between staff development and health instruction in schools in the United States. *Am J Health Educ*. 2004;35:2-10.
23. Kolbe LJ, Kann L, Brener ND. Overview and summary of findings: School Health Policies and Programs Study 2000. *J Sch Health*. 2001;71:253-259.
24. van Dillen SM, Hiddink GJ, Koelen MA, de Graaf C, van Woerkum CM. Exploration of possible correlates of nutrition awareness and the relationship with nutrition-related behaviours: results of a consumer study. *Public Health Nutr*. 2008;11:478-485.
25. Hendrie GA, Coveney J, Cox D. Exploring nutrition knowledge and the demographic variation in knowledge levels in an Australian community sample. *Public Health Nutr*. 2008;11:1365-1371.
26. Parmenter K, Waller J, Wardle J. Demographic variation in nutrition knowledge in England. *Health Educ Res*. 2000;15:163-174.
27. Acheampong I, Haldeman L. Are nutrition knowledge, attitudes, and beliefs

associated with obesity among low-income Hispanic and African American women caretakers? [published online ahead of print May 29, 2013]. *J Obes*. http://dx.doi.org/10.1155/2013/123901.
28. Nuss H, Freeland-Graves J, Clarke K, Klohe-Lehman D, Milani TJ. Greater nutrition knowledge is associated with lower 1-year postpartum weight retention in low-income women. *J Am Diet Assoc*. 2007;107:1801-1806.
29. Petrovici D, Ritson C. Factors influencing consumer dietary health preventative behaviours. *BMC Public Health*. 2006;6:222.
30. Gottschall-Pass K, Reyno L, Maclellan D, Spidel M. What do adults in Prince Edward Island know about nutrition? *Can J Diet Pract Res*. 2007;68:123-130.

New JNEB Collection of Survey Validation Articles

This set of articles on survey reliability and validation provides a top-level view of data collection and evaluation techniques. We have grouped these papers by topic areas of children, adults, and nutrition. The *Journal of Nutrition Education and Behavior* is a refereed, scientific periodical that serves as a resource for all professionals with an interest in nutrition education and behavior.

Validation of a Milk Consumption Stage of Change Algorithm among Adolescent Survivors of Childhood Cancer. Darren Mays, Elissa Gerfen, Revonda B. Mosher, et al. J Nutr Educ Behav. 44(5):464–468.

Validity and Feasibility of a Digital Diet Estimation Method for Use with Preschool Children: A Pilot Study Theresa A. Nicklas, Carol E. O'Neil, Janice Stuff, et al.J Nutr Educ Behav. 44(6):618–623.

The Validation of a Food Label Literacy Questionnaire for Elementary School Children. Jesse S. Reynolds, Judith A. Treu, Valentine Njike, et al. J Nutr Educ Behav. 44(3):262–266.

Parent-reported Social Support for Child's Fruit and Vegetable Intake: Validity of Measures. Jayna M. Dave, Alexandra E. Evans, Marge D. Condrasky, et al. J Nutr Educ Behav. 44(2):132–139.

Validation of a Group-administered Pictorial Dietary Recall with 9- to 11-Year-Old Children. Victoria Wallen, Leslie Cunningham-Sabo, Garry Auld, et al. J Nutr Educ Behav. 43(1):50–54.

Valid and Reliable Measures of Cognitive Behaviors toward Fruits and Vegetables for Children Aged 9 to 11 Years. Barbara Lohse, Leslie Cunningham-Sabo, Lynn M. Walters. J Nutr Educ Behav. 43(1):42–49.

Reliability and Validity of a Questionnaire to Measure Consumer Knowledge Regarding Safe Practices to Prevent Microbiological Contamination in Restaurants. Paula Lazzarin Uggioni, Elisabete Salay. J Nutr Educ Behav. 45(3):250–257.

Evaluation of Supplemental Nutrition Assistance Program Education: Application of Behavioral Theory and Survey Validation. Brett A. Wyker, Patricia Jordan, Danielle L. Quigley. J Nutr Educ Behav. 44(4):360–364.

Cognitive Testing with Female Nutrition and Education Assistance Program Participants Informs Validity of the Satter Eating Competence Inventory. Jodi Stotts Krall, Barbara Lohse. J Nutr Educ Behav. 42(4):277–283.

Validity of a Competing Food Choice Construct Regarding Fruit and Vegetable Consumption among Urban College Freshmen. Ming-Chin Yeh, Brandy Matsumori, Janel Obenchain, et al. J Nutr Educ Behav. 42(5):321–327.

Assessing Fat-related Dietary Behaviors among Black Women: Reliability and Validity of a New Food Habits Questionnaire. Patricia Markham Risica, Gary Burkholder, Kim M. Gans, et al. J Nutr Educ Behav. 39(4):197–204.

Reliability and Validity of Nutrition Knowledge, Social-Psychological Factors, and Food Label Use Scales from the 1995 Diet and Health Knowledge Survey. Saori Obayashi, Leonard J. Bianchi, Won O. Song. J Nutr Educ Behav. 35(2):83–92.

Validation of an Adapted Version of the Nutrition Environment Measurement Tool for Stores (NEMS-S) in an Urban Area of Brazil. Paula A. Martins, Elena C. Cremm, et al. J Nutr Educ Behav. 45(6):785–792.

Evaluating the Reliability of Assessing Home-Packed Food Items Using Digital Photographs and Dietary Log Sheets. Alain P. Gauthier, Bridget T. Jaunzarins, Sarah-Jane MacDougall, et al. J Nutr Educ Behav. 45(6):708–712.

Development and Reliability Testing of a Food Store Observation Form. Leah Rimkus, Lisa M. Powell, Shannon N. Zenk, et al. J Nutr Educ Behav. 45(6):540–548.

The Development and Preliminary Validation of the Behavior, Environment, and Changeability Survey (BECS). Jennifer R. Walsh, Angel Hebert, Carol Byrd-Bredbenner, et al. J Nutr Educ Behav. 44(6):490–499.