ABSTRACT

Medical providers would benefit from a risk assessment tool to supplement a physical exam to predict a BMI trajectory in young children, 3-5 years. Our objective is to estimate predictive validity of a pictorial assessment tool based on BMI collected 24 months later. Low-income parents (n=103) provided data about themselves and their young children. Longitudinal data collection included the 43-item Healthy Kids (HK) and child height/weight for BMI percentile and was repeated 24 months later. Of the 43 potential behavioral items, 14 were selected for the final model using random forests analysis and stepwise regression to predict BMI percentile. The R² was .74 for the final model that included the HK items and BMI percentile compared to an R² of .56 for BMI percentile alone. The partial F test (F = 4.01, p<.0001) comparing a model with BMI percentile and HK to model with BMI percentile only supports the predictive value of HK tool. Summing the estimates indicates a negative relationship; the lower the HK score, the higher the child’s BMI percentile 24 months later. Healthy Kids tool for low-literacy parents adds predictive value to the medical providers’ knowledge of the child’s BMI.

BACKGROUND

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. 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).

Previous Research

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 provided support for the face validity of the tool, now called Healthy Kids, with low-income respondents (Townsend et al. 2015).

OBJECTIVE

A valid behavioral tool focusing on the behaviors under the control of the parent in the child’s environment would be beneficial for these programs for the purpose of needs assessment for the group and risk assessment for the individual parent. In addition, medical providers would benefit from a risk assessment tool to supplement a physical exam to predict a BMI trajectory in young children, 3-5 years. Our objective is to estimate predictive validity of a pictorial assessment tool based on BMI collected 24 months later (Figure 2d).

METHODS

Recruitment

Parent-child pairs were recruited at Head Start and WIC. Interviews for consent and data collection were conducted on site. A stipend of $10 was given to the parent at each interview session. Low-income parents (n=103) provided data about themselves and their young children. Longitudinal data collection included the 43-item Healthy Kids (HK) and child height/weight for BMI percentile and was repeated 24 months later. Of the 43 potential behavioral items, 14 were selected for the final model using random forests analysis and stepwise regression to predict BMI percentile.

Anthropometry

Two trained research assistants weighed each participant twice to the nearest 0.1 pound using the Seca Digital Medical Scale. Height was measured twice to the nearest 0.1 centimeter using the Perspective Enterprises stadiometer. BMI (kg/m²) was calculated as a continuous variable, using the average of the two measured weights (in kilograms) divided by the average of the two measured heights (in meters squared). BMI percentile were then derived by using the Center for Disease Control BMI Percentile Calculator for Children. Waist and hip circumference were measured twice to the nearest 0.1 cm. Waist circumference was divided by height to calculate a ratio. Waist circumference was divided by hip circumference to calculate a second ratio.

Healthy Kids

43-item Healthy Kids tool reflects the parents’ control over the child’s environment for calorie intake, vegetables, eating as a family, sleep, physical activity, and screen time while modelling corresponding healthful behaviors. The 43 items visually demonstrate 23 behaviors identified in previous evidence analysis.

Random Forest Analysis and Stepwise Regression

Random forest, an alternative statistical method to generalized linear models, was applied to the 43 items from the Healthy Kids tool. After generating 1000 trees, an importance plot determined the relative importance of each question by computing the average error when the particular question is omitted from a tree. This method avoided problems faced by stepwise regression in fitting large models. Stepwise regression was applied to the top 20 items that were most predictive of child overweight.

RESULTS

Random Forest Analysis

Random Forest results for BMI percentile, waist circumference: height, waist hip circumference is shown in Table 1 for T16 (3 months from baseline) and T12 (24 months from baseline). The most predictive HK items are identified in the importance table (Figure 1).

Table 1

CONCLUSION

Congress has authorized food and nutrition education programs in the United States serving low-income families to include an obesity prevention focus in their education programs for low-income families. In proposing the development of such a tool targeting the determinants of obesity, four federal programs should be considered for its use. 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. They include the following: Head Start, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), SNAP and EFNEP. HK tool could be used for needs assessment. The Healthy Kids tool for low-income parents in our sample adds predictive value to the health providers’ knowledge of the child’s BMI 24 months later. Next step includes further testing with other low-income audiences in California.

References

Townsend MS, Leavens LL, Ontai LL, Davidson CA, Shilts MK. Graphic Design by Reed ML. (2014, April 10) Shilts MK, Townsend MS, Ontai LL, Leavens LL and Davidson CA. Graphic Design by Reed ML. (2014, April 10) Townsend MS, Young T, Ontai L, Ritchie L, Williams ST. Guiding family relationship; the lower the HK score, the higher the child’s BMI percentile 24 months later. Healthy Kids tool for low-income families to include an obesity prevention focus in their education programs for low-income families. In proposing the development of such a tool targeting the determinants of obesity, four federal programs should be considered for its use. 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. They include the following: Head Start, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), SNAP and EFNEP. HK tool could be used for needs assessment. The Healthy Kids tool for low-income parents in our sample adds predictive value to the health providers’ knowledge of the child’s BMI 24 months later. Next step includes further testing with other low-income audiences in California.

The Healthy Kids website is designed for parents, educators and program directors (Shilts et al.). Parents can complete Healthy Kids (HK) and receive tailored nutrition and child feeding goals.

Educators can use HK and the Guided goal setting intervention in education sessions.

Program directors can tailor HK to client’s specific cultural group.

http://healthykids.ucdavis.edu/

The new version of Healthy Kids now contains 14 items and reflects the results of this study.

http://healthykids.ucdavis.edu/