

Development of a questionnaire to assess knowledge, attitudes, and behaviors in American Indian children¹⁻³

June Stevens, Carol E Cornell, Mary Story, Simone A French, Sarah Levin, Alberta Becenti, Joel Gittelsohn, Scott B Going, and Raymond Reid

ABSTRACT One aim of the Pathways study is to improve the knowledge, attitudes, and behaviors of American Indian children in grades 3–5 regarding physical activity and diet in. This article describes the development of a culturally sensitive, age-appropriate questionnaire to assess these variables. The questionnaire was designed to be administered in the classroom in two 30-min sessions. Questions were developed to assess 4 key areas: physical activity, diet, weight-related attitudes, and cultural identity. Potential questions were written after review of relevant literature and existing questionnaires. Numerous and extensive revisions were made in response to input from structured, semistructured, and informal data collection. Questions were pretested in 32 children in grades 3–5 by using semistructured interviews. Test-retest reliability and the internal consistency of scales were examined in 371 fourth-grade children and subsequently in 145 fourth-grade children. Questions were reviewed by American Indians from the communities involved in the Pathways study several times during the developmental process. The process described here serves as one model for the development of a culturally appropriate tool to assess knowledge, attitudes, and behaviors in American Indian children. *Am J Clin Nutr* 1999;69(suppl):773S–81S.

KEY WORDS American Indians, attitudes, behaviors, children, knowledge, Pathways, schools, questionnaire development, reliability

INTRODUCTION

Pathways is a multicenter obesity-prevention trial that includes 6 American Indian tribes: Pima-Maricopa, Tohono O'odham, Navajo, White Mountain Apache, Oglala Lakota, and Sicangu Lakota. The objective of Pathways is to prevent obesity in American Indian children through a culturally appropriate, elementary school- and family-based intervention that promotes healthful eating behavior and increased physical activity. Several measures will be collected to determine the effect of the Pathways intervention, including a questionnaire designed to assess the effect of the intervention on knowledge, attitudes, and behaviors (KAB) related to diet and physical activity.

Previous school-based nutrition and physical activity intervention studies in grade-school children have relied on self-reported measures to assess changes in KAB targeted by the

intervention. For example, in the Child and Adolescent Trial for Cardiovascular Health (CATCH) (1), intended food choices, knowledge, and self-efficacy regarding healthful eating among children in grades 3–5 were measured by using a classroom-administered questionnaire. Postintervention healthy-food-choice scores were significantly higher in intervention than in control schools (1). Subsequent work corroborated these findings in children in grades 6–9 and showed that self-reported intentions are consistent over time (2, 3). These findings indicate that this type of questionnaire is sensitive to the effects of a school-based intervention, and can be used successfully in an ethnically and socioeconomically diverse student population such as that targeted by CATCH (1). The results from CATCH suggested that self-report classroom-administered questionnaire measures of behaviors and attitudes would be appropriate for use in the Pathways study.

Cross-sectional studies have shown that food consumption and physical activity are influenced by a variety of psychologic, social, cultural, and environmental factors in addition to biological and developmental factors (4, 5). These factors undoubtedly interact, although the importance of each factor and the nature of the interactions are not known because studies of multiple categories of factors are rare. In addition, there has been no systematic research across different age and ethnic groups. Thus, the relative importance of different factors for different groups and at different developmental periods is not known. The Pathways

¹From the Departments of Nutrition and Epidemiology, University of North Carolina, Chapel Hill; the Department of Medicine, Division of Preventive Medicine, University of Alabama at Birmingham; the Division of Epidemiology, University of Minnesota, Minneapolis; the Department of Pediatrics, University of New Mexico School of Medicine, Albuquerque; the Department of Health Services, Gila River Indian Community, Sacaton, AZ; the Department of International Health, Division of Human Nutrition, The Johns Hopkins School of Hygiene and Public Health, Johns Hopkins University, Baltimore; and the Department of Physiology, University of Arizona, Tucson.

²Supported by the National Heart, Lung, and Blood Institute of the National Institutes of Health (U01-HL-50869, U02-HL-50867, U01-HL-50905, U01-HL-50885, and U01-HL-50907).

³Address reprint requests to J Stevens, University of North Carolina at Chapel Hill, Department of Biostatistics, CB#8030, Chapel Hill, NC 27514. E-mail: June_Stevens@UNC.EDU.

study will collect information on several factors related to food consumption and physical activity that will permit examination of interactions among these factors.

This article describes the development of a questionnaire to assess several aspects of KAB related to healthy eating and physical activity. Several previously developed questionnaires were adapted for use, and some previously tested questions were used intact. However, for the most part, suitable questionnaires were not available and new questions had to be developed. The Pathways KAB questionnaire needed to be culturally and developmentally appropriate for third- to fifth-grade American Indian children and targeted to test the Pathways intervention. Cost, time, and staffing constraints also had to be considered.

IDENTIFICATION OF CONCEPT AREAS TO BE MEASURED

A 9-member group of experts working in pertinent technical, tribal, and cultural issues was convened to define the specific or concept areas to be targeted by the questionnaire. The study timeline required that the questionnaire be developed and tested before the classroom curriculum was developed. Therefore, the concept areas included in the questionnaire were influenced by the broad goals of the intervention rather than by a specific curriculum. Information on obesity-related risk factors from a formative assessment conducted in representative American Indian schools and communities from the Pathways field sites was also available (6) and helped to guide decision-making. Four concept areas were targeted: 1) physical activity, 2) diet, 3) weight-related attitudes and behaviors, and 4) cultural identity.

Physical activity

The physical activity portion of the KAB survey was designed to assess factors that were likely to influence a child's present level of activity or the likelihood that they would become active and remain active if exposed to an appropriate intervention. A variety of psychologic factors have been studied in relation to physical activity (4). Individual differences such as achievement motivation, tolerance of stress, social adequacy, movement satisfaction, and independence are either weakly or not associated with physical activity in youth (7, 8). Thus, these factors are probably not strong determinants of children's activity. Similarly, knowledge about fitness and physical activity is an inconsistent correlate of activity (9, 10), though it may have delayed rather than immediate influences.

In contrast, self-efficacy (confidence in one's ability) for physical activity, exercise intentions, and specific perceptions of barriers to activity are potent predictors of activity in adolescents and may be important in children as well. It is also likely that peers and parents have important influences on children's physical activity. For example, both peers and parents have been shown to influence youth sport selection (11) and consistent positive associations have been reported between parental encouragement and activity in young children (12–16). The roles of modeling, reinforcement, environmental prompts, and other potential mechanisms of parental influences have not been well described. Several characteristics of a child's physical environment may help determine physical activity. Time and place factors, such as geographic location and season of the year, are probably important because percentage time spent outdoors is strongly related to physical activity (17). Television viewing, the

most commonly studied environmental factor, is strongly correlated with obesity (18), possibly because it replaces more active leisure-time pursuits.

Previous studies have shown an association between physical self-perception and level of participation in physical activities and organized athletics (18, 19) as well as other fitness indicators (20, 21). Physical self-perception in specific domains has also been shown to differ between individuals engaged in various types of physical activities. For example, participation in ball sports is associated with high self-perception in sports skills for male and female young adults (18). Physical self-perception has been reported to change with participation in physical activities, such as aerobics classes and Outward Bound programs (21, 22). In contrast, physical activity and fitness indicators do not appear to be associated with nonphysical domains of self-perception (20).

The choice of specific factors to measure was based on the strength of the reported associations between physical activity and its correlates, the nature of the planned intervention, and the acceptance of the items in all of the American Indian communities involved in Pathways. Four broad categories were chosen for this section of the questionnaire: physical activity self-efficacy, social support for physical activity, perceived barriers to activity, and physical self-perception. Other potential predictors of activity, including body composition and physical environment factors, such as actual availability and proximity of television watching and of play areas, facilities, and programs, were evaluated elsewhere in the study.

Diet

Children's eating behavior can be examined by looking at individual, behavioral, and environmental factors (23). Individual factors are personality dispositions, cognitions, or affective domains that increase or decrease the likelihood of engaging in a given behavior and include self-efficacy, knowledge, functional meanings of food, and perceived body image. Behavioral factors are those that affect actions directly and include one's behavioral repertoire, behavioral intentions, and skills. Environmental factors are those aspects of the environment that support, permit, encourage, or discourage engagement in a particular behavior and include family and peer influences, social support, social norms, and specific opportunities (23). To change eating patterns successfully, interventions must aim to modify all 3 factors.

Over the past decade, several nutrition-related programs have focused their intervention efforts on these 3 factors (5, 24–26). Outcome evaluation in these programs followed the intervention model and measured specific behaviors, knowledge, attitudes, and intentions as well as physiologic outcomes. Outcomes were generally favorable in terms of knowledge, attitudes, and intentions, and were less so in terms of behavior and physiologic change on nutrition-related measures (25, 26). Recent findings from the CATCH study showed significant improvements in dietary intentions, usual food choices, knowledge, and self-efficacy for eating lower-fat and lower-sodium foods in third-grade children in intervention compared with control schools (24). These findings support theory-based and combined individual and environmental interventions for changing health-related risk behaviors in children. Most of the nutrition education programs that resulted in behavior change used teaching strategies based on social learning theory. In such programs, increasing student knowledge is only one of many objectives. The relation between nutrition knowledge and behavior is weak (5, 25). It is well doc-



umented that although nutrition knowledge is essential, knowledge alone does not enable young persons to adopt healthy eating behaviors. Thus, behaviorally centered approaches (ie, goal setting, behavioral skill building, and efficacy-enhancing experiences) are needed (5). Furthermore, behavioral changes may not be maintained unless the school environment supports the changes and the home environment reinforces the intentions.

The diet measures chosen for assessment in the Pathways KAB questionnaire were based on specific constructs derived from social learning theory that are considered to be determinants of behaviors underlying obesity-related risk factors. The diet measures were also based on the concepts emphasized in the Pathways intervention, specifically, reducing consumption of dietary fat and sugared beverages and increasing consumption of healthful lower-fat foods. Student outcomes targeted for assessment included knowledge of high-fat foods, self-efficacy to make healthy food choices, perceived social support for eating healthful foods, intentions to choose healthful foods, and self-reported behaviors.

Weight-related attitudes and behaviors

Frequent dieting and exaggerated concern about body weight are common in this country. National data collected in 1990 from 11467 high school students as part of the Youth Risk Behavior Survey (27, 28) estimated that 34% of female students and 15% of male students considered themselves overweight. Forty-four percent of female students and 15% of male students reported that they were trying to lose weight. Students trying to lose weight had used several methods in the 7 d preceding the survey, including skipping meals (49% of females, 18% of males), taking diet pills (4% of females, 2% of males), and vomiting (3% of females and 1% of males). Few studies have examined weight-related attitudes and behaviors in preadolescent children. Mellin et al (29) surveyed middle-class girls in California and found that controlled eating was reported by 45% of third-grade and 80% of fourth- and fifth-grade girls. Inappropriate methods of weight control (vomiting, taking diet pills or laxatives, or skipping meals to lose weight) were reported by 10% of the 9- and 10-y-old girls examined.

We know of no similar data from American Indian children of this age. However, studies in older children and adults indicate that attitudes toward dieting and body size are similar in whites and American Indians (30), and that the use of inappropriate weight-loss strategies may be as prevalent or even more prevalent among American Indians than among whites. Smith and Krejci (31) administered the Eating Disorder Inventory and the Bulimic Test to American Indian, Hispanic, and white high school students ($n = 545$; mean age: 15.2 y). They found that the 129 American Indian students consistently scored the highest on each of the 7 items testing for disturbed eating behaviors and attitudes. Story et al (32) reported using national survey data from American Indian and Alaska Native children aged 12–18 y. Most participants, particularly girls, were dissatisfied with their weight and were worried about being overweight. Unhealthy weight-control practices were not uncommon.

Some voluntary control of food intake or attention to the selection of foods is appropriate; however, preoccupation with weight and extreme practices such as fasting and vomiting to lose weight are inappropriate at any age and are especially undesirable in children. In the Pathways study we developed questions to assess children's perceived and ideal body size, concern

about body size, and prevalence of dieting practices. Our hypothesis is that the Pathways intervention will not be associated with negative changes in children's body image, nor will it increase the prevalence of dieting.

Cultural identity

An ethnic identity scale was developed based on the recommendation of American Indian collaborators in the study. The Pathways intervention was carefully designed to be culturally sensitive, but some measure of cultural identity was required so that we could assess whether the intervention was equally effective in children who identified more or less strongly with their American Indian culture. Measurement of cultural identity in Pathways provided the opportunity to gain information about and insights into the impact of cultural issues on the effectiveness of an intervention in this group.

Ethnic identity is known to be related to the concept of self-esteem (33–35). Phinney (36) remarked that “a positive self-concept may be related to the process of identity formation—that is, to the extent to which people have come to an understanding and acceptance of their ethnicity.” Ethnic identity was found in some studies to be related to the level of acculturation to mainstream values and behaviors (37–40). These interrelations were of central concern to this study. Greater ethnic identity and self-esteem may be related to a decreased adoption of dominant American lifestyle attributes in American Indian children.

The only existing literature on developing ethnic identity scales for US children focuses primarily on white ethnic groups and African Americans; there is no such literature on American Indian children. Phinney (36) wrote an excellent review of ethnic identity, but focused on adults and adolescents rather than on children. In fact, the measurement of ethnic identity in children is a difficult proposition considering current models. Many models today consider ethnic identity to be a developmental process, in which individuals go through various life stages. For instance, the Racial Identity Attitude Scale developed by Parham and Helms (41) describes changes in attitudes during the stages of preencounter, encounter, immersion, and internalization. Young children have not been measured with use of these types of models because they are not old enough to have moved through these stages.

CREATION, ADMINISTRATION, AND REVISION OF THE KAB QUESTIONNAIRE

Creation and selection of questions

Responsibility for the creation and selection of potential questions within each concept area was divided among the members of the working group. After a review of existing questionnaires and deliberations with several experts, the first draft of the questionnaire was constructed by collating all proposed questions. This initial draft contained 248 questions, which were reduced to 170 after review by the teams in charge of curriculum design and by field coordinators.

Initial tests with children

To help determine validity of the questionnaire, a subset of 64 questions was pretested with 32 American Indian children by using semistructured interviews. The children were in the third, fourth, or fifth grade. Trained American Indian staff members conducted most of these interviews at the field site. In individual



interviews, children were asked each question on the questionnaire. Follow-up probes included, "What do you think this question is asking?," "Does this question make sense to you?," and "Does this question seem important?"

Input from the American Indian members of the Pathways team

Feedback from American Indian colleagues in Pathways was obtained during a 2-d meeting attended by 16 Pathways staff members, 8 of whom were American Indian. The purpose of each section of the questionnaire was reviewed and then items were examined one by one. As a result, 40 more questions were eliminated and the remaining 130 were revised extensively. At the suggestion of some of the American Indians in attendance, the cultural identity section was added to the questionnaire.

After the questionnaire was approved by the Pathways Study Steering Committee, approval was obtained from all 5 tribes without further revisions.

Selection of protocols for administrators

The working group decided to administer the questionnaire in school classrooms by using a protocol patterned after that of the CATCH study (42) that was age appropriate and accommodated differences in reading level. The children marked their own answers to questions, but a trained test administrator read the questions to the class. This dictated that the questionnaire format had to be simple and easy to understand, with no embedded items. Illustrative pictures were included wherever appropriate. A standardized instruction manual for administration of the questionnaire was developed that oriented the administrator to the purpose of the questionnaire and provided detailed, step-by-step instructions on how to administer the questionnaire. The protocol called for 2 staff members to administer the questionnaire in the classroom, one to read the questions aloud and the other to act as proctor, circulating throughout the room to answer questions and keep the children on task. To accommodate differences in reading level it was decided that questions would be read twice to third- and fourth-grade children and once to fifth-grade children. Brief activities (≤ 5 min) that engaged the children were included in the protocol to break up lengthy testing sessions. The test administrator distributed letters explaining the questions and protocol to the teachers before the start of the test session.

Pretesting in the classroom

The 130-item draft of the questionnaire was pretested in 2 classrooms at one of the field centers. It was given by an administrator and a proctor with 1 other staff member present to observe. The questionnaire was administered in 3 sections, each ≈ 30 min in length, over 2–3 d. The children's general reactions to the questionnaire and their observed comfort level upon completion of the questionnaire were positive. Several modifications were made as a result of this testing. This process yielded version 1.0 of the questionnaire.

Description of version 1.0 of the questionnaire

The reading level of the questionnaire was evaluated as second-grade level (grade 2.4) by the RIGHT WRITER (43) and fifth grade level (grade 5.6) by the FLESCH GRADE LEVEL (44) software programs. Each section of the questionnaire is described below.

Physical activity

Scales were developed or adapted to assess the following constructs thought to be mediators or correlates of physical activity: social support, self-efficacy, perceived barriers, and self-perception. The Physical Self-Perception Profile (PSPP) (18) was chosen as the instrument on which to base the physical self-perception portion of the KAB questionnaire. The PSPP is widely used (18), psychometrically sound (17, 45, 46), and has been adapted for use with younger adolescents (45) and children, including fourth and fifth graders (46). In version 1.0 of the KAB, 2 subscales from the Harter (47) Self-Perception Profile for Children (scholastic competence and social acceptance) were also included. This is the best known and most widely used of the general multidimensional self-perception instruments and has good-to-excellent psychometric properties with children as young as third-grade age (48). The domains included from the Harter profile were those most likely to be associated with obesity or to change as a result of participation in a regular physical activity program.

Diet

The specific diet-related psychosocial constructs measured by the KAB questionnaire included dietary self-efficacy, social support for lower-fat food choices, dietary intentions and expectations, dietary-fat knowledge, and reported food consumption. All measures, with the exception of food consumption, were based on the health behavior questionnaire used in the CATCH study (1). These measures have been used in previous work including Hearty Heart (49) and Go for Health (50) or were developed specifically for CATCH (1). Although the KAB diet-related scales were derived from these measures, the questions, food items, and response categories were changed. The specific food items included in the KAB questionnaire were chosen on the basis of the results of a formative assessment of foods commonly consumed by American Indian children.

Weight-related attitudes and behaviors

Questionnaires to measure weight-related attitudes and behaviors in a variety of populations were available from previous studies (28, 50–60). Some questions in this section were used intact from these existing questionnaires; however, most were modified to simplify the language to make the questionnaire more suitable for third- to fifth-grade children. The concepts assessed included body image, concerns about weight, and attempts at weight loss. As a measure of perceived actual, ideal, and healthy body size, children were asked to select from 8 line drawings of children that ranged from very thin to obese. These drawings were conceptually similar to those previously created for use in adults (52). In this section, as in other sections dealing with weight-related attitudes and behaviors, some questions were included to provide balance. For instance, to balance "Would you like to be skinnier than you are now?" we included "Would you like to be chubbier than you are now?"

Cultural identity

The literature indicates that there are 4 potential components of ethnic identity: ethnic self-identification (the label you give yourself), sense of belonging to a particular ethnic group, positive and negative attitudes toward one's own ethnic group, and ethnic involvement (participation in social and cultural practices) (36). We found that the wording used to measure ethnic



identity by “sense of belonging” and “positive or negative attitudes” was too complex for third-grade children. Therefore, our scale of ethnic identity included only those components that relate to self-identification and ethnic involvement. In particular, the ethnic involvement component focused on concrete behaviors, such as language spoken and activities practiced.

Test and retest of version 1.0

Test-retest reliability was assessed for version 1.0 of the KAB questionnaire by administering the questionnaire twice to the same fourth-grade children with an interval of 3–6 wk between tests. Fourth-grade children were chosen because they would give an intermediate view of what could be expected in terms of comprehension and performance from children in the third, fourth, and fifth grades. Questionnaire administrators and proctors were trained in a 3-h meeting during which instructions were reviewed and administrators were required to rehearse in front of the group.

The questionnaire was administered in 2 schools at each of 4 sites. Three separate sessions (separated by ≥ 1 h) were conducted over a 2- or 3-d interval. An average of ≈ 70 min was required to administer the entire questionnaire. The paper forms were mailed to the coordinating center and all data were entered centrally. A total of 371 fourth-grade children from the 4 study sites took part in the reliability testing; 18% of the questionnaires were incomplete (a questionnaire was considered incomplete if ≥ 3 questions were not answered). This relatively high level of incomplete data was due to student absences and student participation in special programs during one or more of the 3 scheduled test times.

Qualitative feedback was requested from each center regarding problems that arose during the test-retest administration. Overall, these reports indicated that the test was well accepted. However, the body-image questions with the graded body shapes were felt to be insensitive, and teasing of overweight children was a problem at some sites. It was also noted that some children in special education programs were unable to keep up with the rest of the class and may not have provided valid data.

κ Statistics were calculated for each of the study questions as an estimate of repeatability (61). Cronbach's (62) α statistics were calculated as measures of internal consistency of the scales and correlation coefficients were used to estimate the repeatability of scales (63). The following 8 scales had a Cronbach's α and test-retest $r \geq 0.5$: barriers to physical activity, knowledge of high-fat foods, diet self-efficacy, diet behaviors, food frequency, body image, attempts at weight loss, and cultural identity.

Revisions based on reliability data

The questionnaire was revised on the basis of the results of the first reliability testing. Some questions were dropped and others were added. In some cases, new response options were created and tested in an effort to improve repeatability. Selected examples of changes are presented below.

For the physical self-perception section, each subscale contained only 2 items, so internal consistency could not be assessed. To address this problem, the working group decided to include more items to assess each dimension. The scholastic competence and social acceptance scales were judged to be of little relevance to the central aims of the Pathways study and were eliminated. The response format was revised from that of the original PSPP to a Likert (64) format, consistent with the format used in the first KAB testing. Question wording was also revised to improve clarity. The revised version of the self-per-

ception section of the KAB contained six 4-item subscales consisting of questions adapted from the original PSPP.

Neither the physical activity nor the diet social support scales performed adequately. A new 4-point response format (most of the time, sometimes, once in a while, and almost never) was developed and pilot tested that replaced the original 3-choice response set (most of the time, sometimes, and never or almost never). The food-frequency scale was modified because it appeared that children had difficulty conceptualizing the time frame associated with usual intake. In the revised version of the KAB questionnaire, specific foods were presented and children were asked to circle the picture if they had eaten the food the day before; thus, the time frame was more limited and concrete.

To identify the sources of incomplete questionnaires, procedures were put into place to identify children in special education programs, a protocol was written for obtaining data from children who were absent for a portion of the test, and a form was developed to collect information on the amount of effort required to produce higher rates of completion. On the basis of time logs from the first test and retest, it was decided to administer the test in 2 sessions rather than 3 to reduce the staff-associated costs of the administration.

Review of revised questionnaire

The revised questionnaire was sent out to the American Indian members of the Pathways team for review. After approval by that group and the Pathways Steering Committee, the revised questionnaire, version 2.0, was reviewed and approved by the participating tribes.

Test and retest of version 2.0

Sample questions from each section of version 2.0 of the KAB questionnaire are shown in **Table 1**. This version was tested for repeatability between October and December of 1995. Training of the administrators and proctors was conducted in a 2-h conference call. Data were entered at the site rather than centrally for version 2.0, and an additional 2-h conference call was held to train field staff to enter the KAB data at the site. The completion rate of the questionnaires was $>95\%$ because Pathways staff members revisited schools to obtain missing data. The test was completed in ≈ 80 min in 2 sessions.

The number of questions and the average κ statistic by section are shown in **Table 2**, as well as the number of questions, Cronbach's α , and r for repeatability for each scale. The correlation is the appropriate statistic to use for the assessment of the repeatability of scales; however, the average κ of the questions as used in the scales is also shown for descriptive purposes (61, 63). Because one of the goals of the testing was to produce a more concise questionnaire, efforts were made to reduce the number of items in some scales. The mean κ and Cronbach's α statistics were recalculated after deleting poorly performing or unnecessary questions or after collapsing response options. Six of the 8 scales with both a Cronbach's α and test-retest $r > 0.5$ in the first version performed equally well in the second version (barriers to physical activity, knowledge of high-fat foods, diet self-efficacy, diet behaviors, body image, and attempts at weight loss). The repeatability and internal consistency of the physical activity self-efficacy scale improved such that the internal consistency and repeatability tests met the >0.5 criterion value. However, the performance of the food-frequency and cultural-identity scales declined and no longer met this criterion. Generally, the modifi-



TABLE 1
Sample questions in version 2.0 of the Pathways knowledge, attitudes, and behaviors questionnaire

| Section and scale or subsection | Question | Possible responses |
|--|--|---|
| Physical activity Self-efficacy | I can play hard during most of recess. | I know I can I think I can I'm not sure I can I don't think I can |
| Social support | My friends play hard. | Most of the time Sometimes Once in a while Almost never |
| Barriers | The weather is too bad to play sports or active games. | Almost never Once in a while Sometimes Most of the time |
| Self-perception | Some kids wish they could feel better about themselves physically. | Just like me A little like me Not much like me Not at all like me |
| Diet Knowledge of high-fat foods | Which has more fat? | Hot dog Turkey I don't know |
| Self-efficacy | I can put less butter on my tortilla bread. | I know I can I think I can I'm not sure I can I don't think I can |
| Social support | The adults in my house eat fruits and vegetables. | Most of the time Sometimes Once in a while Almost never |
| Intentions | Which would you pick for a snack? | Potato chips Pretzels |
| Food frequency | Did you drink fruit juice yesterday? | Yes No |
| Weight-related attitudes Body image | Do you think you are: | Too skinny About right Too fat |
| Concern regarding weight | How do you feel about your weight? Are you: | Happy Unhappy I never think about it |
| Attempts at weight loss | Are you trying to lose weight? | Yes No |
| Cultural identity | Can you speak your tribal language? | Yes, I can speak easily Yes, I can speak a few words No I do not belong to any tribe |

cations in the questionnaire resulted in only small changes in the repeatability and internal consistency of the scales.

None of the subscales in the physical activity self-perception portion of the questionnaire met our criteria for repeatability and internal consistency. This was due in part to the fact that children had particular difficulty with items that were negatively worded.

FUTURE DIRECTIONS AND LESSONS LEARNED

Readiness of children

The ability of fourth-grade children to answer the questions on the KAB questionnaire reliably varied considerably. Separat-

ing the children in special education programs for individualized testing will likely improve repeatability. There are no other studies using a similar questionnaire in children of the age and ethnicity studied here on which to form a basis for the expected level of repeatability. Because the food self-efficacy scale and the mode of administration used here were patterned after CATCH, some indication of the expected level of repeatability can be gained from an examination of the CATCH results. In the 14-item food self-efficacy scale tested in CATCH, the Cronbach's α was 0.84 and the test-retest r was 0.63 (60). In Pathways, the respective results were 0.76 and 0.59 for the 12-item scale tested. More research is needed on methods of questionnaire administration in children of this age.



TABLE 2
Statistics from version 2.0 of the Pathways knowledge, attitudes, and behaviors questionnaire

| Section and scale or subsection | No. of questions | Average κ | No. of questions in scale | Average κ of questions in scale | Cronbach's α^j | r^j |
|---------------------------------|------------------|------------------|---------------------------|--|-----------------------|-------|
| | <i>n</i> | | <i>n</i> | | | |
| Physical activity | | | | | | |
| Self-efficacy | 5 | 0.30 | 3 | 0.31 | 0.61 | 0.58 |
| Social support | 12 | 0.23 | 9 | 0.18 | 0.78 | 0.48 |
| Barriers | 10 | 0.21 | 10 | 0.22 | 0.56 | 0.52 |
| Self-perceptions | | | | | | |
| Global | 4 | 0.25 | 4 | 0.29 | 0.15 | 0.34 |
| Global physical | 4 | 0.16 | 4 | 0.25 | 0.30 | 0.56 |
| Sports and skills | 4 | 0.24 | 4 | 0.16 | 0.25 | 0.22 |
| Fitness | 4 | 0.25 | 4 | 0.24 | 0.23 | 0.26 |
| Body attractiveness | 4 | 0.29 | 4 | 0.25 | 0.02 | 0.32 |
| Strength | 4 | 0.29 | 4 | 0.29 | 0.25 | 0.57 |
| Social acceptance | 4 | 0.29 | 4 | 0.29 | 0.46 | 0.31 |
| Diet | | | | | | |
| Knowledge of high-fat foods | 10 | 0.30 | 6 | 0.29 | 0.56 | 0.52 |
| Self-efficacy | 15 | 0.26 | 12 | 0.26 | 0.76 | 0.59 |
| Social support | 7 | 0.26 | 7 | 0.26 | 0.19 | 0.29 |
| Intentions | 10 | 0.45 | 8 | 0.43 | 0.76 | 0.64 |
| Food frequency | 13 | 0.24 | 11 | 0.22 | 0.46 | 0.52 |
| Weight-related attitudes | | | | | | |
| Body image | 5 | 0.40 | 5 | 0.41 | 0.57 | 0.64 |
| Concern regarding weight | 2 | 0.38 | — | — | — | — |
| Attempts at weight loss | 8 | 0.40 | 3 | 0.40 | 0.67 | 0.65 |
| Cultural identity | 6 | 0.43 | 4 | 0.44 | 0.41 | 0.49 |

^jOne or more of the questions in the scale may have been deleted or collapsed for this calculation (*see text*).

As noted above, an interesting problem emerged for items that required reverse scoring, apparently because they were negatively worded. A negatively worded item is one in which a negative response is keyed positively (65). For example, "Some kids do not like the way their body looks" is a negatively worded item from the KAB questionnaire. Such items are included in psychosocial questionnaires to guard against a tendency to answer affirmatively to all items. Children completing version 2.0 of the KAB questionnaire responded to such items as though they were positively worded (eg, "Some kids like the way their body looks"). Previous literature suggests similar problems when administering some psychologic questionnaires to children in this age group (66). Taken together with the present results, these findings suggest that negatively worded items may not be appropriate for use in the Pathways study and that other strategies for reducing response-set bias should be investigated.

Cultural issues

The poor performance of the negatively worded questions was likely related to the young age of our sample, but cultural issues may also have contributed. Other questions we found to be problematic were those designed to ascertain information about attitudes or behaviors that could be termed undesirable. Because it is intrinsic to many American Indian cultures to think and speak in a positive way and to avoid thinking or speaking in a negative way (67), questions that elicit negative thinking are inappropriate. In traditional Navajo culture, it is held that thoughts and spoken words have the power to shape reality and to control events. Therefore, asking a question about negative feelings or behaviors is believed to potentially cause those negative feelings and behaviors. An additional culture-bound belief

that made questionnaire development challenging was the tradition of avoiding comparisons between individuals. Rating or ranking individuals is considered unacceptable in several tribes. Thus, questions that required a comparison of oneself to others were not acceptable.

Over the course of the development of the questionnaire we gained an appreciation of the differences between individual opinion and group consensus in the area of cultural input. In the early phases of the study, the KAB working group responded to the suggestions of the individual American Indian members of the team. As time passed and the number of American Indian members on the team grew and the study experienced turnover in staff, it became obvious that there were differences in the culture-bound beliefs between different tribes and between individuals in tribes. We have found it very useful to request formal recommendations from the American Indians on the project as a group rather than individually. Also, we found that occasional face-to-face meetings were essential for discussions of cultural appropriateness.

Our experience underscores the importance of involvement of American Indian members of the Pathways team in every phase of development of the KAB questionnaire. This was important not only in ensuring that the questionnaire was properly worded and culturally appropriate, but in obtaining tribal approval. Too often, instruments are developed for majority children and used with children from different ethnic communities without adequate data on reliability and validity for use within that population, and without input from the community. The American Indian members of the KAB team not only helped to produce a more culturally appropriate instrument, but also facilitated acceptance of the instrument by the larger community.

Conclusion

In conclusion, the development of a questionnaire to measure knowledge, attitudes, and behaviors in American Indian children used many different types of information and expertise. The process has taken >2 y and is still ongoing. Our objective was to produce scales that were internally consistent and repeatable as indicated by Cronbach's α and r values ≥ 0.6 . The final questionnaire will be administered annually during the Pathways full-scale intervention trial. We look forward to learning more about the effect of the intervention in areas pertinent to the health of American Indian children. 

REFERENCES

- Perry C, Stone F, Parcel G, et al. School-based cardiovascular health promotion: the Child and Adolescent Trial for Cardiovascular Health (CATCH). *J Sch Health* 1990;60:406-13.
- Kelder S, Perry C, Klepp K, Leslie L. Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviors. *Am J Public Health* 1994;84:1121-6.
- Kelder S, Perry C, Lytle L, Klepp K. Community-wide youth nutrition education, long-term outcome of the Minnesota Heart Health Program. *Health Educ Res* 1995;10:119-31.
- Sallis JF, Simons-Morton BG, Stone EJ, et al. Determinants of physical activity and interventions in youth. *Med Sci Sports Exerc* 1992;24(suppl):S248-57.
- Centers for Disease Control and Prevention. Guidelines for school health programs to promote lifelong healthy eating. *Morb Mortal Wkly Rep* 1996;45:1-41.
- Gittelsohn J, Evans M, Helitzer D, et al. Formative research in a school-based obesity prevention program for Native American school children (Pathways). *Health Educ Res* 1998;13:251-65.
- Butcher J. Longitudinal analysis of adolescent girls' participation in physical activity. *Sociol Sport J* 1985;2:130-43.
- Dekker H, Ritmeester JW, Snel J. Personality traits and school attitude. In: Kemper HCG, ed. *Growth, health, and fitness of teenagers*. New York: Karger, 1985:137-47.
- Gottlieb NH, Chen M. Sociocultural correlates of childhood sporting activities: their implications for heart health. *Soc Sci Med* 1985;21:533-9.
- O'Connell JK, Price JH, Roberts SM, Jurs SG, McKinley R. Utilizing the health belief model to predict dieting and exercising behavior of obese and nonobese adolescents. *Health Educ Q* 1985;12:343-51.
- Greendorfer SL, Ewing ME. Race and gender differences in children's socialization into sport. *Res Q Exerc Sport* 1981;52:301-10.
- Klesges RC, Coates TJ, Moldenhauer-Klesges M, Holzer B, Gustavson J, Barnes J. The FATS: an observational system for assessing physical activity in children and associated parent behavior. *Behav Assess* 1984;6:333-45.
- Klesges RC, Malott JM, Boschee PF, Weber JM. The effects of parental influences on children's food intake, physical activity, and relative weight. *Int J Eat Disord* 1986;5:335-46.
- McKenzie TL, Sallis JF, Nader PR, et al. BEACHES: an observational system for assessing children's eating and physical activity behaviors and associated events. *J Appl Behav Anal* 1991;24:141-51.
- Moore LL, Lombardi DA, White MJ, Campbell JL, Oliveria SA, Ellison RC. Influence of parents' physical activity levels on activity levels of young children. *J Pediatr* 1991;118:215-9.
- Ross JG, Pate RR. The National Children and Youth Fitness Study II: a summary of findings. *J Phys Educ Recreational Dance* 1987;58:51-6.
- Dietz WH, Gortmaker SL. Do we fatten our children at the television set? Obesity and television viewing in children and adolescents. *Pediatrics* 1985;75:807-12.
- Fox KR, Corbin CB. The Physical Self-Perception Profile: Development and preliminary validation. *J Sport Exerc Psychol* 1989;11:408-30.
- Jackson S, Marsh HW. Athletic or antisocial: the female sport experience. *J Sport Psychol* 1986;8:198-211.
- Marsh HW. Physical fitness self-concept: relations to field and technical indicators of physical fitness for boys and girls aged 9-15. *J Sport Exerc Psychol* 1993;15:184-206.
- Marsh HW, Peart N. Competitive and cooperative physical fitness training programs for girls: effects on physical fitness and on multidimensional self-concepts. *J Sport Exerc Psychol* 1988;10:390-407.
- Marsh HW, Richards G, Barnes J. Multidimensional self-concepts: A long term follow-up of the effect of participation in an Outward Bound program. *Pers Soc Psychol Bull* 1986;12:475-92.
- Perry CL, Lytle LA, Kelder SH. Teaching healthful eating habits. In: Filer LJ, Lauer RM, Luepker RV, eds. *Prevention of atherosclerosis and hypertension beginning in youth*. Philadelphia: Lea and Febiger, 1994.
- Edmundson E, Parcel GS, Perry CL, et al. The effects of the Child and Adolescent Trial for Cardiovascular Health intervention on psychosocial determinants of cardiovascular disease risk among third grade students. *Am J Health Promot* 1996;10:217-25.
- Lytle LA, Achterberg C. Changing the diets of America's children: what works and why? *J Nutr Educ* 1995;27:250-60.
- Stone EJ, Perry CL, Luepker RV. Synthesis of cardiovascular behavioral research for youth health promotion. *Health Educ Q* 1989;16:155-69.
- Kann L, Warren CW, Harris WA, et al. Youth risk behavior surveillance—United States, 1993. *Morb Mortal Wkly Rep* 1995;44(SS1):1-55.
- Serdula MK, Collins ME, Williamson DF, Anda RF. Weight control practices of US adolescents and adults. *Ann Intern Med* 1993;119:667-71.
- Mellin LM, Irwin CE, Scully S. Prevalence of disordered eating in girls: a survey of middle-class children. *J Am Diet Assoc* 1986;92:851-3.
- Gittelsohn J, Harris SB, Thorne-Lyman AL, Hanley AJG, Barnie A, Zinman B. Body image concepts differ by age and sex in an Ojibway-Cree community in Canada. *J Nutr* 1996;126:2290-3000.
- Smith J, Krejci J. Minorities join the majority: eating disturbances among Hispanic and Native American youth. *Int J Eat Disord* 1991;10:179-86.
- Story M, Hauck F, Broussard B, White L, Resnick M, Blum R. Weight perceptions and weight control practices in American Indian and Alaska Native adolescents. *Arch Pediatr Adolesc Med* 1994;148:567-71.
- Marcia J. Identity in adolescence. In: Adelson J, ed. *Handbook of adolescent psychology*. New York: Wiley, 1980:159-87.
- Phinney JS. Stages of ethnic identity development in minority group adolescents. *J Early Adolesc* 1989;9:34-49.
- Parham T, Helms J. Relation of racial identity attitudes to self-actualization and affective states of black students. *J Consult Psychol* 1985;32:431-40.
- Phinney JS. Ethnic identity in adolescents and adults: review of research. *Psychol Bull* 1990;108:499-514.
- Elias N, Blanton J. Dimensions of ethnic identity in Israeli Jewish families living in the United States. *Psychol Rep* 1987;60:367-75.
- Elizur D. Facet analysis of ethnic identity: the case of Israelis residing in the United States. *J Gen Psychol* 1984;111:259-69.
- Clark M, Kaufman S, Pierce R. Explorations of acculturation: toward a model of ethnic identity. *Hum Organ* 1976;35:231-8.
- Matute-Bianchi M. Ethnic identities and pattern of school success and failure among Mexican-descent and Japanese-American students in a California high school: an ethnographic analysis. *Am J Educ* 1986;95:233-55.
- Parham T, Helms J. The influence of black student's racial identity attitudes on preferences for counselor's race. *J Consult Psychol*



- 1981;28:250-7.
42. Luepker RV, Perry CL, McKeenlay SM, Nader PR, et al. Outcomes of a field trial to improve children's dietary patterns and physical activity: CATCH. *JAMA* 1996;275:768-76.
 43. Hedl JJ Jr, Glazer-Waldman HR, Parker HJ. Readability and writing style analysis of selected allied health professional journals. *J Allied Health* 1991;20:25-37.
 44. Panek PE, Greenawalt JP, Rush MC. Readability of the articles used by Goldberg. *Percept Mot Skills* 1976;43:864-6.
 45. Marsh HW, Richards GE, Johson S, et al. Physical self-description questionnaire: psychometric properties and a multitrait-multimethod analysis of relations to existing instruments. *J Sport Exerc Psychol* 1994;16:270-305.
 46. Whitehead JR. A study of children's physical self-perceptions using an adapted Physical Self-Perception Profile Questionnaire. *Pediatr Exerc Sci* 1995;7:132-51.
 47. Harter S. *The Self-Perception Profile for Children manual*. Denver: University of Denver, 1985.
 48. Welk GJ, Corbin CB, Dowell MN, Peinkosz EJ. The reliability of two different versions of the physical self-perception profile in young children. *Med Sci Sports Exerc* 1996;28(suppl):138.
 49. Perry C, Klepp K, Sillers C. Community-wide strategies for cardiovascular health: the Minnesota Heart Health Program for Youth. *Health Educ Rev* 1989;4:87.
 50. Parcel G, Simons-Morton B, O'Hara N, Baronowski T, Wilson B. School promotion of healthful diet and physical activity: impact on learning outcomes and self-reported behavior. *Health Educ Q* 1989;16:181-99.
 51. Herman C, Polivy J. Anxiety, restraint, and eating behavior. *J Abnorm Psychol* 1975;84:666-72.
 52. Stunkard A, Sorensen T, Schulsinger F. Use of the Danish adoption register for the study of obesity and thinness. In: Kety S, Rowland L, Sidman R, Matthysse S, eds. *Genetics of neurological and psychiatric disorders*. New York: Raven Press, 1983.
 53. National Center for Health Statistics. *Health promotion and disease prevention: United States*. *Vital Health Stat* 10 1988:76-8. [Publication (PHS) 88-1591.]
 54. Stunkard A. Restrained eating: what it is and a new scale to measure it. In: Ciofti L, et al, eds. *The body weight regulatory system: normal and disturbed mechanisms*. New York: Raven Press, 1981:243-51.
 55. Stevens J, Kumanyika S, Keil J. Attitudes toward body size and dieting: differences between elderly black and white women. *Am J Public Health* 94;84:1322-5.
 56. Stevens J, Kumanyika S, Keil J, Seibert L. Body size perceptions and eating attitudes in elderly men. *Obes Res* 1994;2:127-34.
 57. Kendall A, Olson C, Frongillo E. Validation of the Radimer/Cornell measures of hunger and food insecurity. *J Nutr* 1995;125:2793-801.
 58. Radmier K, Olson C, Campbell C. Development of indicators to assess hunger. *J Nutr* 1990;120S:1544-8.
 59. Stevens J, Alexandrov AA, Smirnova SG, et al. Comparison of attitudes and behaviors related to nutrition, body size, dieting, and hunger in Russian, black-American and white-American adolescents. *Obes Res* 1997;5:227-35.
 60. Parcel GS, Edmundson E, Perry CL, et al. Measurement of self-efficacy for diet related behaviors among elementary school children. *J Sch Health* 1995;65:23-7.
 61. Landis JR. The measurement of observer agreement for categorical data. *Biometrics* 1977;33:159-74.
 62. Chronbach LJ. Coefficient alpha and the internal structure of tests. *Psychometrika* 1951;16:296-334.
 63. Kleinbum DG, Kupper LL, Muller KE. *Applied regression analysis and other multivariable methods*. Boston: PWS-Kent Publishing Company, 1998:80-95.
 64. Likert R. A technique for the measurement of attitudes. *Arch Psychol* 1932;22:1-55.
 65. Anastasi A. *Psychological testing*. New York: Colier Macmillan Publishers, 1988.
 66. Marsh HW. Negative item bias in ratings scales for preadolescent children: a cognitive developmental phenomenon. *Dev Psychol* 1986;22:37-49.

