Impact of a low-intensity pedagogical model for integrating MedlinePlus exercises into middle school nutrition lessons*†

Jenice Rankins, EdD; Otis Kirksey, PharmD; Yolanda Bogan, PhD; Betty Brown, MS

See end of article for authors' affiliations. DOI: 10.3163/1536-5050.95.4.388

Objective: The research developed and pilot-tested MedlinePlus exercises in a diet-related chronic disease prevention (DCDP) middle school lesson unit called “Live.”

Methods: MedlinePlus exercises were jointly developed by two middle school family and consumer sciences (FCS) teachers and integrated into the “Live” DCDP lesson unit. FCS classes (n = 4) who had participated in a prior “Live” study were chosen to pilot-test the MedlinePlus-supplemented exercises. Evaluation measures included student satisfaction (assessed using an 8-item pre- and posttest questionnaire), knowledge gained, and attitudinal changes (assessed with an abridged version of a previously developed “Live” questionnaire). Statistical analyses were performed using SPSS.

Results: Of 62 total study participants, 56 (92.3%) said that they were either “somewhat” or “clearly”: (a) more likely to use MedlinePlus as a future source for answering questions about their personal health and (b) more knowledgeable about how eating habits can help prevent disease. Selected parameters were improved for nutrition knowledge (P < 0.01) and attitudes (P < 0.01) related to healthy eating.

Conclusions: MedlinePlus has good potential for efficiently communicating trustworthy diet-related disease-prevention behaviors to adolescents in an existing classroom curriculum.

Highlights
- Computers and the Internet in a school setting provide excellent opportunities to teach youth how to find accurate health information.
- MedlinePlus was viewed as useful by this study’s middle school participants.
- A channel for integrating MedlinePlus exercises into middle school curricula is family and consumer sciences (FCS) courses.

Implications
- Health information-seeking skills of youth could be enhanced by integrating MedlinePlus exercises into FCS courses.
- MedlinePlus exercises could be considered as supplements to health subjects included in other middle school classes.

INTRODUCTION

Computers are commonplace in US households today, and basic computer literacy is the standard among US youth [1]. Moreover, virtually all (99%) of US schools currently have access to the Internet, and 87% of them have access at the classroom level [2]. As do adults, adolescents frequently seek health information online [3–5]. According to one study, adolescents often view health information provided via the Internet as salient on the one hand but questionable on the other [5]. This viewpoint is understandable given that Websites are often not reviewed, leading to the dissemination of faulty and unreliable information [6]. Conflicting saliency versus credibility perceptions, if left unresolved, may be a deterrent to applying useful information youth obtain over the Internet. Meanwhile, many preventable risks for leading chronic disease morbidity and mortality can be attributed to exposures during adolescence [7]. Therefore, the public health community should take advantage of youths’ Internet health information–seeking patterns by steering them toward trustworthy Websites [4, 8], such as the National Library of Medicine’s (NLM’s) MedlinePlus [9]. Warner et al. [10] have demonstrated that MedlinePlus is an effective tool to educate high school students about health information resources. However, literature regarding the appropriateness of MedlinePlus for younger adolescents appears not to have been published.

Florida A&M University received NLM funding to develop MedlinePlus exercises to supplement middle school lesson plans on the topic of diet-related chronic disease prevention (DCDP) in 2004. This paper reports results of a pilot trial of a family and consumer sciences (FCS) lesson unit supplemented with MedlinePlus ex-
Table 1
Framework* used to develop Diet and Disease Prevention “Live”† lesson unit

| Lesson activities                           | Instructional strategies‡ | Behavioral change approaches§ |
|--------------------------------------------|--------------------------|------------------------------|
| Diet and health assessments                | X                        | X                            |
| Goal setting, monitoring, and reporting     | X                        | X                            |
| Homework contests with family               | X                        | X                            |
| Food preparation and taste testing          | X                        | X                            |
| Interactive unit reviews                    | X                        | X                            |
| Story telling                               | X                        | X                            |
| Diet and disease quiz                       | X                        | X                            |
| Diet and disease research report            | X                        | X                            |

* Framework adapted from Johnson DW, Johnson RT. The process of nutrition education. J Nutr Educ 1985; 17:S1–2.
† Lesson unit adapted from Rankins J, Weatherspoon L, Cook L, Reed C, Shufford-Law J, Davis Y, Kissinger M, Raiston P. Influences of a chronic disease risk reduction curriculum called “Live” on fat and fiber knowledge and attitudes of black and white adolescents. J Nutr Educ 2000 Jan/Feb;32(1):14–20.
‡ Instructional strategies: CL = cooperative learning; IL = inquiry learning; NE = nutrition experiments; OCE = out-of-class experiences; AC = academic controversies.
§ Behavioral change approaches: GN = group norms; PC = public commitment; SRM = social role models; VPI = vivid, personalized information; ACP = active cognitive processing; LAT = learner as teacher; CM = continuing motivation; GvsL = gains vs. loss appeal.

erences. Perceived readiness of adolescents to use MedlinePlus to find health information was assessed. In addition, pre- and posttest knowledge and attitudes about healthy eating were measured. Study protocols were approved by the Florida State University Institutional Research Board and Leon County Schools Office of Monitoring and Evaluation.

BACKGROUND
Participants and lesson development
Study participants included 113 students taking FCS classes at an inner-city middle school (6th–8th graders) in Florida. The investigators modified a middle school DCDP lesson to incorporate MedlinePlus exercises designed to reinforce and enhance the lesson content. The DCDP lesson was one of a 5-lesson unit module called “Live . . . Eat Less Fat and More Fiber” (“Live”), which was piloted in 1996 in the study school [11].

Overall objectives of the DCDP lesson were to: (a) increase awareness and knowledge about obesity and obesity-related chronic diseases and (b) develop the skills needed to follow a disease-prevention diet and physical activity lifestyle. Lesson content was developed to meet Sunshine State Standards [12]. Curriculum content building was based on a framework called “The Process of Nutrition Education,” encompassing five instructional strategies and eight behavioral change approaches, several of which were included in individual “Live” activities (Table 1) [13]. For example, instructional strategies included activities designed to provide cooperative learning (five activities), out-of-class experiences (four activities), nutrition experiments (one activity), controversial subject matter (one activity), and learning by inquiring (seven activities). Behavioral change approaches were designed to impact group standards (three activities), allow students to publicly attest to their commitment to reducing fat and increasing fiber intake (two activities), and assess benefits and limitations (one activity) of doing so (gains vs. loss appeal). The aim of diet and health risks assessments was to facilitate cognitive processing of information (self-assessments) and learning by teaching others (family members’ assessments). Examples of vivid and personalized information included unit reviews using interactive and colorful Jeopardy-type games, contests, foods labs, and research reports. Family and peers were incorporated as role models in five lessons and activities to reinforce desired behavior (continued motivation) in six lessons.

MedlinePlus exercises
“Live” instructional strategies and behavioral change approaches were reinforced in the MedlinePlus exercises, which were conducted in the school’s computer lab. The goal was to teach students how to search MedlinePlus to find information about diet-related chronic diseases and foods or recipes related to reducing disease risk. Exercises were designed to increase students’ knowledge about: (a) diet-related chronic diseases (especially cardiovascular diseases), (b) seriousness of these diseases, (c) family-related susceptibility to chronic diseases, and (d) diet-related disease risks and dietary change needed to reduce chronic disease risk, namely diets lower in fat, higher in fiber, and lower in salt (LF/HF/LS).

Skills needed to set LF/HF/LS diet goals, to practice achieving set goals, and to encourage self, peers, and family members to do likewise were included. Participants were assigned daily homework to review and discuss MedlinePlus activities during a family meal (table talk), and to solicit support from and participation by family members. Similarly, goal-buddy-monitoring and classroom reporting of progress toward goal achievement were intended to motivate peers. The expected impact of the lessons was increased awareness about a variety of reliable health information resources available through MedlinePlus for access now and into the future. The FCS lesson unit complete with MedlinePlus exercises and homework constitutes a ten-day curriculum (Appendix A) [14].

Lessons were implemented through the coordinated field practicum of a community nutrition course taught at Florida State University by the corresponding author (Rankins). Field practicum students were

J Med Libr Assoc 95(4) October 2007 389
trained by the community nutrition professor and supervised in implementation planning by nutrition graduate students via an online group discussion board. In the middle school classroom, field practicum students were supervised by nutrition graduate students in a face-to-face and participatory manner. Practicum students introduced each lesson and taught the middle school students how to search MedlinePlus to find information about diet-related chronic diseases and healthy eating. They also helped participants assess nutrient composition of specific foods through the use of MyPyramid.gov.

Practicum students led middle school participants in classroom activities such as selecting goal buddies, monitoring and reporting, selecting snacks for preparation, developing infomercials to market snack choices, and conducting MedlinePlus searches to complete DCDP research papers. Exemplary infomercials were filmed and broadcast over the school’s closed-circuit television.

EVALUATION METHODS

Overall satisfaction with the MedlinePlus lessons was assessed using a brief 8-item posttest questionnaire (Appendix B). A Cronbach test of reliability of the instrument [15] yielded an alpha of 0.749, a score within the recommended reliability range [16]. The questions were intended to obtain the students’ perceptions (as a result of the MedlinePlus lesson unit) about the value and utility of MedlinePlus as an educational and research tool for promoting health and preventing disease at the individual and family levels. The questionnaire also asked about participants’ intentions to use MedlinePlus as a future health information resource.

In addition, a pre- and posttest survey, an abridged version of the validated instrument used in a previous “Live” study, was used to assess general knowledge and attitude gain scores among the study participants [11]. The abridged survey contained two multiple-part questions on general knowledge about healthful eating and seven questions pertaining to attitudes toward eating healthily (Appendix C). One of the nutrition knowledge questions asked that students specify whether it is healthier to eat foods that are low or high in sugar, fiber, cholesterol, fat, and salt. The second nutrition knowledge question asked students to indicate which of nine food choices are good sources of fiber (beans, cheese, whole wheat bread, white bread, whole milk, skim milk, fruit, bran cereal, vegetables); for each of the nine items, students marked “Yes,” “No,” or “Don’t know.”

The attitude questions about healthier eating included Likert-scale response options (1 = Strongly disagree, 2 = Agree, 3 = Don’t know, 4 = Agree, 5 = Strongly agree). The FCS classroom teacher assigned each participant an ID number, which students recorded on their pre- and posttest questionnaires. Group means and standard deviations were computed using SPSS. Pre- and posttest data were entered into separate files by student ID. The raw data were imported into SPSS, and each question was analyzed to compute gain scores between pre- and posttesting. The paired t-test was used to assess statistical differences in mean attitude scores on pre- and posttests (attitude change scores). P values less than 0.01 were considered statistically significant.

RESULTS

Participant demographics

Of the 113 students, 62 (54.9%) submitted signed informed parental consent forms and signed informed student assent forms and completed both a pre- and posttest. Only these 62 students were included in the research part of the project, even though other students (n = 51; 45.1%) attended class as usual and therefore received the intervention. Table 2 provides participant demographic information. Half of the students were black (n = 31), and nearly 70% (n = 43) reported that 1–3 other youth under 18 years old resided in their respective households. Students’ ages ranged from 11–15 years, with most (43%; n = 27) 13 years old.

Table 2

| Participant demographics (n = 62) | N (%) |
|---------------------------------|-------|
| **Age**                         |       |
| 11–12                           | 19 (31.0) |
| 13                              | 27 (43.0) |
| 14–15                           | 16 (26.0) |
| **Grade**                       |       |
| 6                               | 11 (18.0) |
| 7                               | 32 (52.0) |
| 8                               | 19 (31.0) |
| **Race/Ethnicity**              |       |
| Black                           | 31 (50.0) |
| White/Non-Hispanic              | 25 (40.0) |
| Hispanic                        | 4 (6.5) |
| Asian                           | 1 (1.5) |
| Native American                 | 1 (1.5) |
| Palestinian                     | 1 (1.5) |
| **Gender**                      |       |
| Male                            | 25 (40.0) |
| Female                          | 37 (60.0) |
| **Household: children < 18 years old** | | | |
| 0                               | 13 (20.9) |
| 1–3                             | 43 (69.4) |
| 4 or more                       | 6 (9.7) |

* Excluding participant.

MedlinePlus satisfaction and impact on knowledge

Eighty to ninety percent of participants (n = 50) responded that they were impacted “somewhat” or “clearly” by 4 of 8 of the MedlinePlus satisfaction variables, while two of the variables impacted relatively fewer students (73%–78%; n = 45–48). Seventy-eight percent (n = 48) of participants said that they had gained skills to use MedlinePlus for researching wellness and disease prevention topics, while 82% (n = 51) reported increased skills to research different diseases (Table 3). Similarly, 73% (n = 45) of participants reported increased understanding of how their family
behavioral impacts on their own behaviors, and 85% (n = 53) indicated that they had a better understanding of how their behaviors impacted their own health. Ninety percent (n = 56) of the students responded that they “somewhat” or “clearly” recognized MedlinePlus as a good resource for answering questions about their health now and into the future. In addition, 94% (n = 58) of the students indicated that they were more knowledgeable about how their eating habits can prevent disease.

Nutrition knowledge

Table 4 reports nutrition knowledge before and after the DCDP lesson. Incorrect responses related to foods that have high or low fat, sugar, and fiber content ranged from 3 for fat to 15 for fiber at pretesting. Incorrect responses on the posttest declined by values ranging from 50.0% to 66.7% for all foods except cholesterol, for which the decline was only 12.5%. Between 64.0%–77.0% (n = 40 and 48) of the students incorrectly chose cheese, whole milk, and skim milk as good sources of fiber in the pretest. For good food sources of fiber, more than half (n = 35) of the students failed to identify beans in the pretest, and roughly 1/3 (n = 21 to 23) failed to identify fruit, bran cereal, and vegetables. At posttesting, the number of incorrect responses for good sources of fiber was substantially reduced for all foods except skim milk. Likert-scale responses were significantly more favorable (P < 0.01) for 3 of the 7 attitudinal indicators: availability of healthy food that taste good, eating healthily is not a lot of trouble, and encouragement from friends to eat healthy (Table 5).

DISCUSSION

Results of this DCDP MedlinePlus-supplemented pilot study with middle school teachers and students were consistent with findings of an earlier study involving librarians training high school students to use MedlinePlus [10]. Undergraduate nutrition students were chosen over librarians in the current trial, because the experience served as a field practicum course requirement with a built-in system of supervision, evaluation, continuity of successful outcomes, and self-generated performance rewards—a grade. New undergraduates come into the program each semester, providing for low-cost renewable inputs with practical experimental outcomes that are highly valued by practicing students and teachers. This study and Warner et al.’s study of teaching MedlinePlus to high school students demonstrated that adolescents and teachers find MedlinePlus a useful health information resource after just low-intensity training. Both also used systems-building implementation approaches, which made prospects for sustainability good.

The “Live” DCDP lesson unit focused specifically on improving adolescent knowledge and attitudes about healthy eating for diet and chronic disease prevention, and MedlinePlus exercises were designed to reinforce and supplement this focus. The number of correct responses for 9 of 13 nutrition knowledge questions increased by 50%–71% at posttest, compared to pretest, and there were significant gains in attitude scores (P < 0.01). Behavior change was not an expected outcome of the current pilot trial due to its low intervention intensity (10 hours total, 5 of which were devoted to the MedlinePlus exercises). For face-to-face nutrition interventions, 50 hours are considered minimum intensity for achieving behavior change [17]. To the investigators’ knowledge, measures of required in-

| Outcome variables | No response N (%) | No, not at all N (%) | No, not really N (%) | Yes, somewhat N (%) | Yes, clearly N (%) |
|-------------------|------------------|----------------------|----------------------|---------------------|-------------------|
| 1. More knowledge about how eating habits can prevent disease | 2 (3.3) | 0 (—) | 2 (3.2) | 16 (25.8) | 42 (67.7) |
| 2. Better understanding of online MedlinePlus resources | 2 (3.1) | 4 (6.5) | 5 (8.1) | 31 (50.0) | 20 (32.3) |
| 3. Increased understanding of how family history impacts health | 2 (3.3) | 2 (3.2) | 8 (12.9) | 25 (40.3) | 25 (40.3) |
| 4. Increased understanding of how my behaviors impact my health | 2 (3.2) | 1 (1.6) | 14 (22.6) | 25 (40.3) | 20 (32.3) |
| 5. Increased understanding of how my behaviors impact my health | 3 (4.9) | 0 (—) | 6 (9.7) | 19 (30.6) | 34 (54.8) |
| 6. Skills to use MedlinePlus for researching different diseases | 2 (3.2) | 1 (1.6) | 8 (12.9) | 20 (32.3) | 31 (50.0) |
| 7. Skills to use MedlinePlus for researching wellness and prevention | 3 (4.8) | 3 (4.8) | 8 (12.9) | 20 (32.3) | 28 (45.2) |

Table 3: Impact of MedlinePlus lessons: participants’ responses (n = 62)

Table 4: Pre- and posttest performance on general nutrition knowledge (n = 62)

| Options                                                                 | Participants responding incorrectly at pretest N (%) | Participants responding incorrectly at posttest N (%) | % Improvement posttest incorrect/pretest incorrect minus 100 |
|------------------------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|----------------------------------------------------------|
| Is it healthier to eat these foods that have high or low . . . ?        |                                                     |                                                     |                                                          |
| Sugar                                                                  | 6 (9.7)                                             | 3 (4.8)                                             | 50.0                                                     |
| Fiber                                                                  | 15 (24.2)                                           | 6 (9.7)                                             | 60.0                                                     |
| Cholesterol                                                            | 8 (12.9)                                            | 7 (11.3)                                            | 12.5                                                     |
| Salt                                                                   | 6 (9.7)                                             | 3 (4.8)                                             | 50.0                                                     |
| Fat                                                                    | 3 (4.8)                                             | 1 (1.6)                                             | 66.7                                                     |
| Which of these foods are good sources of fiber?                         |                                                     |                                                     |                                                          |
| Beans                                                                  | 35 (56.5)                                           | 10 (16.1)                                           | 71.5                                                     |
| Cheese                                                                 | 48 (77.4)                                           | 36 (58.1)                                           | 25.0                                                     |
| White bread                                                            | 34 (54.8)                                           | 21 (33.9)                                           | 38.3                                                     |
| Whole wheat bread                                                      | 14 (22.6)                                           | 4 (6.5)                                             | 71.4                                                     |
| Whole milk                                                             | 40 (64.5)                                           | 30 (48.4)                                           | 25.0                                                     |
| Skim milk                                                              | 45 (72.6)                                           | 49 (79.0)                                           | 8.0                                                      |
| Fruit                                                                  | 21 (33.9)                                           | 14 (22.6)                                           | 33.4                                                     |
| Bran cereal                                                            | 23 (37.1)                                           | 7 (11.3)                                            | 69.6                                                     |
| Vegetables                                                             | 22 (35.5)                                           | 7 (11.3)                                            | 68.2                                                     |
tervention intensity to achieve behavioral change in computer-based or combined computer-based and face-to-face interventions have not been reported.

Limitations of this study included the small sample size of 62 students, short intervention period, and lack of a parallel comparison group and long-term follow-up. While 113 FCS students participated in the lessons, 51 of them could not be included in the pilot trial largely because their parents did not complete consent forms. There is a need to more effectively sensitize parents to the importance of research aimed at improving access to reliable health information and developing strategies to improve their children's food choices. While interventions of longer duration are desirable, they are often not feasible in school settings because of highly structured standard curricula and heavy teacher work loads. Pilot studies such as this one cannot be used to make broad generalizations but can provide justification for larger efficacy studies of longer duration with a comparison group and follow up. In addition to outcome measures, follow-up studies should be designed to provide insight into the intervention process, especially family feedback from activities such as the “table talk” homework and qualitative performance of individual students on MedlinePlus exercises.

CONCLUSIONS

MedlinePlus offers great potential for enhancing the reliability and validity of online health information seeking by adolescents now and into the future. Integrating face-to-face classroom instruction on topics of diet and disease prevention with MedlinePlus exercises is a feasible approach to providing trustworthy information to growing numbers of youth commonly seeking health information on the Internet. Future studies should focus on processes and outcomes for determining the level of intervention intensity required to achieve behavioral change in face-to-face dietary interventions for chronic disease prevention that integrates MedlinePlus exercises.

A research design that incorporates collaboration between nutritionists and librarians is likely the best way forward. In such an arrangement, subject matter would be the responsibility of the nutrition faculty and methods for using MedlinePlus for health information seeking would be the responsibility of library sciences faculty. Both nutritionists and librarians are well positioned to promote and orient teachers and students to sanctioned Internet sources through nutrition and health information models such as the one presented here. Integration of jointly trained and supervised students from both disciplines in the implementation of intervention research would contribute both to the experiential needs of college students and program training and support needs of participating middle school teachers. The urgency to act is imminent. Nine million children over 6 years of age are overweight or obese, which predisposes them to early onset of mortal chronic diseases [18]. Even so, only 30% of adolescents consume a diet consistent with chronic disease prevention [19]. The expertise of nutritionists and librarians could contribute significantly toward remedying this situation.

ACKNOWLEDGMENTS

The authors are grateful to the following teachers of middle schools and high schools located in Tallahassee, Florida, who participated in developing the MedlinePlus exercises and integrating them into the “Diet and Disease” lesson unit: Ethel Harvey, Chiles High School; Jamey Hill, Griffin Middle School; Patricia Lee, Raa Middle School; Gala Sanders, Chiles High School; and Anita Cathy York, Fairview Middle School. This study was carried out at Raa Middle School in FCS classes in collaboration with Patricia Lee, FCS teacher. The collaboration and support from Lee, the Raa administration, and staff are fully appreciated. Very special thanks are extended to the FCS students for their participation and cooperation. Also deeply appreciated are the contributions of dietetics students enrolled in a community nutrition class at The Florida State University, who implemented lesson activities under the supervision of their professor (Rankins) and graduate student group leaders: Alana Hopewell, Dykibra Montgomery, Susan Oladeji, and Jaleena Worthing. The authors are also very grateful to Yolanda Bogan for developing the MedlinePlus student satisfaction survey (Appendix B).

REFERENCES

1. Subrahmanyam K, Greenfield P, Kraut R, Gross E. The impact of computer use on children’s and adolescents’ development. J Appl Dev Psychol 2001 Jan/Feb;22(1):7–30.
Integrating MedlinePlus exercises

2. Guinee K, Eagleton MB, Hall TE. Adolescents’ Internet search strategies: drawing upon familiar cognitive paradigms when accessing electronic information sources. J Educ Comput Res 2003;29(3):363–74.

3. Skinner H, Biscope S, Poland B, Goldberg E. How adolescents use technology for health information: implications for health professionals from focus group studies. J Med Internet Res [serial online]. 2003 Dec;5(4):e32. [cited 20 Apr 2004]. <http://www.jmir.org/2003/4/4/210>.

4. Borzekowski DLG, Rickert VI. Adolescents, the Internet, and health issues of access and content. J Appl Dev Psychol 2001 Jan/Feb;22(1):49–59.

5. Gray NJ, Klein JD, Noyce PR, Sesselberg TS, Cantrill JA. Health information-seeking behaviour in adolescence: the place of the Internet. Soc Sci Med 2005 Apr;60(7):1467–78.

6. Smith PK, Fox AT, Davies P, Hamid-Manesh L, Cyberchondriacs. Int J Adolesc Med Health 2006 Apr-Jun;18(2):209–13.

7. Committee on Progress in Preventing Childhood Obesity, Food and Nutrition Board. Progress in preventing childhood obesity: how do we measure up? Washington, DC: Institute of Medicine of the National Academies, 2006.

8. Hansen DL, Derry HA, Resnick PJ, Richardson CR. Adolescents searching for health information on the Internet: an observational study. J Med Internet Res [serial online]. 2003 Dec;5(4):e25. [cited 20 Apr 2004]. <http://www.jmir.org/2003/4/4/210>.

9. Marill JL, Miller N, Kitendaugh P. The MedlinePlus public user interface: studies of design challenges and opportunities. J Med Libr Assoc 2006 Jan;94(1):30–40.

10. Warner DG, Olney CA, Wood FB, Hansen L, Bowden VM. High school peer tutors teach MedlinePlus: a model for Hispanic outreach. J Med Libr Assoc 2005 Apr;93(2):243–52.

11. Rankins J, Weatherspoon L, Cook L, Reed C, Shufford-Law J, Davis Y, Kissinger M, Ralston P. Influences of a chronic disease risk reduction curriculum called “Live” on fat and fiber knowledge and attitudes of black and white adolescents, J Nutr Educ 2000 Jan/Feb;32(1):14–20.

12. Florida Department of Education. Sunshine State Standards. [Web document]. The State. [cited 1 Dec 2006]. <http://www.fldoe.org/doi/ccurric/prek12/frame2.htm>.

13. Johnson DW, Johnson RT. The process of nutrition education. J Nutr Educ 1985;17:S1–7.

14. Department of Nutrition, Food, and Exercise Sciences, Florida State University. The nutrition neighborhood, nutrition lessons, adolescents. [Web document]. Tallahassee, FL: The Department, 2005. [rev. 10 Jul 2006; cited 1 Feb 2007]. <http://www.chs.fsu.edu/nfes/nutrition/nutritionlessons.htm>.

15. Litwin MS. How to measure survey reliability and validity. Thousand Oaks, CA: Sage, 1995.

16. Sapp SG, Jensen HH. Reliability and validity of nutrition knowledge and diet-health awareness tests developed from 1989–1991 Diet and Health Knowledge Surveys. J Nutr Educ 1997 Mar–Apr;29(2):63–72.

17. Contenko I, Balch G, Bronner YL, Lytle LA, Maloney SK, Olson CM, Swadener SS. The effectiveness of nutrition education and implications for nutrition education policy, programs and research: a review of research. J Nutr Educ 1995; 27(6):n.p.

18. Committee on Prevention of Obesity in Children and Youth, Food and Nutrition Board. Preventing childhood obesity: health in the balance. Washington, DC: Institute of Medicine of the National Academies, 2005.

19. Munoz KA, Krebs-Smith SM, Ballard-Barbash R, Cleveland LE. Food intakes of U.S. children and adolescents compared with recommendations. Pediatrics 1997 Sep;100(3):323–9.

AUTHORS’ AFFILIATIONS

Jenice Rankins, EdD, jrankins@mailer.fsu.edu, Associate Professor, Department of Nutrition, Food, and Exercise Sciences, College of Human Sciences, Florida State University, Tallahassee, FL 32306-1493; Otis Kirksey, PharmD, otis.kirksey@famu.edu, Professor and Director, Division of Pharmacy Practice, College of Pharmacy and Pharmaceutical Sciences, Florida A&M University, Tallahassee, FL 32307; Yolanda Bogan, PhD, yolanda.bogan@famu.edu, Director and Associate Professor, Clinical Coordinator, Mental Health Counseling Program, Florida A&M University, Tallahassee, FL 32307; Betty Brown, MS, brown@acns.fsu.edu, Statistical Consultant, University Computing Services, Florida State University, Tallahassee, FL 32306

Received February 2007; accepted May 2007