Health Literacy and Parent Attitudes about Weight Control for Children

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ABSTRACT

The purpose of this study was to examine associations between parental health literacy and parent attitudes about weight control strategies for young children. Parental low health literacy has been associated with poor child health outcomes, yet little is known about its relationship to child weight control and weight-related health information-seeking preferences. Data were drawn from the STRONG Kids Study, a Midwest panel survey among parents of preschool aged children ($n=497$). Parents endorsed an average of 4.3 ($SD=2.8$) weight loss strategies, 53% endorsed all recommended weight loss strategies for children, and fewer than 1% of parents endorsed any unsafe strategies. Parents were most likely to seek child weight loss information from healthcare professionals but those with low (versus adequate) health literacy were significantly less likely to use the Internet or books and more likely to use minister/clergy as sources. Poisson and logistic regressions showed that higher health literacy was associated with endorsement of more strategies overall, more recommended strategies, and greater odds of endorsing each specific recommended strategies for child weight control, after adjusting for parent age, education, race/ethnicity, income, marital status, weight concern, and child BMI percentile. Findings suggest that health literacy impacts parental views about child weight loss strategies and health information-seeking preferences. Pediatric weight loss advice to parents should include assessment of parent attitudes and prior knowledge about child weight control and facilitate parent access to reliable sources of evidence-informed child weight control information.

22 **Keywords:** weight loss strategies, child weight control, dieting, health literacy, information-
23 seeking, health communication, family

Health Literacy and Parent Attitudes about Weight Control for Children

Health literacy is the degree to which an individual has the capacity to obtain, understand, communicate, and apply basic health information and services to improve one's health (U.S. Department of Health and Human Services, 2012). About 36% of adults in the U.S. have inadequate health literacy (Kutner, Greenberg, Jin, & Paulsen, 2006; White, 2008). Health literacy is viewed somewhat differently in medical and public health contexts (Nutbeam, 2000). In medical contexts, low health literacy is viewed as a barrier to healthcare and treatment adherence, requiring that providers and healthcare organizations adapt to become more accessible and user-friendly (Liechty, 2011). In public health contexts, health literacy is viewed as an opportunity for education and empowerment, a capacity-building challenge to enable persons to exercise more agency in their lives and better utilize health information and services (Nutbeam, 2000). Public health literacy also encompasses skills in evaluating public health information and the ability to apply it in ways that impact small groups and entire communities rather than individual health alone (Freedman et al., 2009). To date, most health literacy research has been individually and clinically focused, leaving a gap in our understanding of its family health implications. Improving the health literacy of a parent can affect health behaviors and outcomes for the entire family, and studying early family influences on weight-related health has been identified as a national priority (National Institutes of Health Obesity Research Task Force, 2011). This study examines the impact of parental health literacy on weight-related information-seeking and parental attitudes toward weight control among young children, with implications for both public health and healthcare practice.

48 *Parental Health Literacy, Child Health, and Child Weight*

49 Among adults, low health literacy has been associated with poorer health status and
50 poorer health outcomes such as lower medical adherence, lower awareness of medical condition,
51 longer hospital stays, and greater use of the Emergency Department (Agency for Healthcare
52 Research and Quality, 2011; Nielsen-Bohlman, Panzer, & Kindig, 2004). Low health literacy
53 among parents has also been found to be associated with poor child health outcomes (DeWalt,
54 Dilling, Rosenthal, & Pignone, 2007) and may be a driver of health disparities (Yin et al., 2009).
55 A meta-analytic review of parental health literacy and child health outcomes found that parents'
56 low health literacy was associated with less knowledge about their child's medical condition and
57 fewer health promoting behaviors related to their child's condition (DeWalt & Hink, 2009).
58 More importantly, health literacy is modifiable. The same meta-analysis found that appropriate
59 interventions, such as materials written in plain language and brief counseling approaches,
60 improved parent health knowledge and medical adherence (DeWalt & Hink, 2009).

61 The components of literacy include reading, writing, verbal communication, numeracy,
62 and cultural and conceptual knowledge (Nielsen-Bohlman et al., 2004). In the context of health
63 literacy and child weight, it is crucial to better understand parental cultural and conceptual
64 knowledge with regards to weight, weight control, and health information, as this is the template
65 through which parents will filter information from pediatricians and other sources. Parental
66 obesity is strongly associated with child obesity (Harrison & Liechty, 2012), and so parents of
67 overweight children may be challenged to simultaneously improve their own health habits as
68 well as their child's. Weight loss is extremely difficult to achieve and maintain (National
69 Institutes of Health Obesity Research Task Force, 2011) and popular "fad diets" abound. Parents
70 who are advised to help a child with weight loss or maintenance are susceptible to the same

myths and misconceptions about weight loss as the general public (Casazza et al., 2013; National Institute of Diabetes and Digestive and Kidney Diseases, 2012b) and use what they know to help their child. However, the extent to which parental health literacy is associated with parental attitudes toward appropriate and effective weight loss strategies for young children is largely unknown.

Information and Recommendations on Weight Loss Strategies for Children

One of the key components of healthy literacy is the ability to obtain and understand health information, but little is known about where parents look for information regarding child weight loss strategies, or if preferred sources differ by level of parental health literacy. The American Academy of Pediatrics (AAP) issued evidenced-based recommendations for the prevention and treatment of overweight and obesity among children and many of the strategies are directed to parents and the home environment (Barlow & Expert Committee, 2007). In addition, federal resources such as the U.S. Dietary Guidelines 2010 (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010) have been issued to promote healthy eating and activity and are readily available on user-friendly websites for parents. There is ample public health information on obesity *prevention*, but the availability of high quality information for parents on *child weight loss* and strategies for parents to help a child who is already overweight or obese is limited. This gap in resources for parents is somewhat surprising given the high percentage of children and families affected by this dilemma. Twenty-three percent of children ages 2-5 in the U.S. are overweight or obese, and 8.4% are obese (Ogden, Carroll, Kit, & Flegal, 2014). Despite recent findings that on average obesity rates among preschoolers may be decreasing (Ogden et al., 2014), troubling disparities persist in

obesity rates among 2-5 year old Hispanic (16.7%) and African American (11.3%) children relative to White (3.5%) and Asian (3.4%) children (Ogden et al., 2014).

Low health literacy presents additional challenges to the dissemination of child weight-related health recommendations (Gustafson et al., 2005). The use of the Internet for health information is now widespread (Mackert, Kahlor, Tyler, & Gustafson, 2009), but reliable advice about child weight loss or weight management in the home is hard to find amidst the magnitude of available digital information. Effective Internet searches can be elusive for new users and parental recommendations regarding weight management for overweight and obese children may be subsumed under general information about child health, healthy eating, or physical activity. Even if parents do find credible health websites, they may not use the information. One study found that while 78% of adults with obesity sought weight loss information on the Internet (Lewis et al., 2011) and visited a wide range of websites including high quality government and public service websites, they reported acting most frequently upon information from user-friendly commercial websites selling products (Lewis et al., 2011). An evaluation of government websites from a health literacy perspective has noted the need for improvement in readability, user-friendly content, and cultural tailoring (Neuhauser, Rothschild, & Rodríguez, 2007). While great progress in these areas has been made, parents' ability to successfully navigate to high quality sources of child weight management information is still uncertain, and such challenges may be compounded by low health literacy (Gustafson et al., 2005).

The purpose of this study was to describe child weight-related information-seeking preferences by parents and weight loss strategies parents would consider using for children; and to examine the degree to which these preferences and strategies are influenced by level of health literacy. Specifically, we tested the following hypotheses: 1) Compared to parents with adequate

health literacy, parents with low health literacy will prefer more informal and fewer professional sources of information for child weight loss. 2) Parents with low health literacy will endorse fewer recommended and more unsafe weight loss strategies than parents with adequate health literacy. 3) After controlling for demographics, parent weight concern, and child weight, higher health literacy will be associated with more recommended and fewer unsafe weight loss strategies for children. Finally, to contextualize findings and compare to our results, we also sought to identify key federal and expert websites that recommended specific child weight control strategies for parents.

METHODS

Data and Participants

Data were drawn from a larger study, STRONG Kids, a prospective, longitudinal panel study that followed preschool age children and primary caregiver (n=497 pairs) over 3 waves beginning in 2009 (Harrison et al., 2011). The study and sampling design have been described elsewhere (Harrison & Liechty, 2012). We used cross-sectional data from Wave 1 (W1) for this study. The study was approved by the Institutional Review Board of the University of Illinois. Parents in the study were 89.7% female and their mean age was 32.5 years ($SD=6.7$). Parent self-reported race/ethnicity was non-Hispanic White (67%), African American (18%), Hispanic (6%), Asian (8%), other (1%). Thirty-nine percent received Women, Infants & Children (WIC) supplemental food program services. About half the parents completed college, 32% some college or technical school, and 13% completed high school or less. At Wave 1 the children (49.9% female) were an average of 3.3 years or 39.0 months ($SD = 8.1$). Cases with missing data on the primary independent (health literacy) and dependent (weight loss strategies) variables were excluded, yielding an analytic sample of n=475.

139 *Measures*

140 *Parent demographics.* Demographic variables included parent age, race/ethnicity, marital
 141 status, education, and income. Parent Body Mass Index (BMI), was also used as a control
 142 variable and was calculated in the standard manner (kg/m^2) from self-reported weight and height.

143 *Child Body Mass Index (BMI) Percentiles.* Children's height and weight were measured
 144 by trained assistants using a digital metric scale, stadiometer, and manualized protocol. Child
 145 BMI was calculated as (kg/m^2) and age and sex adjusted BMI percentiles were obtained using
 146 Centers for Disease Control and Prevention (CDC) Growth Charts (Kuczmarski et al., 2002) and
 147 SAS programs for calculating BMI percentiles and Z-scores (CDC, 2011).

148 *Health literacy* was measured using the Newest Vital Signs (NVS; Weiss, Mays, Martz,
 149 Castro, DeWalt, Pignone et al., 2005), a 6-item standardized assessment of health literacy and
 150 numeracy based on a person's ability to correctly interpret a nutrition label from an ice cream
 151 nutrition label. In this study, the NVS was administered as part of the self-report survey rather
 152 than verbal administration. Cronbach's alpha for the 6 items has been reported to be 0.76 (Weiss
 153 et al., 2005) and in this study was 0.79. The NVS was used as a continuous measure in the
 154 regression models (range 0-6). Otherwise, standard cut-offs identified in the literature were used
 155 to identify three levels of health literacy (Weiss et al., 2005), which label low (0-2), moderate (3-
 156 4), and high (5-6). To compare parents with low and adequate health literacy, we constructed a
 157 binary variable by collapsing moderate and high categories into "adequate" health literacy.

158 *Weight-related health information-seeking.* Health information-seeking preferences were
 159 measured with a 15-item instrument adapted from the Health Information National Trends
 160 Survey (National Cancer Institute, 2013; Yach, 2004). It assessed preferred sources of
 161 information regarding child weight control. Respondents were asked, *If you wanted to help your*

child lose weight, rate how likely you would be to consult the following sources for advice and information? They rated 15 sources (e.g., television, pediatrician, newspaper) on a scale from 1-5, ranging from very unlikely to very likely. The three family sources (mother, grandmother, other family) were collapsed into a “family” variable.

Child Feeding Questionnaire. We used two of seven available subscales from the Child Feeding Questionnaire (CFQ) (Birch, Fisher, Grimm-Thomas, Markey, Sawyer & Johnson, 2001), a widely used measure of parental attitudes, beliefs, and strategies related to child feeding and risk for eating problems. The first subscale, Weight Concern, was used to assess parent concern about child weight. There are 3 items and the Cronbach’s alpha in this sample was 0.77. A sample item reads: *How concerned are you about your child becoming overweight?* Weight concern has been shown to alter parents’ interactions with children around food (Payne, Galloway, & Webb, 2011), and so was included as a control variable to better estimate the independent effect of health literacy. The second CFQ subscale, Restriction, was used to assess the degree to which parents report restricting the amount or type of food for their child. There are 8 items in this subscale and the Cronbach’s alpha in this sample was 0.78. A sample item reads: *I have to be sure that my child does not eat too many high fat foods.* The Weight Concern subscale is attitudinal, and the Restriction subscale is behavioral. Both subscales were used as validation measures for the weight loss strategy checklist described below.

Weight loss strategy checklist. Weight loss strategies that parents would consider using for their child were assessed with a checklist based on the weight control checklist format used in national surveys in the U.S. (Harris, 2009; Kruger, Galuska, Serdula, & Jones, 2004; National Institutes of Health, 1993; Weiss, Galuska, Khan, & Serdula, 2006), the National Weight Control Registry (McGuire, Wing, Klem, Seagle, & Hill, 1998), and other population surveys (French,

Jeffery, & Murray, 1999; Neumark-Sztainer, Wall, Story, & Standish, 2012) to assess dieting behaviors. The checklist was adapted for this study to include current federal recommendations for addressing child obesity in the family. Participants were presented with a list of 24 weight loss strategies and asked: *Which of the following weight control strategies would you consider using to help yourself or to help your child lose weight if needed, now or in the future? (check all that apply)*. This measure differs from other uses of a weight loss checklist in two ways. First, although the checklist has been used extensively with adults and adolescents, and parental feeding practices have been vigorously studied for decades, this may be the first time a standard weight control strategy checklist has been administered among parents to assess strategies they would use to help a child lose or control weight. Second, the W1 version of this checklist was intended to assess parental attitudes toward various weight loss strategies for children, not behaviors, given the very young age of the children and the prospective nature of the study whereby overweight rates were expected to be very low at W1. (In W2 the stem question on this measure was changed to assess recent behavior.)

Since this was a novel application, we evaluated the content and response patterns of the child weight loss strategy checklist. First, cases reporting any unsafe strategies for young children (e.g., purging, fasting, diet pills) were screened for data quality, and three cases with implausible responses were removed from the sample. Second, Principal Component Analysis (PCA) was performed to reduce the number of items and to empirically summarize the relationships among observed variables into aggregated components for analysis, one of the purposes of PCA for which meeting assumptions of normal distribution of variables are not required (Tabachnick & Fidell, 2001, p.588). The Kaiser-Meyer-Olkin test statistic (KMO=.81) indicated good sampling adequacy. Adequate correlation between the variables was confirmed

using Bartlett's test of Sphericity ($X^2(190) = 2880.77, p < 0.0001$). The first unrotated, unrestricted PCA solution identified five components that accounted for 55.0% of the variance; and results suggested that the number of checklist items could be reduced to 15. Nine items were removed due to non-response, cross-factor loadings > 0.3 , and single-item components. A second unrestricted PCA with varimax rotation was performed on the retained 15 items. Three components were identified, accounting for 52.4% of the variance. The three components were interpreted based on the literature and current public health recommendations on child weight control, as follows: recommended strategies (3 items, Cronbach's alpha = 0.74), unsafe strategies (4 items, alpha = 0.87) and neutral strategies (8 items, alpha = 0.75).

Recommended child weight control strategies are those that were recommended on parent or consumer-oriented web pages on all of the federal websites shown in Table 4. Unsafe strategies correspond to weight loss methods classified as unhealthy, risky, problematic or unsafe in the literature based on their associations with distress and disordered eating (Jeffers, Benotsch, & Koester, 2013; Liechty, 2010; Neumark-Sztainer et al., 2012). Neutral strategies are those that were neither considered unsafe nor necessarily recommended across the federal web sources in Table 4. These include a range of commonly used strategies such as monitoring (e.g., keep a food diary, count calories), reducing calories (e.g., eat low calorie foods, reduce amount of food), and coping (e.g., practice stress management). A continuous summary score was constructed for the full 15-item checklist (Cronbach's alpha = 0.79) and each component (recommended, unsafe, and neutral) by summing the responses. Binary variables were constructed for unsafe (any vs. none) and recommended (any vs. none, and all 3 vs. < 3).

Finally, to examine validity of the checklist we examined correlations between the summary score for the full checklist and its components with the two subscales of the CFQ:

Weight Concern and Restriction as described above (Birch et al., 2001). Higher parental weight concern for child was positively correlated with the scores for the full summary checklist [$r(466) = 0.11, p = .02$], the neutral component [$r(466) = 0.10, p = .03$], and the unsafe component [$r(466) = 0.15, p = .001$]; but weight concern was not significantly correlated with the recommended strategies score. The CFQ Restrictive Feeding subscale was positively correlated with the full checklist and neutral and recommended components [$r(452) = 0.22, p < .0001$; $0.20, p < .0001$; and $0.17, p < .001$, respectively]. Overall, the weight loss strategies checklist appears to have adequate to good validity and internal reliability. Parents' responses on the weight loss strategies checklist for young children were consistent with other established measures of parental concern for child weight and food restriction practices and the coefficients for internal consistency of the full checklist and components were good (all were > 0.7) (Tabachnick & Fidell, 2001).

Analytic strategy. Univariate and initial multivariable analyses were conducted using SPSS version 21 (IBM Corp., Armonk, NY, USA); final multivariable models were conducted using Statistical Analysis Software (SAS) version 9.3 (SAS Institute, Cary, NC, USA). To test the first hypothesis (H1), we used the 2-sample Mann-Whitney U Test with t-approximation to examine whether or not parent preferences for sources of weight loss information differed by level of health literacy. For H2, chi-square tests were conducted to compare weight loss strategies between those with low versus adequate health literacy; the Fischer's Exact test was used when cell sizes were below five. For H3, multivariable regression modeling was conducted to examine the degree to which health literacy was associated with the number and type of weight loss strategies endorsed by parents, after adjusting for parent demographics (age, race/ethnicity, education, household income, and marital status), parent concern about child

weight, and child BMI percentile. Poisson regression was used for the continuous weight loss strategy outcomes since the data were positive integer-valued and we could not assume a normal distribution. The ratio of the deviance to the model degrees of freedom was used to assess model fit. Logistic regression was used for the binary outcomes. A two-tailed p -value < 0.05 was considered statistically significant.

RESULTS

One in six parents (16%) in this sample had low health literacy. Parents endorsed an average of 4.3 ($SD=2.8$) weight loss strategies. Overall, 53% endorsed all three recommended weight loss strategies for children, and this rate was higher among parents with adequate (58%) versus low health literacy (24%). In addition, nearly a third (31%) of parents with low health literacy did not mark any of the recommended strategies compared to 11% of their counterparts. Most parents (69%) expressed little or no weight concern for their child, and neither weight concern nor food restriction on the CFQ subscales differed by health literacy level. Very few parents marked that they would consider using unsafe weight loss strategies for their children; however it is concerning that even a few parents (0.8%) endorsed using laxatives ($n=3$), diet pills ($n=2$), fasting ($n=1$), and skipping meals ($n=2$) for children.

Our first hypothesis was that parents with low health literacy would prefer more informal and fewer professional sources of information for child weight control compared to those with adequate health literacy, and this hypothesis was partially supported. Parents at all levels of health literacy show a strong preference for obtaining child weight loss information from healthcare professionals such as pediatricians, nurses, and nutritionists, but preferences for other sources of information differed by health literacy level. Parents' reported likelihood of seeking weight loss information from minister/clergy was significantly higher among those with low

(versus adequate) health literacy, and the likelihood of using the Internet or books as sources of weight loss information was significantly lower among those with low (versus adequate) health literacy (Figure 1).

Our second hypothesis was that parents with low health literacy would endorse fewer recommended and more unsafe strategies than parents with adequate health literacy, and this hypothesis was supported (Table 1). Table 1 shows that the rate at which weight control strategies were endorsed differed significantly between low and adequate health literacy groups on all but a few strategies (counting calories, reducing amount of food, and eating less meat) and on three of the four composite continuous scores. A large majority of parents (79%) endorsed at least two of the three recommended strategies for child weight control, though rates differed by low (53%) versus adequate (82%) health literacy. However, only 24% of parents with low health literacy endorsed all three recommended strategies compared to 59% among their counterparts (not shown).

Table 1 presents the distribution of the strategies parents would consider to help the child lose weight by level of health literacy. Overall, parents with low health literacy marked fewer strategies ($M=2.8$, $SD=2.8$) than parents with adequate health literacy ($M=4.6$, $SD=2.7$), and fewer recommended strategies ($M=1.5$, 2.3 ; $SD=1.2$, 1.0 , respectively; $p<.0001$ for both). The three recommended strategies were also the strategies most frequently selected by parents to help a child lose weight; however the proportion of parents endorsing each of these strategies differed significantly by level of health literacy (Table 1). For example, 84% of parents with adequate health literacy endorsed *increasing fruits and vegetables* for children, compared to only 63% of parents with low health literacy. The percentage of parents with adequate health literacy who marked at least one unsafe strategy was 0.5% compared to 2.7% among low health literacy, but

the difference was not statistically significant. After the highly endorsed recommended strategies, the next three most common strategies were: change food type, eat low-calorie foods, and keep a food diary, all of which differed by health literacy ($p=.001$).

Our third hypothesis tested if higher health literacy would be associated with more recommended and fewer unsafe strategies for children after controlling for background factors, and this hypothesis was partly supported (Table 2). In the multivariable models we controlled for parent age, race/ethnicity, education, marital status, household income, child BMI percentile, and parent concern about child weight to assess the adjusted effect of low health literacy on the number of weight loss items endorsed. Poisson and logistic regressions showed that higher health literacy was associated with endorsement of more strategies overall, more recommended and neutral strategies (Table 2), and greater odds of endorsing each specific recommended strategy as well as odds of endorsing all three of the recommended strategies for child weight control in fully adjusted models (Table 3). Due to small sample sizes on unsafe strategies, the models for unsafe strategies did not converge under either the Poisson or the Logistic procedures and therefore could not be estimated. Although weight concern was not correlated with level of health literacy, we found that weight concern itself was associated with endorsement of neutral and more strategies overall (Table 2) and with greater odds of endorsing decreased fat intake (Table 3).

Finally, Table 4 summarizes child weight loss recommendations for parents. There were many governmental public health websites with excellent information for parents on healthy lifestyle habits to *prevent* obesity, but relatively limited information on child “weight loss,” i.e., reducing positive energy balance. Numerous federal agencies did provide specific strategies for

parents to help a child who is already overweight or obese such as increasing fruit and vegetable intake and physical activity, and recommendations varied by source.

DISCUSSION

This study is among the first to describe attitudes toward a variety of specific weight loss strategies among parents of young children, and to our knowledge, the first to find that health literacy is associated with parental attitudes toward specific weight control strategies. Parental health literacy was positively associated with endorsement of recommended weight loss strategies (e.g., increasing fruit and vegetables and physical activity, and decreasing fat intake), and the number of strategies overall, even after controlling for demographic and other background factors. Said another way, low health literacy was associated with fewer recommended strategies and fewer strategies overall. Consistent with prior research (DeWalt & Hink, 2009; Yin et al., 2009), this study suggests that health literacy is more than a proxy for income or education; it exerts its influence above and beyond fixed demographic factors. A recent systematic review of interventions to improve health literacy shows that health literacy, unlike most fixed demographic factors, is modifiable and can be improved (Jacobs, Lou, Ownby, & Caballero, 2014). Health literacy is a promising target for intervention.

Health Literacy and Sources of Child Weight Control Information

Compared to parents with adequate health literacy, parents with low health literacy in this study showed far less reliance on the Internet as a source of information on child nutrition and weight control. Why? Persons with low health literacy are less likely to have access to Internet in their homes (U.S. Department of Education, 2007), may not be familiar with searching and evaluating Internet information, and may find the massive quantity of information daunting (Mackert et al., 2009). The gap between parents with low versus adequate health literacy in their

preference for using the Internet for health information is troubling in an era where web-based dissemination is the norm, and when e-Health interventions to improve health literacy are not only expanding but effective (Jacobs et al., 2014). A recent study in the U.S. based on the Health Information National Trends Survey (n=3959) found that lower education level (but not race/ethnicity) predicted lower use of e-Health technology (Kontos, Blake, Chou, & Prestin, 2014). Specifically, people with high school or less education had lower odds of using a website to track their physical activity, food intake or and weight and lower odds of accessing health information on a mobile device than those with more education (Kontos et al., 2014). In response, public health approaches can aim to both increase uptake of credible e-Health resources among parents with lower health literacy and expand dissemination practices to match preferences. For example, parents with low health literacy were more likely to choose clergy as sources of health information for child weight control, and partnerships with faith-based organizations to deliver health information is a relatively new but promising venue for health promotion (Delgado, 2013). Finally, all parents strongly favored “friends” as a source of health information regardless of health literacy, and this suggests opportunities for tailored outreach through social networks to improve health literacy. A promising venue for reaching parents of young children is daycare centers (Larson, Ward, Neelon, & Story, 2011), a place where parents build social ties and where many early eating and physical activity habits in children are formed (Dev & McBride, 2013).

Availability of Child Weight Control Information for Parents and Caregivers

The child weight control strategies for parents shown in Table 4 varied somewhat by source, may be perceived as vague by consumers (e.g., maintain “appropriate calorie balance”), and were hard to find. Within the National Institutes of Health, there were at least four institutes

and two funded programs that offered excellent resources for parents and children to promote healthy weight (Table 4). However, the public has little knowledge of how the NIH institutes are organized, or which specific institutes to check for obesity prevention and treatment information. Thus, if searching on the Internet, once parents locate a single “NIH webpage” related to child obesity, they may end their search, even if other NIH webpages would provide more targeted information to address their concerns. Despite the high quality information on child weight control available to parents on these sites, one study found that parents with low health literacy actually avoided government websites for weight-related health information due to the perception that these websites would be too complex and difficult to navigate (Mackert et al., 2009).

Most of the recommendations for parents shown in Table 4 focused on strategies to reduce positive energy balance through increasing expenditure (exercise), and decreasing intake (fewer calories). Less information was available to parents about “how” they can be successful in changing energy related behaviors in the home despite systematic reviews of family-based child obesity intervention trials that have identified core parent behavior change strategies that improve child obesity outcomes (Faith et al., 2012). These core strategies were summarized in a scientific statement from the American Heart Association as follows: specifying target behaviors, self-monitoring, realistic goal-setting, managing stimulus control in the home, practicing positive reinforcement with child, and fostering child self-management skills (Faith et al., 2012). While these evidence-based behavioral strategies are routinely incorporated into structured family-based treatment protocols (Barlow & Expert Committee, 2007), parents seeking self-help advice may find little exposure to these important strategies to improve their child’s health, particularly if low health literacy deters them from navigating into the scientific literature. Clearly, much

work lies ahead in synthesizing, translating, and disseminating critical weight-related health information for parents in ways that empower them to address child obesity in the home in safe and effective ways.

Implications for Healthcare Practitioners

Parents with lower health literacy may have reduced access to credible information, be less informed, or simply be less persuaded by current evidence-informed strategies to manage child weight. It may be helpful to assess parental prior knowledge and assumptions about safe and effective weight loss methods. If unsafe weight loss strategies are in parents' mental schema, or part of their own current or past behavioral repertoire, such strategies will seem familiar and could be reactivated if urged by a healthcare provider to address their child's obesity problem. However, parents' preconceived ideas about weight loss are rarely explored in time-constrained, routine pediatric visits, and this step is not currently included in clinical guidelines for counselling parents about child obesity (Barlow & Expert Committee, 2007; Rao, 2008). Health professionals (e.g., pediatrician, nurse, dietician) are reliable sources of nutrition and health information, and indeed parents favored these sources above all others, regardless of health literacy level. Even so, a recent study found that the language of providers matters a great deal to parents: terms such as *unhealthy weight* and *weight problem* were perceived as acceptable and motivating, while terms such as *obese* and *fat* were perceived as stigmatizing and blaming (Puhl, Peterson, & Luedicke, 2011). Further, discussing problems of excess child weight with parents who are themselves overweight has been identified as very challenging for providers (Edvardsson, Edvardsson, & Hörnsten, 2009)

When counseling parents about how to help an overweight child, we suggest providers consider expanding their assessment protocol to elicit parents' health beliefs about dieting and

weight loss, address misconceptions without judgment, and offer a few key sources for reliable information on child weight control such as those featured in Table 4. Finally, a brief screen for health literacy may help identify parents who could benefit from more tailored information, dialog, or referral to equip them to help their child achieve and maintain a healthy weight.

Limitations

Several limitations bear noting. All data were cross-sectional so causal inferences cannot be made. Questionnaires were based on self-report and thus subject to bias, and excluded parents who were unable to read. We administered the 6-item Newest Vital Signs measure as part of a written survey (pen-and-pencil or on-line), and the NVS was originally validated based on verbal administration (Weiss et al., 2005). The Weight Loss Checklist in Wave 1 assessed intention rather than behavior due to the young age of the children (aged 2-5); in Wave 2 of the study, forthcoming, the checklist assesses parent use of weight loss strategies for children in the previous 30 days. The checklist has typically been administered to adults or adolescents about their own behavior rather than to parents concerning strategies they would consider using to help their child, and more extensive psychometric testing may be warranted. A limitation of the sample was that only 10% were fathers (n=49; n=12 with low health literacy). Although fathers play an important role in establishing family norms for eating, dieting, and physical activity, the number of fathers in this sample was too few to stratify the analyses or make comparisons by gender.

Conclusion

Health literacy influences parental views and attitudes about child weight loss strategies, even after controlling for a wide range of potential confounders. Lower health literacy is associated with endorsement of fewer recommended weight control strategies and endorsement

of a narrower range of strategies overall. Low health literacy may also be a risk factor for using less reliable sources of health information and for selecting more unsafe weight control strategies for children. In research and clinical practice, greater attention needs to be given to parents' attitudes about weight loss and dieting that may affect their ability to effectively help their child achieve a healthy weight. Efforts should also be made to facilitate parents' access to reliable sources of evidence-based child weight control information in formats that are user-friendly. Brief, standardized measures of health literacy may be helpful in screening parents with insufficient awareness of recommended strategies. Tailored dissemination strategies and educational approaches are needed that enhance parent health literacy and ensure access to safe and effective approaches to weight management in the family.

Acknowledgements

This research was funded, in part, by grants from the Illinois Council for Agriculture Research to Kristen Harrison (PI), the University of Illinois Health and Wellness Initiative to Barbara Fiese and Sharon Donovan (Co-PIs), and the United States Department of Agriculture (Hatch 793-328) to Barbara Fiese (PI). The authors would like to acknowledge the STRONG Kids Team for data collection and design of the parent study. The STRONG Kids Team includes Kristen Harrison, Kelly Bost, Brent McBride, Sharon Donovan, Diana Grigsby-Toussaint, Juhee Kim, Janet Liechty, Angela Wiley, Margarita Teran-Garcia and Barbara Fiese. Jaclyn Saltzman was supported by the National Institute for Agriculture under the Illinois Transdisciplinary Obesity Prevention Program (I-TOPP) training grant (2011-67001-30101) to the Division of Nutritional Sciences at the University of Illinois.

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633
634 ^aThese resources appear in Table 4.

Table 1

Prevalence of Strategies Parents Would Consider Using to Help Child Lose Weight by Level of Parental Health Literacy

	All	Adequate Health Literacy	Low Health Literacy	<i>p</i> -value
	M(SD) or n(%)	M(SD) or n(%)	M(SD) or n(%)	
All strategies (range 0-15)	4.31 (2.82)	4.61 (2.74)	2.75 (2.78)	<.0001
Recommended ^a (range 0-3)	2.17 (1.07)	2.30 (1.00)	1.47 (1.17)	<.0001
Increase fruit & vegetables	382 (80.4)	335 (83.8)	47 (62.7)	<.0001
Increase exercise/activity	337 (70.9)	305 (76.3)	32 (42.7)	<.0001
Decrease fat intake	311 (65.5)	280 (70.0)	31 (41.3)	<.0001
Neutral (range 0-8) ^b	2.13 (2.09)	2.30 (2.10)	1.21 (1.80)	<.0001
Change food type	200 (42.1)	182 (45.5)	18 (24.0)	0.001
Eat low-calorie foods	173 (36.4)	158 (39.5)	15 (20.0)	0.001
Keep a food diary	154 (32.4)	142 (35.5)	12 (16.0)	0.001
Count calories	140 (29.5)	125 (31.3)	15 (20.0)	0.05
Reduce amount of food	128 (26.9)	114 (28.5)	14 (18.7)	0.08
Eat less high-carb food	112 (23.6)	104 (26.0)	8 (10.7)	0.004
Practice stress management	58 (12.2)	54 (13.5)	4 (5.3)	0.047
Eat less meat	45 (9.5)	40 (10.0)	5 (6.7)	0.37
Unsafe (range 0-4) ^c	0.02 (0.21)	0.01 (0.11)	0.07 (0.47)	0.06
Unsafe (Any vs. None)	4(0.8)	2 (0.5)	2 (2.7)	0.12
n	475 (100)	400 (84.2)	75 (15.8)	

Note. LHL=low health literacy. AHL=adequate HL. M=Mean. SD=standard deviation. P-values reflect the following: Mann-Whitney U tests were used for continuous summary variables, Chi-Square tests were used for binary variables, and the Fishers Exact test was used when a cell size was less than 5. Principal Component Analysis was used for item reduction and empirical grouping of weight loss strategies. Three components were identified. These were interpreted and defined based on the literature and current public health recommendations oriented toward parents and caregivers on child weight control.

^aRecommended weight control strategies for children are those that were recommended on parent-oriented webpages on all of the following federal websites: U.S. Department of Agriculture's Dietary Guidelines for Americans, Centers for Disease Control and Prevention, and four institutes at the National Institutes of Health..

^bNeutral strategies are those that were neither endorsed across the federal web sources noted above nor considered unsafe.

^cUnsafe strategies included use of laxatives (n=3), diet pills (n=2), fasting (n=1), and skipping meals (n=2). Due to small cell sizes (less than 5) on all the Unsafe strategies, items were recoded into one binary variable (any versus none) where any unsafe strategy =1 and no unsafe strategies =0. Four additional unsafe strategies had zero endorsements (i.e., liquid diet, enemas, diuretics, and purging/throwing up) and so are not shown. Strategies classified as Unsafe have been associated with distress and disordered eating in the literature.

Table 2

Poisson Regression Showing Associations between Child BMI Percentile, Parental Weight Concern, and Parent Health Literacy with Weight Loss Strategies for Child (n=475)

	All strategies (range 0-15)			Recommended strategies (range 0-3)			Neutral strategies (range 0-8)		
	Beta	(95% CI)	<i>p</i>	Beta	(95% CI)	<i>p</i>	Beta	(95% CI)	<i>p</i>
Child BMI percentile	0.009	(-0.0435, 0.0624)	0.727	0.026	(-0.049, 0.101)	0.501	-0.0007	(-0.075, 0.074)	0.986
CFQ weight concern	0.084	(0.032, 0.136)	0.002	0.046	(-0.029, 0.122)	0.230	0.112	(0.039, 0.184)	0.003
NVS Health Literacy	0.172	(0.093, 0.251)	<0.0001	0.128	(0.020, 0.235)	0.021	0.218	(0.102, 0.334)	0.0002

Note. Beta=standardized regression coefficient, CI =confidence interval, BMI, body mass index, CFQ=Child Feeding Questionnaire weight concern subscale (range 3-15), NVS= Newest Vital Signs measure of health literacy (range 0-6). All models are adjusted for parent age, parent education, family structure, household income, and race/ethnicity. The model predicting Unsafe weight loss strategies (range 0-4) did not converge under Poisson regression and is therefore not presented.

Table 3

Logistic Regression Showing Associations between Child BMI Percentile, Parental Weight Concern, Parent Health Literacy and Recommended Weight Loss Strategies for Children, Adjusting for Background Factors (n=475)

	More fruits & vegetables (Y/N)				More physical activity (Y/N)				Decrease fat intake (Y/N)				All three recommended strategies (Y/N)			
	OR	(95% CI)		<i>p</i>	OR	(95% CI)		<i>p</i>	OR	(95% CI)		<i>p</i>	OR	(95% CI)		<i>p</i>
Child BMI percentile	1.01	(1.00,	1.02)	0.25	1.00	(0.99,	1.01)	0.59	1.01	(1.00,	1.02)	0.18	1.01	(1.00,	1.01)	0.25
CFQ weight concern	1.06	(0.77,	1.45)	0.73	1.18	(0.88,	1.57)	0.27	1.44	(1.08,	1.92)	0.01	1.19	(0.92,	1.54)	0.18
NVS Health Literacy	1.20	(0.97,	1.47)	0.09	1.40	(1.15,	1.71)	0.001	1.22	(1.01,	1.47)	0.04	1.36	(1.11,	1.67)	0.003

Note. OR= odds ratio, CI= confidence interval, OR= odds ratios, BMI= body mass index, CFQ=Child Feeding Questionnaire Weight Concern subscale (range 3-15), NVS=Newest Vital Signs measure of health literacy (range 0-6). All models are adjusted for parent age, parent education, marital status, parent race/ethnicity, and household income.

Table 4

Child Weight Control Recommendations and Strategies for Parents Found on Selected Federal and Expert Websites

Source	Document or webpage	Add or Increase								Limit or Decrease						Other Suggestions
		Physical Activity	Fruits /Veg	Whole grains	Water beverage	Meal planning	Family meals	Portion control	Breakfast	Low-fat dairy ^a	Screen time	Solid fats	Fast food	Sugared drinks	Added sugar	
AAP	Expert committee (Barlow, 2007)	X	X				X	X	X		X		X	X		Eat high fiber diet rich in calcium. Limit consumption of energy-dense foods. Breastfeed exclusively for first 6 months, maintain breastfeeding after introduction of solid food to 12 months. Increase home-prepared meals and limit fast food consumption.
CDC	Tips for parents... to help children maintain a healthy weight (CDC, 2014a)	X	X	X	X			X	X		X	X		X	X	Choose lean meats, poultry, fish, lentils, and beans for protein.

	Strategies and solutions for parents (CDC, 2014b)	X			X		X				X	X		X	X	Visit child's child care site to monitor for healthy foods and limits on screen time. Work with schools to limit foods high in added fats, sugar, and salt. Prepare healthy food at home.
DHHS	Help your child stay at a healthy weight (U.S. DHHS, 2014)	X	X	X	X	X	X		X	X	X		X		X	Talk to your doctor. Look for weight-loss program that includes counseling for kids. Involve children in meal prep. Read nutrition labels. Be active as a family. Be a role model for healthy eating. Provide nutritious snacks. Allow kids to stop eating when they feel full. Ensure child has adequate sleep.
USDA	Dietary Guidelines for Americans 2010 (USDA, 2010)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Assess calorie needs for age and gender. Track food and calorie intake. Cook and eat more at home. Reduce sodium intake. Include lean meat, poultry, eggs, beans and peas, soy products, and

unsalted nuts and seeds for protein. Increase seafood consumption. Choose foods high in potassium, fiber, calcium, vitamin D; and iron for girls. Read nutrition labels. Improve family nutrition literacy, gardening and cooking skills. Facilitate individual behavior change through environmental strategies.

Include lean meats, beans, eggs, and nuts. Chew slowly and remind others to enjoy food. Use GO, SLOW, and WHOA foods chart. Count calories.

Include lean meat, poultry, fish, beans, eggs, and nuts. Read nutrition labels. Be active as a family.

NHLBI,	Ways to
NIDDK,	enhance
NICHD,	children's
and NCI	activity and
<i>We Can!</i>	nutrition
<i>program</i>	(NHLBI, 2013)

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Families finding
the balance: A
parent handbook
(NHLBI, 2005)

X X X X X X X X X X X X

NIDDK	Helping your over-weight child (NIDDK, 2013)	X	X	X	X	X	X	X	X	X	X	X	X	X	Offer healthy snacks. Try not to use food as a reward. Be aware of food marketing to kids. Be a positive role model for physical activity; be active as a family. Encourage child to join a sports team or class. Be supportive and sensitive to child's feelings at any weight. Be active together as a family.
	Take charge of your health: A guide for teenagers (NIDDK, 2012a)	X	X	X	X	X	X	X	X	X	X	X	X	X	Avoid distracted eating, such as eating in front of TV. Eat slowly. Avoid fad diets. Read nutrition labels. Limit sodium, candy, and sweets. Be aware of food advertising. Set realistic goals. Find a buddy to support new habits. Get enough sleep. Make changes slowly. Use a journal to review your nutrition and activity habits

Note. AAP=American Academy of Pediatrics. CDC=Centers for Disease Control and Prevention. DHHS=U.S. Department of Health and Human Services. USDA=U.S. Department of Agriculture. NHLBI=National Heart, Lung and Blood Institute. NICHD= National Institute for Child Health and Development. NIDDK=National Institute of Diabetes, Digestive, and Kidney Diseases. NCI=National Cancer Institute.

^aLow-fat dairy is recommended after age 2.

Figure 1. Sources parents are likely to use for health information about child weight loss shown in mean scores by level of health literacy (low versus adequate). Significant differences were based on Mann-Whitney U Test, a nonparametric test. Mean scores are based on responses to the following item: *If you wanted to help your child lose weight, rate how likely you would be to consult the following sources for advice and information* [range 1-5, very unlikely to very likely]. Error bars indicate 95% confidence intervals. Analytic sample size was n=475 (low health literacy n=75, adequate n=400).

*** $p < .0001$. ** $p < .001$. * $p < .05$.