

Obesity Risk for Young Children: Development and Initial Validation of an Assessment Tool for Participants of Federal Nutrition Programs

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Abstract

This paper describes the development of a parent-report obesity risk assessment tool for young children and the efforts to establish the tool's face validity with parents of low socioeconomic status who are participants of four federal nutrition assistance programs. Cognitive interviews (n=77) with ethnically diverse low-income parents provided contextually rich qualitative data for instrument development, including how respondents interpreted text and photographs and their recommendations for changes to improve understanding, consistency of interpretation, and appeal by limited literacy readers. Respondents modified text for all questions, revised content for most photographs, identified unnecessary text for elimination and suggested visual content to replace text resulting in a new version with first-grade readability and a low respondent burden of ten to fifteen minutes for completion. Interview results provided support for the face validity of the tool, now called Healthy Kids, with low-income respondents.

Keywords: overweight, obesity, young children, preschool, face validity, qualitative research

Introduction

Parents have direct influence over young children's physical and social environments and specifically their physical activity, eating, sleep, and lifestyle behaviors (American Academy of Pediatrics 2003). Yet, many families are practicing nutrition, parenting, and lifestyle behaviors that set young children on trajectories for unhealthy weight gain with 31 percent of low-income preschoolers overweight or obese in the United States (Ogden, Carroll, and Flegal 2012). Several studies show that this young age is ideal for intervention to establish obesity preventive behaviors as "the usual routine" (American Academy of Pediatrics 2003). Recognizing that parents directly influence their children's physical, eating, and social environments, the Institute of Medicine (IOM) and the American Academy of Pediatrics [AAP] recommend the development of assessments targeting families' modifiable environmental and behavioral factors associated with the risk of pediatric obesity (AAP 2003; IOM 2005).

Consistent with the AAP recommendation, a comprehensive evidence-based literature review identified twelve modifiable determinants of pediatric obesity (Ontai et al 2009). Another review focused on the behaviors practiced by low-income families within each of these twelve identified determinants and the corresponding tools available (Townsend et al. 2009). Four validation studies produced assessment tools for low-income three- to five-year-old children for two of the twelve determinants of obesity: dietary fat (Frank et al. 1991; Dennison et al. 2009) and parenting styles (Power et al. 2002; Hughes et al. 2005). Subsequently, Ihmels et al. (2009a and 2009b) developed the Family Nutrition and Physical Activity Screen Tool to assess family environmental and behavioral determinants in school-aged children six to twelve years old. Dickin et al. published a fifteen-item evaluation tool for an EFNEP intervention targeting parents of children three to eleven years old in New York State (Dickin et al. 2012). Importantly, no pediatric obesity risk assessment tools covering eleven or twelve determinants in the diet, lifestyle, and parenting behavioral categories were appropriate for low-income parents of three- to five-year-old children in a group community setting. In proposing the development of such a tool targeting these determinants, four federal programs should be considered for its use because they offer an excellent environment in which to make an impact on the pediatric obesity prevalence and are available in all or most low-income communities (Townsend 2006a). They include the following: Head Start (U.S. Department of Health and Human Services 2014); Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (U.S. Department of Agriculture Food and Nutrition Service 2014a); SNAP-Ed (U.S. Department of Agriculture Food and Nutrition Service 2014b) and EFNEP (U.S. Department of Agriculture National Institute for Food and Agriculture 2014).

Requirements for tool. Several characteristics of this proposed assessment tool should be considered. With literacy an issue in low-income communities, use of realistic visuals on a tool has been shown to increase learner understanding with incorporation of visual information

processing theories to the design (Levie and Lentz 1982). Further, the psychometric properties of reliability and validity are enhanced by giving attention to readability, format, and learning environment to enhance participant understanding with the application of cognitive load theory to the assessment process (Townsend et al. 2014). Consequently, the ideal obesity risk tool would be appropriate for non- and limited-literacy readers as described above; be self-administered by the parent to accommodate needs of community-based education (Townsend et al. 2003); be brief, taking no more than fifteen to twenty-five minutes of nutrition education class time (U.S. Department of Health and Human Services 2014; Townsend 2006b); have potential to be self-scored; be sufficiently attractive to hold the attention and interest of program participants (Johns and Townsend 2010) and have the ability to discriminate among targeted users.

Objective. The Socio-Ecological Model (SEM) and the aforementioned literature reviews guided tool development, with recognition that parents create and control the home environment for their children (U.S. Department of Agriculture Food and Nutrition Service 2014a). They make healthful food available and model its consumption at meals and snacks. Likewise, they control the child's environment for sleep, physical activity, and screen time while modelling corresponding healthful behaviors (AAP 2003).

In order to increase the likelihood of a tool meeting these aforementioned properties, maximizing the tool's face validity from the perspective of the participant or end user is vital (Townsend 2006b). With that in mind, this paper describes the development of a parent-report obesity risk assessment tool for young children, specifically in terms of question wording, photographs and response options, and the efforts to establish the tool's face validity with parents of young children of low socioeconomic status.

Methods

Subject matter content of tool. To establish content validity, the subject matter for this tool was identified from results of comprehensive literature reviews for the broad determinants of obesity, corresponding behaviors and survey items. Using evidence-based analysis, twelve empirically supported determinants of pediatric obesity were identified (Ontai et al. 2009). Behaviors [n=23] in the child's environment related to food, physical activity, screen time, sleep, and parenting practices were revealed in subsequent literature reviews (Townsend et al. 2009). Coincidentally, these behaviors are consistent with the principles of SEM which will guide an accompanying education intervention.

Versions of tool. Initial wording of questionnaire items is shown in Table 1, Column 1 and reflected: results of the literature review mentioned above and the federal EFNEP databank of nearly 200 test questions. Respondent interviews described below generated the subsequent versions leading to the revised text with photographs shown in Table 1, Column 2. Using

principles from the *Evaluator's Division of Responsibility* model for tool development (Townsend et al. 2014), researchers planned the subject matter content of the tool (Ontai et al. 2009) to reflect the twenty-three identified behaviors (Townsend et al. 2009). Note: The twelfth determinant, parenting style, is represented in a second visually enhanced tool, *My Child at Meal Time*, and is reported elsewhere. Respondents decided “how” to ask each question including preferences for item structure, wording and photographic content (Townsend et al. 2008; Banna et al. 2010). A behavioral checklist format (U.S. Department of Health and Human Services 2014; Townsend et al. 2003) and its visually enhanced version (Banna et al. 2010) were selected for the tool for the ease of self-administration by parents in group classes with the concomitant requirement for reading skills.

Interview protocol. To understand how low-income parents interpreted proposed questions, contextually rich qualitative data were collected using in-depth cognitive interviewing procedures, with each interview lasting about forty-five to sixty minutes (n=77) (Willis 1994). Interviews were conducted at three Head Start sites in two contiguous California counties over a five-year period, 2005-2009, by the first author with a co-author taking notes. The protocol was approved by the Institutional Review Board of the University of California, Davis.

Cognitive interviewing. Three strategies were employed to uncover the cognitive processes occurring as respondents thought about and developed answers to potential items and corresponding visuals: concurrent think-aloud technique, paraphrasing strategy, and probing question strategy (Willis 1994). The traditional text-only strategies were expanded to include photographs (Townsend et al. 2008; Banna et al. 2010). To that end, respondents were asked, “Looking at this photo, is there a better way to make a picture of the words?” and “Are there any words we might remove and show in a photo?”

Interviewees. Respondents (n=77) were ethnically diverse parents or caregivers, over the age of 18 years and who understood English as a first or second language, and had at least one child between the ages of two and five enrolled in Head Start [160 percent poverty threshold maximum]. Respondents received a \$10 gift card from a local chain store.

Photographic sessions. Participant families in the photographic sessions were volunteers recruited from the four sites in the same two counties. Our first approach using on-line photo galleries and second approach photographing in a lab were unsuccessful with parents who commented, “The people in these pictures do not look like me and my family and apartment.” For the third approach, we staged and photographed respondents and their children in their kitchens, bedrooms, backyards, and grocery stores demonstrating the twenty-three behaviors illustrated on the tool. Although expensive in terms of staff time and participant compensation, parents expressed universally positive reactions to these photographs. The advantage of this

approach is the tailoring of visual information to the race, ethnicity, socioeconomic status, and physical environment of the target audience.


Face validity. Using an iterative process with each interview building upon previous respondent suggestions, respondents examined each successive version of the tool and made additional recommendations (Townsend et al. 2008; Banna et al. 2010). The process continued until respondents were satisfied with their choice of words, item structure, and visuals, and researchers agreed the message was consistent with original intent for each item (Banna et al. 2010).

Readability. Readability of the text component of the visually enhanced items was assessed by the Flesch-Kincaid Reading Index and Flesch Reading Ease using Microsoft Word software (MS Office for PC, Microsoft, Inc., Seattle, 2003). No method currently exists for assessing readability of text with visual (Townsend et al. 2008; Banna et al. 2010).

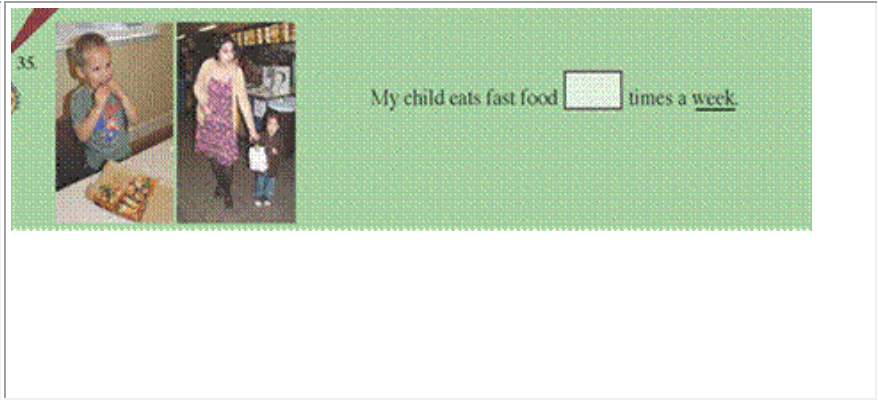

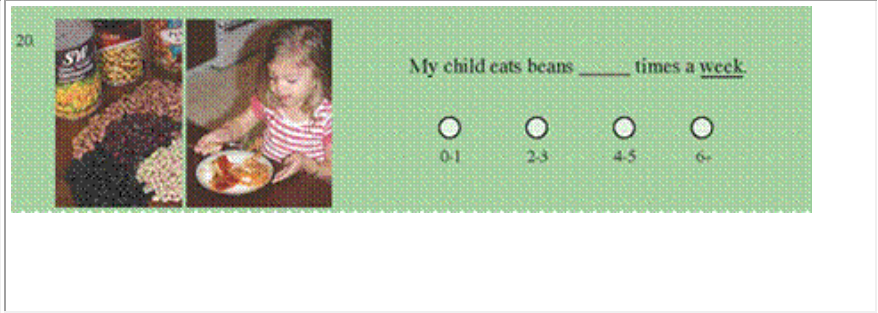
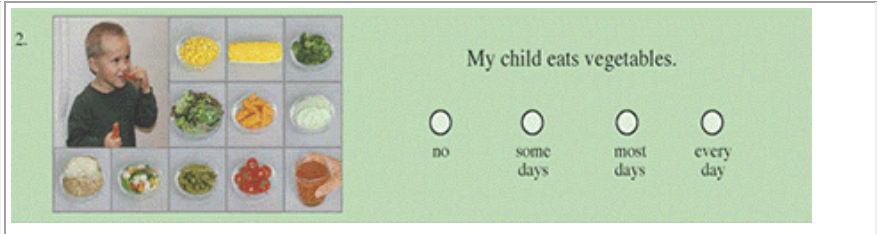
Respondent burden. One final consideration for tools is the ease with which they may be self-administered in parent classes (Townsend et al. 2014). Respondents unfamiliar with the tool were observed and timed completing it.







Table 1: Initial and modified item text with visuals

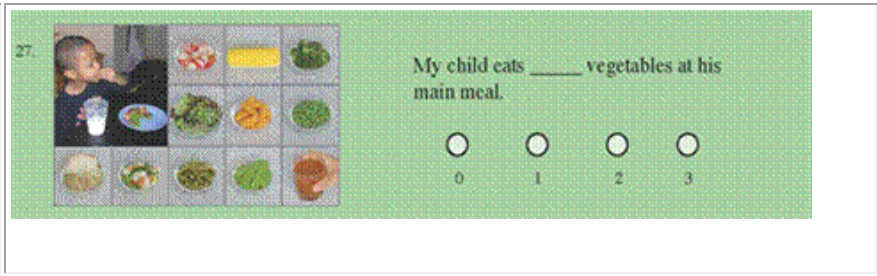
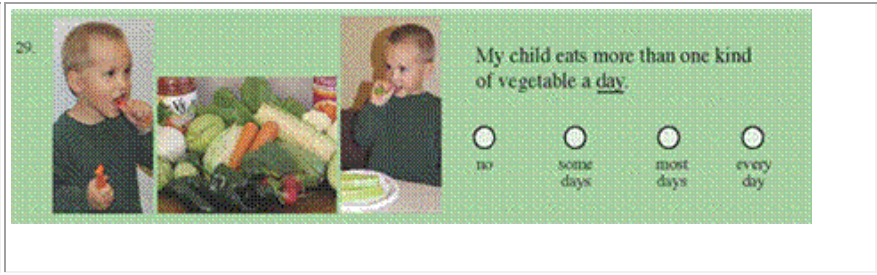
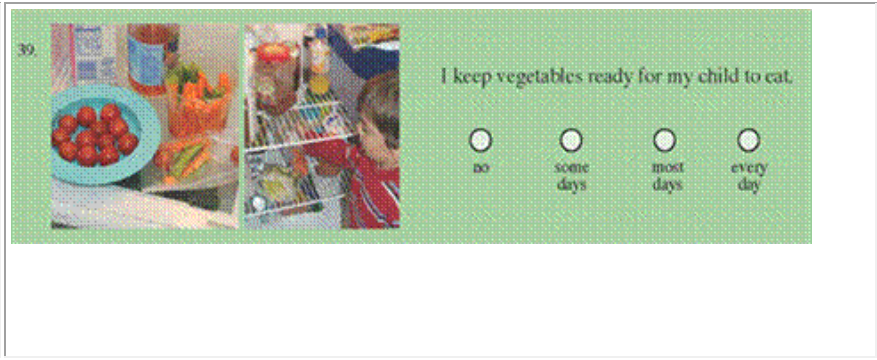
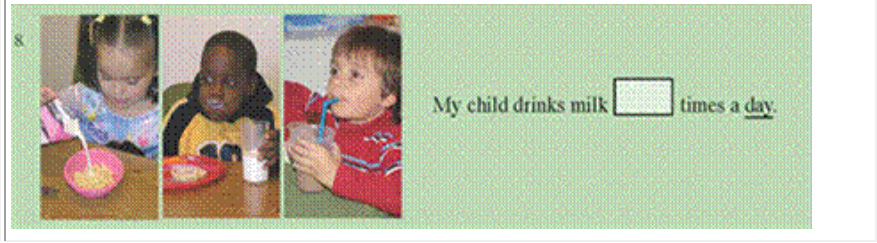
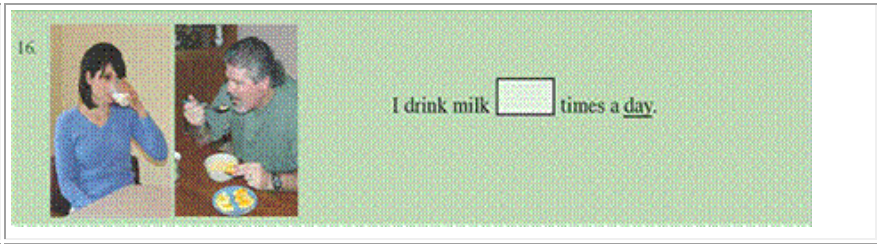
(Table 1 Summary: Initial and modified versions of forty-five items and visuals on the *Healthy Kids* pediatric obesity risk assessment tool following cognitive interviews (n=77) with low-literate program participants: word count, syllable count, Flesch-Kincaid Readability Index with items grouped by determinant of obesity)

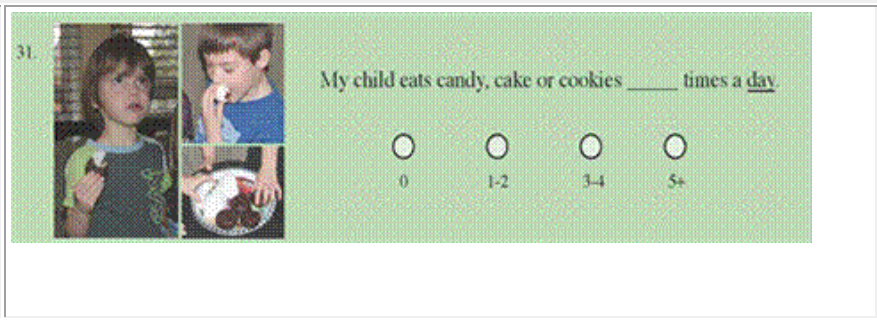
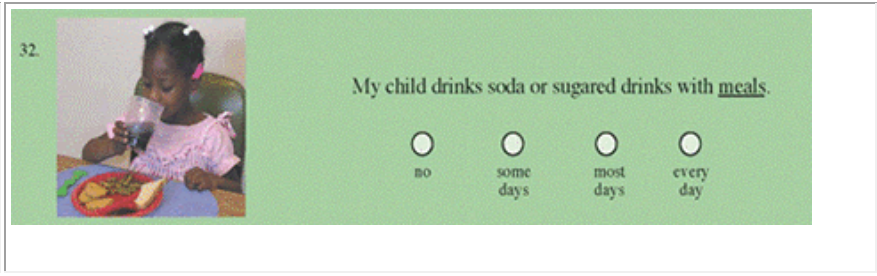
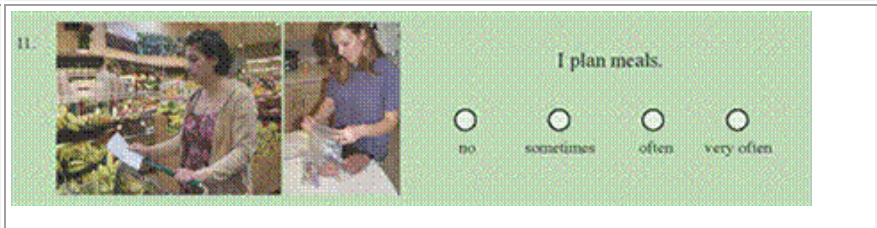
Item Initial version	Item after cognitive interviews
Determinant of obesity DIETARY FAT	
What kind of milk does your child usually drink? (9 words, 12 syllables) ➔ (4 words, 4 syllables)	 <p>The image shows a survey question: "My child drinks milk." Below the text are six radio button options: "no", "whole", "2% reduced fat", "1% lowfat", "skim/nonfat", and "soy". Above each option is a small image of a milk carton: "Whole Milk", "2% Reduced Fat Milk", "1% Lowfat Milk", "Fat Free Milk", and "Soy Milk".</p>







<p>Do you usually trim the fat before serving and eating meat? (11 words, 17 syllables) ➡ (6 words, 8 syllables)</p>	<p>43.  I trim fat before eating meat. <input type="radio"/> no <input type="radio"/> sometimes <input type="radio"/> often <input type="radio"/> very often</p>
<p>Do you usually remove the skin before eating chicken or turkey? (11 words, 18 syllables) ➡ (6 words, 7 syllables)</p>	<p>44.  I eat the skin on chicken. <input type="radio"/> no <input type="radio"/> sometimes <input type="radio"/> often <input type="radio"/> very often</p>
<p>In a typical week, how often do you serve fried foods to your family? (14 words, 19 syllables) ➡ (8 words, 10 syllables)</p>	<p>38.  My family eats fried foods _____ times a <u>week</u>.</p>
<p>DIETARY ENERGY DENSITY</p>	
<p>In a typical month, how often do you buy chips, candy or cookies for your child to eat? (18 words, 23 syllables) ➡ (6 words, 8 syllables)</p>	<p>18.  I buy chips, candy or cookies. <input type="radio"/> no <input type="radio"/> sometimes <input type="radio"/> often <input type="radio"/> very often</p>
<p>In a typical day, how many times does your child snack on high fat snacks such as chips? (19 words, 22 syllables) ➡ (7 words, 7 syllables)</p>	<p>36.  My child eats chips for snacks _____ times a <u>day</u>. <input type="radio"/> 0 <input type="radio"/> 1-2 <input type="radio"/> 3-4 <input type="radio"/> 5+</p>
<p>In a typical week, how often does your child eat energy dense snack foods like cookies, chips and candy? (19 words, 22 syllables) ➡ (7 words, 7 syllables)</p>	<p>21.  My child eats snack foods like cookies, chips and candy. <input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>

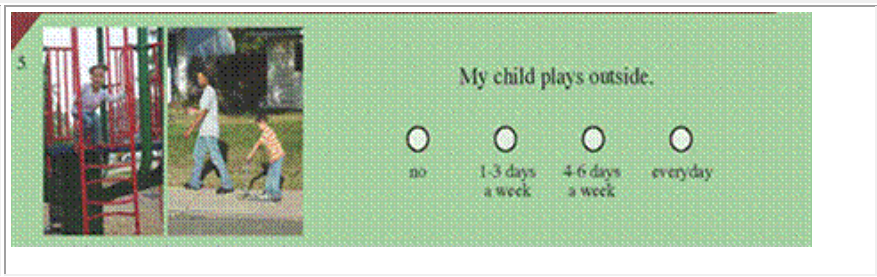
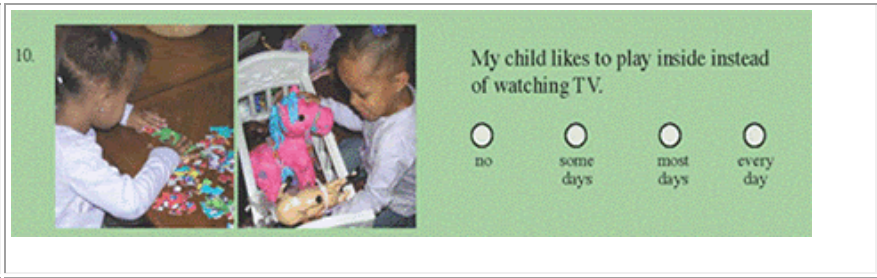

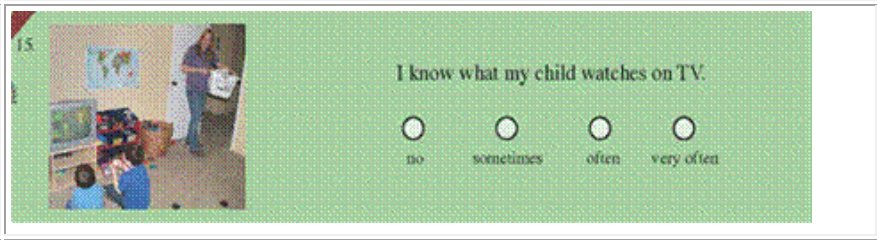

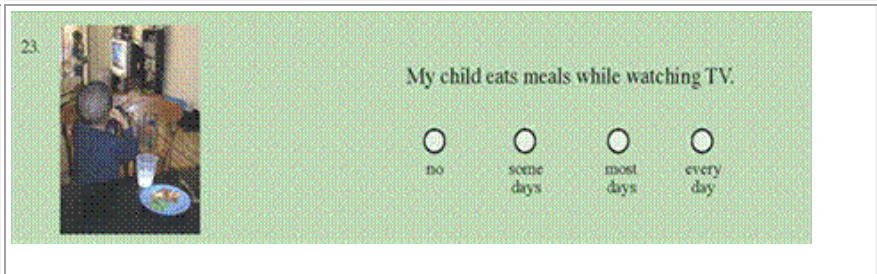
<p>(19 words, 26 syllables) ➡ (10 words, 12 syllables)</p>	
<p>RESTAURANT PREPARED FOOD</p>	
<p>In a typical week, how often do your children usually eat take out, delivery, or fast foods [such as burgers, fried chicken, pizza, Chinese food)? (25 words, 39 syllables) ➡ (8 words, 8 syllables)</p>	 <p>35. My child eats fast food <input type="text"/> times a <u>week</u>.</p>
<p>In a typical week, how often does your family eat in a fast food outlet or other restaurant? (19 words, 28 syllables) ➡ (6 words, 6 syllables)</p>	 <p>40. We eat out <input type="text"/> times a <u>week</u>.</p>
<p>DIETARY FIBER PLUS FRUIT/VEGETABLE ITEMS</p>	
<p>How often do you give beans such as pinto, black, garbanzo, and kidney and other legumes to your child to eat? (21 words, 28 syllables) ➡ (7 words, 7 syllables)</p>	 <p>20. My child eats beans _____ times a <u>week</u>.</p> <p><input type="radio"/> 0-1 <input type="radio"/> 2-3 <input type="radio"/> 4-5 <input type="radio"/> 6+</p>
<p>FRUIT/VEGETABLES</p>	
<p>Thinking about the last month, how often do your children eat vegetables? (12 words, 19 syllables) ➡ (4 words, 7 syllables)</p>	 <p>2. My child eats vegetables.</p> <p><input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>







<p>Thinking about what your child usually eats, how often does your child eat fruit? (14 words, 20 syllables) ➡ (4 words, 4 syllables)</p>	<p>7.  My child eats fruit.</p> <p><input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>
<p>How often do you buy vegetables for your child to eat when you shop for groceries? (16 words, 22 syllables) ➡ (3 words, 6 syllables)</p>	<p>13.  I buy vegetables.</p> <p><input type="radio"/> no <input type="radio"/> sometimes <input type="radio"/> often <input type="radio"/> very often</p>
<p>Thinking about last month, how often do you keep fruit, such as grapes, apples or bananas, washed and ready for your child to eat? (24 words, 31 syllables) ➡ (9 words, 10 syllables)</p>	<p>19.  I keep fruit ready for my child to eat.</p> <p><input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>
<p>How often do you buy fruit for your child to eat when you shop for groceries? (16 words, 20 syllables) ➡ (3 words, 3 syllables)</p>	<p>14.  I buy fruits.</p> <p><input type="radio"/> no <input type="radio"/> sometimes <input type="radio"/> often <input type="radio"/> very often</p>
<p>Is your child a picky eater (only eats certain foods, will not try new foods)? (15 words, 19 syllables) ➡ (9 words, 11 syllables)</p>	<p>25.  My child is picky about the foods he eats.</p> <p><input type="radio"/> no <input type="radio"/> sometimes <input type="radio"/> often <input type="radio"/> very often</p>
<p>Thinking about last month, how often does your child eat snack foods like apples, bananas or carrots?</p>	<p>26.  My child eats snack foods like apples, bananas or carrots.</p> <p><input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>

<p>(17 words, 24 syllables) ➡ (10 words, 14 syllables)</p>	
<p>Thinking about last month, how many vegetables does your child eat at his main meal? (15 words, 21 syllables) ➡ (9 words, 11 syllables)</p>	
<p>On a typical day, does your child eat more than one kind of vegetable? (14 words, 19 syllables) ➡ (11 words, 14 syllables)</p>	
<p>In a typical month, how often do you keep vegetables, washed, trimmed, sliced and refrigerated, ready for your child to eat? (21 words, 32 syllables) ➡ (9 words, 13 syllables)</p>	
<p>DAIRY</p>	
<p>On a typical day, how often does your child drink milk? (11 words, 14 syllables) ➡ (7 words, 7 syllables)</p>	
<p>Thinking about the parent, how many times a day do you drink milk? (13 words, 17 syllables) ➡ (6 words, 6 syllables)</p>	
<p>ADDED SUGAR</p>	

<p>How many times a day does your child eat high sugar foods such as candy, cake or cookies? (18 words, 22 syllables) ➡ (10 words, 12 syllables)</p>	 <p>31. My child eats candy, cake or cookies ___ times a <u>day</u>.</p> <p>0 1-2 3-4 5+</p>
<p>SUGAR SWEETENED BEVERAGES</p>	
<p>How often do your children drink sugar sweetened beverages with meals? (11 words, 18 syllables) ➡ (9 words, 11 syllables)</p>	 <p>32. My child drinks soda or sugared drinks with <u>meals</u>.</p> <p>no some days most days every day</p>
<p>How often do your children drink regular [NOT diet] soda? (10 words, 16 syllables) ➡ (7 words, 8 syllables)</p>	 <p>33. My child drinks soda <input type="text"/> times a <u>day</u>.</p>
<p>How often do your children consume sports drinks or other sugar sweetened beverages? (13 words, 22 syllables) ➡ (11 words, 12 syllables)</p>	 <p>34. My child drinks sport drinks or sugared drinks <input type="text"/> times a <u>day</u>.</p>
<p>PARENTING PRACTICES</p>	
<p>How often do you plan meals ahead of time for your family? (12 words, 16 syllables) ➡ (3 words, 3 syllables)</p>	 <p>11. I plan meals.</p> <p>no sometimes often very often</p>

<p>Thinking about last month, how many times a day did you eat fruit? (13 words, 16 syllables) ➡ (6 words, 6 syllables)</p>	<p>12.  I eat fruit <input type="text"/> times a <u>day</u>.</p>
<p>Do you usually role model eating vegetables for your child? (10 words, 18 syllables) ➡ (6 words, 9 syllables)</p>	<p>37.  My child sees me eat vegetables.</p> <p><input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>
<p>In a typical month, how often do you eat dinner or share a meal with your child? (17 words, 21 syllables) ➡ (9 words, 9 syllables)</p>	<p>41.  I sit and eat a meal with my child.</p> <p><input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>
<p>On average, how many hours of TV do you watch every day? (12 words, 17 syllables) ➡ (6 words, 7 syllables)</p>	<p>45.  I watch TV <input type="text"/> hours a <u>day</u>.</p>
<p>Thinking about a typical week, how often do you cook dinner for your child? (14 words, 20 syllables) ➡ (6 words, 6 syllables)</p>	<p>42.  I fix meals for my child.</p> <p><input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>
<p>PHYSICAL ACTIVITY</p>	
<p>Thinking about a usual day, how many hours is your child physically active outside? (14 words, 24 syllables) ➡ (7 words, 8 syllables)</p>	<p>1.  My child is outside _____ hours a <u>day</u>.</p> <p><input type="radio"/> 0-1 <input type="radio"/> 1-2 <input type="radio"/> 2-4 <input type="radio"/> 4+</p>

<p>Thinking about a usual week, how many days is your child physically active outside? (14 words, 24 syllables) ➡ (4 words, 5 syllables)</p>	 <p>5</p> <p>My child plays outside.</p> <p><input type="radio"/> no <input type="radio"/> 1-3 days a week <input type="radio"/> 4-6 days a week <input type="radio"/> everyday</p>
<p>Thinking about a typical week, does your child enjoy playing more than watching TV? (14 words, 22 syllables) ➡ (9 words, 14 syllables)</p>	 <p>10.</p> <p>My child likes to play inside instead of watching TV.</p> <p><input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>
<p>How often are you physically active outside with your child? (10 words, 16 syllables) ➡ (9 words, 10 syllables)</p>	 <p>17.</p> <p>I play outside with my child ___ days a week.</p> <p><input type="radio"/> 0-1 <input type="radio"/> 2-3 <input type="radio"/> 4-6 <input type="radio"/> 7</p>
<p>SCREEN TIME</p>	
<p>Are you familiar with each program that your child watches on television? (12 words, 19 syllables) ➡ (8 words, 10 syllables)</p>	 <p>15.</p> <p>I know what my child watches on TV.</p> <p><input type="radio"/> no <input type="radio"/> sometimes <input type="radio"/> often <input type="radio"/> very often</p>
<p>Does your child have a television in his or her bedroom? (11 words, 15 syllables) ➡ (8 words, 10 syllables)</p>	 <p>22</p> <p>My child has a TV in his bedroom.</p> <p><input type="radio"/> no <input type="radio"/> yes</p>
<p>How often does your child watch television while eating a meal or snack? (13 words, 18 syllables) ➡ (7 words, 9 syllables)</p>	 <p>23.</p> <p>My child eats meals while watching TV.</p> <p><input type="radio"/> no <input type="radio"/> some days <input type="radio"/> most days <input type="radio"/> every day</p>

<p>How much time in hours do your children spend watching television? (11 words, 16 syllables) ➡ (7 words, 9 syllables)</p>	<p>24.  My child watches TV _____ hours a <u>day</u>. ○ 0-1 ○ 1-2 ○ 2-3 ○ 3-4 ○ 4+</p>
<p>How many hours a day do your children watch or use a computer screen for playing video or computer games? (20 words, 30 syllables) ➡ (10 words, 15 syllables)</p>	<p>30.  My child plays video or computer games _____ hours a <u>day</u>. ○ 0-1 ○ 1-2 ○ 2-3 ○ 4+</p>
<p>BREAKFAST</p>	
<p>Thinking about a typical week, how often does your child eat cereal for breakfast? (14 words, 22 syllables) ➡ (9 words, 12 syllables)</p>	<p>28.  My child eats cereal for breakfast <input type="text"/> times a <u>week</u>.</p>
<p>Thinking about a typical week, how often does your child eat breakfast? (12 words, 18 syllables) ➡ (7 words, 8 syllables)</p>	<p>6.  My child eats breakfast <input type="text"/> times a <u>week</u>.</p>
<p>SLEEP [DURATION]</p>	
<p>Thinking about a usual week, how many hours does your child sleep each night? (14 words, 19 syllables) ➡ (6 words, 7 syllables) ➡ (7 words, 9 syllables)</p>	<p>4.  My child gets up around <input type="text"/> A.M.</p> <p>3.  My child goes to bed around <input type="text"/> P.M.</p>

READABILITY	
FLESCH-KINCAID INDEX 6.8 grade level or approximately seventh-grade reading level	1.2 grade level or approximately first-grade reading level
FLESCH READING EASE Score of 72, meaning a seventh- to ninth-grade reading level	Score of 99 [of a possible 100], meaning easiest reading level

Results

Cognitive testing. Parents recommended word substitutions using familiar vocabulary with fewer syllables for twenty-four test items, response options for twenty-eight items, instructions, and tool title. They suggested representative visuals as substitutes for text for eighteen items and identified some words as redundant, implied, or unnecessary for nineteen items. They suggested modifications to the initial version of thirty visuals to add clarification to text. Three examples of respondent suggestions from cognitive interviews are described below.

◆ During interviews, respondents repeatedly expressed the preference for the short declarative statement [Q11 “I plan meals.”] over more complex interrogative version [Q11 “How often do you plan meals ahead of time?”]. The original version included nine words and eleven syllables and an interrogative sentence structure. Respondents recommended new wording to increase understanding by low-literate parents, reducing the item to three words and three syllables plus a two-part photograph of a mother with a grocery list in the supermarket and another mother preparing to freeze two- to three-ounce ground beef patties to convey planning ahead [Table 1, Q11]. They felt that the words “ahead of time” were unnecessary stating, “I wouldn’t plan after eating, only before. That’s silly.” They suggested deleting “for my family,” stating that it was implied.

◆ Respondents preferred the simple question structure mentioned above over the more complex structure often used in research. For example, “How often do you buy vegetables for your child?” with nine words and thirteen syllables was simplified to “I buy vegetables” with a two-part visual of a parent and child selecting fresh broccoli in the produce section of the market and a kitchen counter with canned and frozen vegetables [Table 1, Q13]. Respondents felt that “for my child” was redundant. They responded favorably to the changes recommended by other

participants. The simplified version contained three words, six syllables, and a declarative format.

◆ Photographs clarified the content of some items, such as “My child eats beans.” [Table 1, Q20]. Some respondents thought of “bean” as the vegetable green bean when the intent for the dietary fiber determinant is cooked dry beans or legumes. To provide clarity, a two-part visual was added depicting a variety of canned and fresh dry beans and a child eating a meal containing refried beans.

Photographs. Subjects in the photos were representative of diverse clientele at the Head Start and WIC sites. Respondents expressed appreciation that the visuals depicted children and parents like them and in familiar settings. An on-line photo bank is now available to Cooperative Extension professionals for tailoring the tool, now named “*Healthy Kids*,” to specific racial and ethnic groups. These materials can be accessed at <http://healthykids.ucdavis.edu> via three pathways for program directors, educators, and participants.

Readability and respondent burden. A comparison of the initial version of *Healthy Kids* with a subsequent version following the cognitive interviews indicates an improvement in readability of six grade levels, with Flesh-Kincaid indices of 6.8 and 1.2, indicating a seventh and a first-grade reading level. This change is due primarily to three factors: substitution of text with visuals for fewer total words, use of participant vocabulary for item text and response options, and use of participants’ preferred declarative sentence structure. On an item or question basis, the ranges of reading grade levels for each of the forty-five items is 3.7 to 12.0 for the research version and 0 to 4.9 for the low-literate programmatic version. Respondents had suggestions for new phrasing for all forty-five items. No parents complained that the final text was simplistic. The Flesch Reading Ease produced similar results (Table 1).

On average, respondents took ten to fifteen minutes to complete the forty-five-item version of *Healthy Kids*, meeting our criteria for “rapid” assessment. Parents struggling with reading took twenty minutes. Furthermore, the forty-five items with one- and two-syllable wording and the overall simplified format met our criteria for minimal respondent burden for a self-administered tool.

Instruction Guide for field staff. To provide consistency in administration of the tool and reduce random error, a twenty-two-page instruction guide was developed and reviewed by twelve professional experts in program content and paraprofessional staff familiar with low-income clients. The guide includes a description of photographic content and background information for each item, and potential user questions with recommended responses. The new color illustrated *Healthy Kids* (11 x 17” folded, eight-sided booklet) and instruction guide can be viewed at <http://Townsendlab.UCDavis.edu>.

Face validity. Respondents reported the new visually enhanced tool captured their attention, stimulated their interest in the assessment process, motivated them to complete the tool, provided cues to understanding the text, and improved their understanding of the behaviors in question, further ensuring accurate assessment of the targeted behaviors. This phase of questionnaire development rendered a rapid assessment with previously established content validity and now found to have excellent face validity among these respondents.

Discussion

Based on these cognitive interviews, this version of *Healthy Kids* contains forty-five items representing twenty-three behaviors in the child's family environment associated with the eleven broad determinants of pediatric obesity. The results support the face validity of this visually enhanced tool with these parents of young children. Guided by respondents, the items were rewritten in familiar one- and two-syllable vocabulary supported by realistic color photographs for text clarification and substitution generating a parent assessment tool with a readability of grade 1. The tool has a low respondent burden lending it to self-administration and scoring and for use by parents with minimal literacy skills. The tool has potential for use in nutrition education classes at WIC, Head Start, EFNEP, and SNAP-Ed. The results presented here support the importance of the inclusion of visual information to assess complex behavioral concepts producing a reduced literacy burden. The ability of Cooperative Extension professionals to tailor the visual information to the race and ethnicity of the audience is noteworthy. An important finding applicable for researchers developing other tools for low-literate audiences is the preference of these respondents for declarative statements. Our interpretation is that the apparent preference for the simplified declarative structure on the tool may be due to its reduced literacy demands.

This behavioral checklist format with color photographs circumvents the limitations of traditional data collection methods, such as the twenty-four-hour diet recall that is difficult to complete in a group and requires costly data entry and analysis software with an extensive foods database accommodating a wide range of ethnic foods. The reading level for *Healthy Kids* of grade 1 met our goal for this audience. The first-grade level reflected text only, recognizing that the visuals, layout, and overall appeal were not factored directly into the calculation of the index (Townsend et al. 2008; Banna et al. 2010).

Reducing error. Recognizing that no questionnaire or item is perfect, i.e. without error for respondents, a desired outcome of this validation process was reducing the error associated with respondent misunderstanding or skipping items associated with literacy and related motivational issues. To reduce error, the overall tool was structured to appeal to low-literate clients and to motivate them to respond to each item with accuracy. Stimulating client interest in a self-administered measure is important; it serves a motivational function (Townsend et al. 2008;

Keller 2010). When respondent interest is not present, the result is an elevated level of random error (Nunnally and Bernstein 1994). Words of three, four, and five syllables replaced with visuals served what Levie identified as a compensatory function (Levie and Lentz 1982). Items written with the shorter one- and two-syllable words familiar to this audience can enhance understanding and thus the tool's cognitive function for the respondent (Levie and Lentz 1982). The motivational, compensatory, and cognitive functions are particularly important for Cooperative Extension professionals to consider when respondents' primary language is not English or when respondents have minimal literacy skills (Townsend et al. 2014).

Limitations. Applicability of these findings to other low-income audiences is unknown. However, because these findings are consistent with theories of visual information processing (Townsend et al. 2008; Levie and Lentz 1982), with efforts to reduce client cognitive load for audiences with minimal literacy skills (Townsend et al. 2014), and procedures for development of a respondent-driven assessment tool described by the Evaluator's Division of Responsibility (Townsend et al. 2014), our results may be applicable beyond this sample of study respondents. Another limitation is that respondents did not provide demographic information. Because they were recruited at the same sites as a subsequent study (Townsend et al. 2012), we had no reason to suspect they possessed different demographic characteristics from the 206 Head Start parents in that study. On average, those low-income parents were 33.0 years old. They reported having no high school diploma [18 percent], a diploma [28 percent], some college or trade school [41 percent], female [85 percent], married [50 percent], and parenting a 3-5-year-old child [100 percent]. They self-identified as Hispanic [41 percent], white [26 percent], black [18 percent], Asian [6 percent], Native American [2 percent], and other [2 percent] (Townsend et al. 2012).

Next steps. *Healthy Kids* is a work in progress with face validity now established. A critical next step involves reducing the total number of items and determining additional validation using other methods: item analysis, factor and reliability analyses, and convergent validation using parent-report diet, and physical activity and sleep duration assessments on their children's behalf. And finally, we will examine criterion validity using chemical biomarkers and anthropometric measures predictive of excessive weight gain.

Conclusion

Face validity was assessed favorably with this sample of low-income parents. The tool has potential as a rapid and easy-to-administer parent assessment of a child's family environment and the child's risk for becoming overweight or obese. In addition, with prevention key, the tool could be a valuable health promotion opportunity for providing individualized feedback and intervention information to parents enrolled in SNAP-Ed, EFNEP, WIC, or Head Start. Because rigorously validated tools for participants of these federal nutrition programs are few and even

fewer for low-literate participants (Townsend et al. 2009), other researchers could employ these methods in future validation research.

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