

**A Review of Household  
Behaviors for Preventing  
Obesity in Children**

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## CONTENTS

Chapter	Page
I	OVERVIEW .....1
II	BACKGROUND .....2
	THEORETICAL MODEL FOR THE VIDEO ACHIEVING ITS DESIRED OUTCOMES.....2
	DEFINING TERMS USED IN THE REPORT.....2
III	FRAMEWORK FOR EVIDENCE EVALUATION.....4
IV	TARGET BEHAVIORS .....5
	PHYSICAL ACTIVITY/INACTIVITY .....5
	1. Reducing “screen time” (time spent watching television or videotapes, using the computer, or playing video games).....5
	2. Increasing time spent in gross motor play, indoors and outdoors.....6
	3. Walking or biking to school.....7
	EATING CONTEXT .....8
	4. Limiting portion sizes .....8
	5. Reducing the number of meals consumed away from home, especially at “fast food” restaurants.....8
	6. Increasing the number of meals eaten with family members, especially parents .....9
	7. Not skipping breakfast .....10
	8. Reducing snacking between meals.....11
	FOOD CONSUMED .....11
	9. Limiting consumption of sugar-sweetened beverages .....11
	10. Limiting the consumption of “unhealthy foods” (foods high in fat, high in sugar, and/or low-nutrient density) .....12
	11. Increasing the consumption of reduced-fat dairy products .....13
	12. Increasing the consumption of fruit and vegetables.....14
	13. Increasing the consumption of water .....15

## CONTENTS *(continued)*

Chapter	Page
PARENT FEEDING .....	16
14. Breastfeeding.....	16
15. Not feeding children in response to their emotional states .....	16
16. Not using food to reward children .....	17
17. Determining what food is offered to children, but allowing children to determine how much of it to eat.....	18
V TARGET AUDIENCES .....	20
THE DISTRIBUTION CHANNEL.....	20
THE TRACKING OF CHILDHOOD OBESITY .....	21
THE ROLE OF PARENTS IN CHILDREN'S BEHAVIOR.....	21
DELIVERING MESSAGES TO CHILDREN OF DIFFERENT AGES .....	22
SUMMARY .....	22
VI SUMMARY RECOMMENDATIONS .....	23
PHYSICAL ACTIVITY/INACTIVITY .....	24
EATING CONTEXT .....	24
FOODS CONSUMED .....	24
PARENT FEEDING .....	24
CONCLUDING RECOMMENDATION .....	26
REFERENCES.....	27

## I. OVERVIEW

This informational report has been prepared for the Agency for Healthcare Research and Quality (AHRQ) to assist the Agency in its efforts to develop an interactive video for children and their parents about the subject of childhood obesity. This tool may ultimately take multiple forms, including digital video disk (DVD) or compact disk (CD); but the tool will be referred to throughout this report as a “video.” The video will be designed to encourage viewers to adopt specific behaviors that may help prevent or treat childhood obesity. Once the video is developed, it will be distributed to children and their parents, primarily by pediatric primary care clinicians.

In developing this video, AHRQ wishes to evaluate the available evidence to inform the selection of (1) the primary target messages to be communicated in the video (“practical salient messages about specific behaviors”), and (2) the population that will serve as the primary target audience. The primary purpose of the report is to summarize evidence for a group of experts that will be convened by AHRQ on January 20, 2004 to discuss the development of the proposed video. The group will include representatives from the fields of nutrition, physical activity, child development, and interactive media.

The report is not intended to make a specific behavioral prescription for families about how best to prevent or treat obesity. Family behaviors, such as those involving diet and physical activity that are discussed in this report, are highly personal and culturally embedded. When parents try to shape these behaviors in children through modeling and by altering the home environment, these efforts cannot easily be separated from the overall process of parenting. Feeding and eating, in particular, are behaviors tightly linked to how parents attempt to love and nurture their children. For all these reasons, it is acknowledged that, even where the “evidence” may be strong that adopting a particular behavior might help prevent obesity, families may differ in the value they place on different health outcomes, such as obesity, and on the relative weights they assign to certain harms and benefits of adopting a behavior. This informational report was prepared under contract to the AHRQ.

The body of the report to follow has five sections. The background section will briefly describe a theoretical model for how the video is intended to achieve its desired results and will define how several key terms will be used in the report. Next, the report will describe the conceptual framework used to review evidence. The major emphasis in the report is on the section that reviews the evidence for and against selecting certain target messages. There will then be a briefer discussion that follows, about possible target audiences and the use of video as the medium for communicating those messages. The report will conclude with summary recommendations. This report has been prepared by Mathematica Policy Research, Inc. (MPR) under contract from AHRQ. The conclusions and recommendations do not necessarily reflect the views of AHRQ or its parent agency, the U.S. Department of Health and Human Services (DHHS).

## II. BACKGROUND

### THEORETICAL MODEL FOR THE VIDEO ACHIEVING ITS DESIRED OUTCOMES

The goal of the video is to communicate messages that change behaviors in the viewer that, if adopted, will help prevent or treat obesity. These behaviors are intended to achieve this outcome by altering energy balance (i.e., the relationship between calories consumed and calories expended) to either prevent or treat obesity.<sup>1-3</sup> Theoretically, then, at least two major steps are necessary for the video to achieve its intended results—the messages in the video must first change target behaviors, and the target behaviors must then alter energy balance. This report primarily evaluates the evidence that specific behaviors could, if adopted, alter energy balance; only secondarily does it consider the question of whether a message, communicated through a video, could alter behaviors.

For two reasons, the report does not address the question of how the video should be designed to change a behavior. First, the video is a relatively novel technique for altering behavior. Very little is known about how video would compare to other methods or mediums used to change behaviors related to obesity. Second, even if the video were successful in changing target behaviors, it would not be successful as a tool in obesity prevention or treatment if those behaviors had no impact on energy balance. Therefore, even though this report is designed to facilitate the selection of target messages for the video, the report will emphasize whether there is evidence that certain target behaviors are related to obesity. After considering the strength of the evidence relating the target behavior to obesity, important considerations will still remain about whether video is a suitable medium for altering a given behavior and, if so, who might be the best target audience (e.g., parents, children, or both) for messages about the behavior.

### DEFINING TERMS USED IN THE REPORT

The following terms are each central to this report and are subject to potential misinterpretation: overweight, obesity, prevention, treatment, children, family, parent, household, and play. To avoid confusion, the use of each term, for the purpose of this report, will be clarified.

The Centers for Disease Control and Prevention (CDC) has established the term “overweight” to describe children with body mass index (BMI)  $\geq$  95th percentile and the term “at risk for overweight” to describe children with a BMI  $\geq$  the 85th and  $\leq$  the 95<sup>th</sup> percentile.<sup>4</sup> However, throughout this report, the term “obesity” will be used preferentially, rather than either of the other two terms. In medical and scientific circles, obesity is defined as a condition characterized by excess body fat. An “excess” is usually considered an amount of body fat (often expressed as the percentage of body mass composed of fat) that is sufficient to cause adverse physical or emotional health consequences. The exact percentage of body fat at which adverse consequences occur can vary greatly across individuals, as can the definition of “adverse consequences.” Nonetheless, the central purpose of the video is to prevent children from

becoming obese—that is, from reaching levels of body fat that can impair health—and to treat those children who are already obese. Thus, the term “obesity” will be used.

In reviewing the evidence for each candidate behavior (or message to alter that behavior), a distinction will *not* be made between whether the behavior is intended to “prevent” obesity or to “treat” it. The distinction is somewhat artificial when it comes to messages about behavior change to alter energy balance. Any behavior that will help treat obesity by altering energy balance will also help prevent obesity. While the magnitude of behavior change required may differ between treatment and prevention, the target behaviors do not. Furthermore, the vast majority of the scientific literature that informs the selection of target behaviors involves observational studies showing an association between a behavior and body weight. There are only a handful of experimental studies in which a behavior change intervention is randomly assigned to groups of children (either obese or non-obese at baseline) with the primary end points being a change in body weight. Thus, there are insufficient data to determine the extent to which a target behavior should be selected for prevention, for treatment, or for both. In this report, the term “prevention” will be used preferentially, but it is also meant to include treatment of children already obese.

“Family,” “household,” and “parent” are all rapidly changing concepts in American society. In this report, the term “parent” is not meant to refer exclusively to a child’s biological parents. Rather, “parent” is meant to include all adults who have significant roles in shaping the household environments where children spend their time and in monitoring children’s behavior in those household settings. The term “household” means a private residence where the child spends significant portions of time—that is, where the child sleeps, eats meals, and/or stores personal belongings.

The term “children” will be used as a general term to describe anyone less than 20 years of age. While recognizing that some in this age range are emancipated from their parents (some, in fact, are parents themselves), it is noted that the term “children” places greater emphasis on the relationship of those under 20 to their parents than on a child’s particular developmental stage. The age boundary between developmental stages varies across individuals, but the following traditional developmental stages are used in the report when discussing potential target audiences: infants (the first year of life), toddlers (1- and 2-year-olds), preschoolers (3-, 4- and 5-year-olds), school-age children (6- through 9-year-olds), pre-adolescents (10-, 11-, and 12-year-olds), and adolescents (13- through 19-year-olds).

The terms “physical activity” and “exercise” are the terms most often used to describe the general behaviors that increase energy expenditure much in the way diet, eating, and food intake are the general terms used to describe energy intake. A major problem with the terms “physical activity” and “exercise,” however, is that they are not well suited for younger children. What toddlers, preschoolers, and even school-age children do is “play,” not exercise. Play is the spontaneous activity in which children engage to amuse and occupy themselves. Direct observations reveal that as preschool children play, they have short and intermittent, rather than continuous, bouts of activity with frequent rest periods.<sup>5</sup> Compared to adults, children have more spontaneous activity, a shorter attention span, less interest in sustaining a single activity, more interest in trying new activities, and the need for more frequent rest periods.<sup>6</sup>

### III. FRAMEWORK FOR EVIDENCE EVALUATION

Obesity is one of many chronic health conditions with a multifactorial etiology that involves the interaction between inherited genes and numerous complex behaviors that are, in turn, each shaped by numerous environmental determinants.<sup>7,8</sup> Accordingly, it may be impossible ever to determine through experimental studies which “single” behaviors cause obesity or what interventions targeted at which behaviors might prevent or treat obesity. Indeed, few such experiments have been conducted in children, and the external validity of their findings is unclear.<sup>9,10</sup> Thus, in trying to determine what behaviors “work” to prevent or treat obesity, an approach using a traditional evidence-based review that places experimental studies atop a hierarchy of study designs is likely to be uninformative.

Therefore, selecting the targeted behaviors (and their related messages) that are the “best” ones for clinicians to communicate to families (either directly or through a video that they distribute) requires adopting another framework for reviewing evidence. The framework developed for this report involves asking three questions in relation to each target behavior being considered:<sup>11</sup>

1. Could the intervention or behavior(s) resulting from the intervention, if adopted, help prevent or treat obesity?
2. Could the intervention or behavior(s) resulting from the intervention, if adopted, improve other aspects of child health and well-being, aside from any impacts on obesity?
3. Could the intervention, behaviors resulting from the intervention, or efforts made to alter behaviors cause any harm?

Because of time constraints on the development of this report for the January 20, 2004 meeting sponsored by AHRQ, an exhaustive search for published and unpublished evidence could not be performed. Within this limitation, the report attempts to explicate what is known or not known about potential benefits and harms and to stimulate dialogue among those assembled by AHRQ for the meeting on January 20, 2004. Across the target behaviors considered, the amount and quality of “evidence” varied greatly, and the study designs were largely observational ones. In selecting studies for citation, the most important aspects considered were the sampling frame, sample size, and prospective versus cross-sectional design.

## IV. TARGET BEHAVIORS

Seventeen target behaviors have been selected for review. These behaviors were selected because they met the following criteria: (1) the behavior has been previously proposed as an obesity prevention or treatment strategy, (2) there is some evidence that the behavior may be related to the development of obesity, (3) the household is a setting in which the behavior can be influenced, and (4) the behavior is sufficiently specific that it can be applied in the household setting. These behaviors were divided into four domains—physical activity/inactivity, eating context, foods consumed, and parent feeding.

In the evidence review for each behavior, three criteria in the framework will be discussed: (1) could prevent or treat obesity; (2) could improve other aspects of child health and well-being; and (3) could do harm. With regard to the first question, the report will also include a discussion, where applicable, of the theoretical basis for how the behavior might be associated with altering energy balance. In addition to addressing possible harms, the report will discuss some potential challenges in message development associated with the target behavior.

### PHYSICAL ACTIVITY/INACTIVITY

#### 1. Reducing “screen time” (time spent watching television or videotapes, using the computer, or playing video games)

*Could prevent or treat obesity.* There are at least three mechanisms by which television (TV) could cause obesity. Compared to being engaged in another activity, children watching TV tend to expend less energy, are more likely to be eating at the same time, and are more likely to be encouraged to eat because of the food advertisements placed on TV.<sup>12</sup> There are theoretical reasons that different forms of “screen time,” such as working on the computer or playing video games with different modalities (TV, desktop computer or hand-held devices) may be less obesity-promoting than TV, or have a different profile of non-obesity risks and benefits. However, no research to date has clearly established that one form of “screen time” is more or less associated with BMI than another. Thus, all forms of “screen time” are considered together; inferences about “screen time” are made largely from studies that examined TV viewing time.

Of the 17 behaviors examined in this report, TV viewing is the only behavior for which there is experimental evidence that altering the behavior has impacts on weight gain.<sup>13, 14</sup> These experiments suggest that the association between TV viewing time and obesity that has been demonstrated in several national studies is a causal one.<sup>15-18</sup> While the size of the association between TV viewing and BMI is small, the behavior is, nevertheless, an important target, because children’s exposure to television is so significant. When all television viewing time is added together, the average child in the United States spends more than three years of his life, between the ages of 2 and 17, watching television.<sup>12</sup> It is now estimated that 57 percent of U.S. children ages 8 to 16 years, and 36 percent of children under age 6 years have TVs in their bedrooms.<sup>19,20</sup> One study has shown that low-income, preschool children who have a TV in their bedroom are more likely to be overweight, independent of the hours of reported TV viewing.<sup>21</sup>



Children have substantial exposure to TV early in life,<sup>20,22</sup> and recent evidence shows that even infant behavior is affected by TV viewing.<sup>23</sup>

***Could improve other aspects of child health and well-being.*** The impact of TV on children's behavior and cognitive development is substantial.<sup>24</sup> Despite evidence that some children's educational programming can be beneficial,<sup>25</sup> the TV programs to which young children are exposed are sometimes violent and developmentally inappropriate. There is experimental evidence suggesting that reducing television viewing decreases aggressive behavior in school-age children.<sup>26</sup> If parents are less able to monitor the content of the programs children watch in their bedrooms, and if unmonitored children watch programs that have inappropriate content (violence, sexuality, and/or obscenity in programming or advertising), removing TV's from children's bedrooms might help minimize the adverse impacts of television that are unrelated to obesity.

***Could do harm.*** Some children's programming has clear educational value<sup>25</sup> and may be especially important to those children who lack cognitive stimulation from other sources in the home. Removing the TV from children's bedrooms seems like a sensible measure to reduce "screen time." It is possible, however, that some younger children may then be exposed to more adult programming on other household TV's in common areas of the house (e.g., kitchen or family room) if they are not allowed to watch children's programming on a TV in their own bedroom.

One challenge in promoting a behavioral message to reduce "screen time" is that reducing this sedentary behavior does not necessarily mean that children will then be more active. Epidemiologic studies show weak to absent correlations between TV viewing time and physical activity;<sup>27</sup> this may be especially true in younger children.<sup>28,29</sup> Thus, any messages about reducing screen time must be accompanied by constructive suggestions about alternative, less sedentary behaviors.

## **2. Increasing time spent in gross motor play, indoors and outdoors**

***Could prevent or treat obesity.*** Although the term "play" often is reserved for young children, it conveys a message about gross motor movement that is fun. Such a message to increase play is applicable across the life cycle and in different environments, both indoors and outdoors. Play can include activities ranging from games like musical chairs to dancing to walking with a friend or a parent. "Increasing time spent in gross motor play" is, perhaps, the only specific, yet widely applicable, piece of advice that can be given to increase physical activity.

Evidence suggests that gross motor play, while not restricted to the outdoors, is much more likely to occur there. Time spent outdoors is by far the strongest behavioral correlate of physical activity in young children.<sup>30-32</sup> In preschool children, parent report of the time children spend playing outdoors has been correlated with direct measurement of physical activity by accelerometers.<sup>33</sup> In addition, preschool children who watched two or more hours of TV a day spent an average of 30 minutes less time each playing outside, compared to children who watched less than two hours a day.<sup>20</sup>

One potential advantage to a message about children's play, especially for parents, is that it may be more consistent with the aspirations parents have for their children's health (the child being able to play, interested in play, and enjoying play) than is a focus on children's weight.<sup>34</sup>

***Could improve other aspects of child health and well-being.*** Gross motor play has the potential to promote children's social, emotional, and cognitive development by allowing children to participate in unstructured activity with each other, to integrate motor movement into learning, and to explore their physical environments.<sup>35-38</sup> Based on animal experiments,<sup>39</sup> it appears that exposure to varied physical environments and the motor activity those environments stimulate may have direct effects on brain neurogenesis. Inadequate amounts of gross motor play may cause deterioration in children's classroom performance.<sup>40</sup> A recent survey of 800 parents revealed that 86 percent felt that physically active children are better able to learn and that they are better behaved in the classroom.<sup>41</sup>

By joining their children in gross motor play, parents may be able to increase their own physical activity and receive, for themselves, some improvement in weight maintenance.<sup>42</sup> Mood may be affected in both parents<sup>43,44</sup> and children,<sup>45,46</sup> not only by physical activity itself, but also by exposure to sunlight if the play occurs outdoors.<sup>47</sup>

***Could do harm.*** A potential harm from increasing gross motor play, especially outdoors, is increased rates of injury. Despite frequent reports that parental concerns about neighborhood safety act as a major barrier to children's physical activity, there are few data evaluating the association between neighborhood safety and physical activity in children. One study of 800 fourth-grade students of diverse ethnic and economic backgrounds living in northern California showed that children who reported perceiving more neighborhood hazards actually reported more physical activity.<sup>48</sup> Another study of low-income preschool children showed no relationship between childhood obesity and neighborhood crime level.<sup>49</sup> Among adolescents, however, those living in high-crime neighborhoods were less likely to be in the group with the highest level of moderate to vigorous physical activity.<sup>50</sup>

If children are able to engage in free play outdoors with parent supervision, it may lessen parental concerns about children's safety outdoors.<sup>51</sup> In addition, being outside the home and in public spaces can promote social interaction and interaction between parent and child. Such social contacts may improve the well-being of both parent and child.

### **3. Walking or biking to school**

***Could prevent or treat obesity.*** Walking or biking to school every day is one way to increase the amount of physical activity in children. Although the amount of energy expended by a child walking or biking to school each day may be small, it is the small but sustained imbalances of energy intake and expenditure that are felt to lead to obesity at all ages.<sup>2</sup> In the last three or four years, many communities have developed "walk to school" programs,<sup>52</sup> and this behavior has been strongly promoted by the CDC.<sup>53</sup> However, there have been no published evaluations of these programs that estimate their impact on children's energy expenditure or body weight.

***Could improve other aspects of child health and well-being.*** One of the primary barriers to children walking or biking to school is a perception that the activity is unsafe. Anecdotal evidence suggests that when “walk or bike to school” programs develop at a community level, significant attention is brought to the questions of safety.<sup>54</sup> Thus, whether a child can walk or bike to school can become a functional test of whether families perceive that their communities are safe places for children to be outdoors. A “Walk to School Program” could benefit children by catalyzing community activities to improve neighborhood safety and the sense of social cohesion that can arise in a community through coalition building on behalf of children’s health and well-being.<sup>55,56</sup>

***Could do harm.*** As with other gross motor activities done outdoors, walking or biking to school could increase the rate of injury, particularly those related to motor vehicles. A potential problem with this behavioral message is that the behavior might be difficult for parents to encourage in their children, without a community-wide effort to deal with safety concerns, particularly those related to traffic.<sup>57</sup> Furthermore, many of the same time constraints that apply to implementing the “family meal” (see behavior #6) might also prevent parents from being able to supervise their younger children in walking or biking to school. Furthermore, it is estimated that only a small percentage of U.S. children now reside within walking distance from school, despite an ongoing movement to place new schools closer to where the students live.<sup>58</sup>

## **EATING CONTEXT**

### **4. Limiting portion sizes**

***Could prevent or treat obesity.*** “Portion size” refers to the amount of a particular food one consumes in a single episode of eating. Portion sizes have been increasing<sup>59-63</sup> concurrent with the childhood obesity epidemic. Children,<sup>64,65</sup> like their parents,<sup>66</sup> tend to eat more food when presented with larger portions. This evidence, taken together, suggests that growing portion sizes may be an important contributor to the obesity epidemic. Therefore, one approach to controlling the childhood obesity epidemic is to help children reduce the amount of food they eat by reducing portion sizes.

***Could improve other aspects of child health and well-being.*** There are no other apparent benefits.

***Could do harm.*** There are no apparent harms unless parents were to over-respond to this message and begin feeding their children too little food, placing their children in negative energy balance. The biggest challenge in constructing a message about portion sizes is that children’s energy requirements change by age and so, accordingly, do recommendations about what constitutes an appropriate portion size.

### **5. Reducing the number of meals consumed away from home, especially at “fast food” restaurants**

***Could prevent or treat obesity.*** An increasing proportion of meals eaten by children are eaten away from home. These meals, aside from those consumed in U.S. Department of

Agriculture (USDA) school lunches, have poorer nutrient quality than those eaten at home.<sup>67-69</sup> There are now several studies showing an association between “fast-food” consumption in children and a number of aspects of diet quality that would lead to positive energy balance and obesity.<sup>70-74</sup> Two of these are recent studies that utilize national data from the USDA’s Continuing Survey of Food Intake by Individuals (CSFII), and the two studies arrive at similar conclusions. About one-third of U.S. children eat at a fast food restaurant on a typical day. After controlling for socio-demographic factors, children who eat fast food, compared with those who do not, consume more energy (about 187 calories more per day), more fat, more carbohydrate, more added sugar, more sugar-sweetened beverages, less fiber, less milk, and fewer fruits and vegetables. Even when the same children are compared on days with and without a fast food meal, these findings are similar. One factor that may produce these findings is the portion sizes served as part of “value-marketing” at fast food restaurants.<sup>75</sup>

Most studies linking fast food to obesity in children are cross-sectional studies that link the consumption of fast food to diet quality. However, a recent prospective cohort study in 101 white girls associated the consumption of fast food twice per week with greater increases in relative BMI over time.<sup>76</sup> The association of fast-food consumption and BMI in adults has been shown in cross-sectional<sup>77,78</sup> and prospective studies.<sup>79</sup>

***Could improve other aspects of child health and well-being.*** Meals eaten at home expose children to food preparation skills and may be more likely to be consumed with other family members (see behavior #6).

***Could do harm.*** It is possible that a segment of the population may be less well nourished if they failed to eat fast food because the alternative “at home” food sources would be of even lower nutritional value. Children enjoy “fast food” and, for some parents, dining at a fast food restaurant may be one affordable way for parents to provide a “treat” for their children. It may also provide some families an atmosphere in which to share a family meal that is safer, more predictable, and more comfortable than their own homes. If a meal prepared at home is of equal or lower nutritional value than the fast food meal, and if the meal at home is consumed by the child sitting alone in front of the TV rather than at a table with his or her family, it cannot necessarily be assumed that fast food is the lesser choice.

Despite an increasing literature about the role of fast food in the American diet, there is no well-accepted definition of fast food.<sup>49</sup> Not only does this make research in the area difficult to interpret, but it also makes creating messages about fast food difficult.

## **6. Increasing the number of meals eaten with family members, especially parents**

***Could prevent or treat obesity.*** A cross-sectional study of more than 4,700 middle and high school students showed that the frequency of family meals, adjusted for socio-demographic factors, was positively associated with intake of fruits and vegetables, grains, and calcium-rich foods and negatively associated with soft drinks. No associations between frequency of family meals and BMI was examined. In addition, a cross-sectional study of more than 16,000 children 9 to 14 years of age showed that eating a family dinner was associated with a more healthful dietary intake pattern, including the consumption of more fruits and vegetables, less fried food

and soda, less saturated and trans fat, a lower glycemic load, and more fiber and micronutrients.<sup>80</sup> In a longitudinal analysis of this same study cohort, however, eating a family dinner at baseline was not associated with differences in subsequent BMI.<sup>81</sup> It is noteworthy that in both studies, despite the relationship between family meals and diet quality, children who consumed family meals also consumed more calories.

***Could improve other aspects of child health and well-being.*** Family meals allow for communication between family members, especially between child and parent. One report has shown that the more often children have dinner with their parents, the less likely they are to smoke, drink, or use illegal drugs.<sup>82</sup> Although these data are based on a national phone survey, it is not clear that the associations were adjusted for socio-demographic factors that may explain part of this observed relationship. However, another report that analyzed data from the National Longitudinal Study of Adolescent Health, and which does adjust for these potential confounding factors, found an association between family meals and teen smoking, alcohol use, marijuana use, and sexual activity.<sup>83</sup>

***Could do harm.*** It cannot be assumed that most or all mealtime interactions with family members have beneficial impacts on children's social, emotional, or cognitive development. For example, communication from family members can sometimes be emotionally abusive, and such abuse can have long-term health impacts.<sup>84</sup> One particularly sensitive topic that may occur during mealtime is eating and body image. It appears that daughters may be particularly susceptible to the influences of their mothers' communication about their own weight concerns and dieting.<sup>85,86</sup> In addition, parental depression is common, especially among the mothers of young children,<sup>87</sup> and children may be adversely affected by the difficulties they face in trying to communicate with emotionally disengaged parents who are suffering from depression.<sup>88</sup>

Any messages about family meals must be directed primarily to parents. Many parents, even those who strongly aspire to having family meals, may find it unrealistic to achieve because of their work schedules. By choice or necessity, however defined at an individual-level, both parents in two-parent households often work outside the home. The challenge of a family meal is even greater in households headed by one parent, often a single mother earning a low income. Thus, communicating a message about family meals carries the risk of alienating parents who may view the recommendation, however well intentioned, as "out of touch" with their life circumstances.

## **7. Not skipping breakfast**

***Could prevent or treat obesity.*** Enthusiasm for this recommendation has arisen out of multiple cross-sectional studies showing an association between skipping breakfast and higher body weight in children.<sup>89-92</sup> Of nearly 3,000 adults who had maintained substantial weight loss for a year, 78 percent reported eating breakfast regularly. In contrast, a randomized trial in obese women showed that more weight was lost among those who skipped breakfast.<sup>93</sup> In addition, a longitudinal study of more than 14,000 children 9 to 14 years of age showed that overweight children who never eat breakfast had significantly greater declines in BMI over the following year than those who ate breakfast. Among children of normal weight, there was no significant difference in BMI change between breakfast eaters and breakfast skippers.<sup>94</sup> As in other studies,

breakfast skippers were heavier than breakfast eaters at baseline. In summary, in a randomized trial of adults and in a prospective study of children, breakfast skipping, not breakfast eating, appears to be associated with weight loss in those who are overweight. However, in cross-sectional studies, breakfast skipping is associated with higher body weight.

***Could improve other aspects of child health and well-being.*** Several studies have shown positive benefits to children of eating breakfast, including affects on psychosocial functioning, school absenteeism, school tardiness, and academic performance.<sup>95-98</sup>

***Could do harm.*** There is no apparent harm in eating breakfast unless doing so does, in fact, increase caloric intake and promote weight gain for those already obese.

## **8. Reducing snacking between meals**

***Could prevent or treat obesity.*** Children consume an increasing proportion of their energy from snacks.<sup>99,100</sup> What is far less clear, however, is whether this pattern of eating itself promotes obesity. Over time, the number of calories per snack has not changed; and neither the nutrient density nor the energy density appear substantially different between snack food and meal food.<sup>99</sup> However, to the extent that between-meal snacks increase total energy intake so that it exceeds total energy expenditure, these snacks can promote obesity even if the caloric imbalance that results from eating them is small but sustained.

***Could improve other aspects of child health and well-being.*** There are no other apparent benefits.

***Could do harm.*** There is some potential harm in developing a message about snacks because of the considerable ambiguity of what role snacks should play in a healthy diet. For example, it is not clear whether the message should be to reduce snacking, make snacks “healthier,” or do both (see behavior # 10). The nature of this message is further complicated by age-related differences in physiology and metabolism. Young children, for example, have smaller stomachs than adults and much larger daily energy requirements per kilogram of body weight. Thus, it may not be biologically optimal for young children to consume all of their daily calories in three meals and to fast between meals. For this reason, feeding young children between-meal snacks is regarded as part of a healthy eating pattern. Nonetheless, if young children are inactive, snacks may still promote obesity. In contrast, between-meal snacks may not be necessary for achieving energy balance in many adolescents, especially if their activity levels are low.

## **FOOD CONSUMED**

### **9. Limiting consumption of sugar-sweetened beverages**

***Could prevent or treat obesity.*** There is a single study that directly links consumption of sugar-sweetened beverages to the development of obesity in children. This two-year, prospective, observational study showed that the risk of childhood obesity increased 60 percent with each additional daily serving (12 ounces) of a sugar-sweetened soft drink over the amount

consumed at baseline.<sup>101,102</sup> Aside from this study, the data that link consumption of sugar-sweetened beverages to childhood obesity is indirect. Soft drink consumption has increased markedly in the past 20 to 30 years, and it has done so concurrently with the childhood obesity epidemic.<sup>102,103</sup> Beyond being low in nutrient density, these beverages contribute significantly to children's energy intake, with the average U.S. teenager obtaining about 8 percent of his or her daily calories from soft drinks.<sup>104</sup> Sugar-sweetened beverages are also the single largest source of added sugars in the diets of U.S. children,<sup>95</sup> with sugar-free soft drinks constituting only a small proportion of the soft drinks consumed by children.<sup>105</sup>

Two recent lines of scientific evidence suggest that foods that are very concentrated in sugars, such as soft drinks, cause obesity because of the way they are metabolized and affect the brain. One line of evidence posits that highly sugared foods have a high glycemic index. That is to say, they cause relatively large increases in blood sugar that engender hormonal responses that lead to greater hunger signals in the brain during the postprandial period.<sup>106</sup> The second line of scientific evidence suggests that sugar may be addictive. In rats, it has now been shown that sugar acts on the brain to release dopamine the same way that opiates do, and that rats develop tolerance and withdrawal symptoms related to sugar intake.<sup>107,108</sup> The World Health Organization recently recommended that adults and children limit the consumption of sugar-sweetened soft drinks in order to prevent obesity.<sup>109,110</sup> While the U.S. Dietary Guidelines Advisory Committee has addressed the issue of added sugars in the U.S. diet, it has not specifically made recommendations about sugar-sweetened beverages.<sup>111</sup>

***Could improve other aspects of child health and well-being.*** There is some evidence suggesting that sugar-sweetened soft drinks may also promote tooth decay.<sup>112,113</sup> There is also evidence that these drinks lead to suboptimal bone mineralization in children.<sup>114,115</sup> The mechanism by which this occurs is somewhat controversial. Nevertheless, the consensus, at present, is that the mechanism is related to the displacement of milk from the diet—not from the sugar, caffeine, or phosphorus content of sugar-sweetened beverages.<sup>116</sup>

***Could do harm.*** There are no apparent harms to reducing children's consumption of sweetened beverages. In terms of message development, there may be some confusion for parents about the difference between 100 percent fruit juices and fruit drinks.<sup>117</sup> In addition, it also appears that the message to decrease consumption of sugar-sweetened beverages may need to be paired with a message about increasing the consumption of other more nutrient-dense beverages such as 100 percent fruit juice or low-fat milk.

## **10. Limiting the consumption of “unhealthy foods” (foods high in fat, high in sugar, and/or low-nutrient density)**

***Could prevent or treat obesity.*** The primary challenge in evaluating the evidence related to this behavior, as well as to developing messages to alter this behavior, is that it is difficult to determine what foods are classified as “unhealthy.” Generally, “unhealthy” foods are those foods that are high in fat, high in sugar, and/or of low-nutrient density. Foods low in nutrient density are those containing low levels of vitamins and minerals in relation to their caloric content (hence the colloquial term “empty calories” and “junk food”). While candy, various “chips,” and sugar-sweetened sodas (see behavior #9) fall into this category, there are many

foods that have a much more ambiguous classification. Red meats and dairy products, which can be high in saturated animal fat (and calories), are also nutrient-rich and are, respectively, the primary sources of iron and calcium in children's diets. Even more difficult to classify are foods such as "pizza" and "chicken nuggets," which are well loved by children but which vary widely in their fat content and nutrient density, depending on how they are prepared. This problem is exemplified by the vigorous scientific debate about whether dietary fat, in particular, is associated with obesity<sup>118,119</sup> and what foods would constitute an ideal weight-loss diet (for example, low in fat versus low in carbohydrates).<sup>120</sup>

Evidence abounds that the diets of U.S. children do not meet dietary recommendations.<sup>121</sup> It is far more difficult, however, to pinpoint a relationship between a particular food (aside, perhaps, from sugar-sweetened beverages) and body weight in children. Thus, while low-nutrient density foods contribute more than 30 percent of daily energy to the diets of U.S. children (with sweeteners and desserts jointly accounting for nearly 25 percent), there is no cross-sectional association between the intake of low-nutrient density foods and BMI.<sup>122</sup> In addition, other cross-sectional studies have found no evidence that obese children eat more low-nutrient density foods.<sup>123</sup>

***Could improve other aspects of child health and well-being.*** There are no apparent non-obesity benefits.

***Could do harm.*** No apparent harms can be easily identified. The dilemma in delivering any message about limiting "unhealthy foods" arises from the as yet unsettled debate in the public health nutrition field over whether one can create a dichotomy between "good foods" and "bad foods" or between "healthy foods" and "unhealthy foods." The American Dietetic Association, for example, generally avoids the use of this dichotomy in its public education messages.<sup>124</sup>

## **11. Increasing the consumption of reduced-fat dairy products**

***Could prevent or treat obesity.*** Dairy products, fluid milk in particular, are still the predominant source of calcium in children's diets,<sup>125</sup> even though the consumption of milk by children has declined in recent decades.<sup>103</sup> Skim milk has the same nutrient content as whole milk, but contains less energy due to the elimination of saturated fat. The saturated animal fat contained in whole milk is associated with a serum lipid profile that is atherogenic. Therefore, it appears sensible to recommend that all dairy products consumed by children be reduced in fat as one method of reducing children's energy intake.

The evidence mounts that dietary calcium may play an important role in regulating body fat<sup>126</sup>—in particular, evidence from epidemiologic studies in adults (both cross-sectional and prospective) of an inverse relationship between dietary calcium intake and adiposity.<sup>127-129</sup> Two smaller studies also suggest such an association in children.<sup>130,131</sup> However, a recent prospective study in young girls found no relationship between dairy intake and change in body mass index.<sup>132</sup> The mechanisms for the effect of calcium on adiposity are unclear, but these mechanisms may be related to the binding of fatty acids in the gut by calcium. Animal models



also suggest that there may be a role for calcium in the regulation of adipocyte lipolysis and lipogenesis.<sup>133,134</sup>

***Could improve other aspects of child health and well-being.*** Because dairy products are the primary source of dietary calcium and because calcium consumption is associated with optimal bone mineralization, childhood dairy intake may protect against fractures in adult life.<sup>135</sup> Dietary calcium may also be associated with reduced blood pressure.<sup>136,137</sup>

***Could do harm.*** There is some controversy about the age at which it is appropriate to recommend that children consume low-fat milk. In particular, there have been theoretical concerns about inadequate dietary fat intake in children under two years of age who are still experiencing rapid brain growth. Concerns about the safety of low-fat diets in children were based largely on case reports of parents who significantly restricted energy intake in their children because of fear of the children becoming obese.<sup>138-140</sup> However, a large randomized trial in Scandinavia of low-fat diets for children, beginning in infancy, has shown no adverse effects of this diet on children's growth, cognition, or body image through five to seven years of age.<sup>141-145</sup>

## **12. Increasing the consumption of fruit and vegetables**

***Could prevent or treat obesity.*** Fruits and vegetables are high in nutrient density and generally low in energy density. Their low-energy density is related, in part, to their high content of water and fiber and their low content of fat. Because of these nutrient characteristics, it is not surprising that the consumption of fruit and vegetables has been suggested as a mechanism for protecting against the development of obesity. Thus, nearly every dietary intervention to treat obesity or prevent weight gain involves encouraging individuals to increase their consumption of fruits and vegetables in hopes of reducing their overall energy intake and minimizing feelings of hunger. However, eating more of one food often means eating less of something else, so it is difficult to study the impact of fruit and vegetables in isolation.

Epstein and colleagues have demonstrated in one small randomized trial of weight loss in obese children that increasing fruit and vegetables consumption, as a specific dietary strategy, was associated with greater weight loss than was a strategy focused on reducing high fat and high sugar foods.<sup>146</sup> The majority of other intervention studies in children to increase fruit and vegetable consumption have examined fruit and vegetable consumption itself, rather than body weight, as the outcome; or they have concurrently targeted other behaviors such as TV viewing that also affect energy balance.<sup>13,147</sup> Interventions designed to change knowledge or attitudes about fruit and vegetable consumption have had marginal impact.<sup>148,149</sup> However, a recent study that employed a multimedia computer game for fourth graders showed modest short-term increases in reported fruit and vegetable intake in a randomized trial.<sup>150</sup> There is evidence that it is the availability of fresh fruit and vegetables that moderates the relationship between knowledge and consumption.<sup>151</sup>

***Could improve other aspects of child health and well-being.*** Aside from the ability to promote energy balance, consuming fruits and vegetables has been associated in large epidemiologic studies with a number of positive health outcomes including reducing the risk of coronary artery disease<sup>152,153</sup> and, to a lesser extent, several forms of cancer.<sup>154</sup>

***Could do harm.*** While encouraging children to eat more fruits and vegetables is unlikely to be harmful, it is not clear how best to deliver a message which promotes that behavior or to determine whom the message should be directed toward. Long before the obesity epidemic, consuming fruits and vegetables was considered sound nutritional advice. Despite much public confusion about what constitutes a healthy diet, it has never been questioned that such a diet should involve eating ample amounts of fruits and vegetables. This has been a core message of nutrition education for decades. Yet, despite this consistent message, fruit and vegetable consumption in children remains low.<sup>155</sup> As previously discussed, providing children with information about the health benefits of fruits and vegetables is itself insufficient to change behavior. In fact, focus-group studies with middle-school children suggest that the message to increase fruit and vegetable consumption actually “turns off” children.<sup>156</sup>

Although the most promising interventions to increase the consumption of fruits and vegetables involve increasing household availability, a potential problem with directing such a message to parents is that some parents may be unable to obtain fruits and vegetables in their neighborhoods<sup>157</sup> or be unable to afford them.<sup>158</sup> As with many behavioral messages targeted at obesity prevention, there is always a risk of alienating a target audience with a message about behavioral change that is regarded as impossible to implement based on economic or environmental constraints.

### **13. Increasing the consumption of water**

***Could prevent or treat obesity.*** Water could potentially help prevent obesity to the extent that water was consumed as an alternative to beverages of high caloric density and low nutrient density, such as sugar-sweetened soft drinks. Another approach to reducing caloric intake, which has been tested experimentally in adults, is to lower the nutrient density of food (calories per gram of prepared food) while preserving the same level of satiety. This strategy is successful in adults if the nutrient density of food is lowered by adding water to the food.<sup>159,160</sup> However, consuming water with the food, but not incorporating it in the food, does not appear to affect energy intake.<sup>160</sup> Thus, based on experiments with adults, it does not appear that children’s appetites and energy intake at meals or snacks could be reduced by encouraging the consumption of water when eating. However, this strategy has not been tested experimentally in children, who may respond differently than adults due to age-related differences in the physiology of gastric emptying and satiety signaling.

***Could improve other aspects of child health and well-being.*** There are no other non-obesity benefits except those possibly related to bone and dental health if water is used to replace sugar-sweetened beverages (see behavior #9).

***Could do harm.*** Water intoxication from consuming excess water is very unlikely in older children with normally functioning brains and kidneys that can respond to reduced levels of serum osmolality, which may occur after drinking too much water. In children under six months of age, feeding water is not recommended because it may result in inadequate caloric intake for normal growth and/or water intoxication.

## PARENT FEEDING

### 14. Breastfeeding

***Could prevent or treat obesity.*** There are now nine published studies that have 2,000 or more subjects that examine the relationship between breastfeeding and later obesity. Some show no evidence that being breastfed protects against later obesity,<sup>161-165</sup> while others do show a protective effect.<sup>166-169</sup> Multiple differences between these studies in their design could explain the different findings.<sup>170, 171</sup> Because breastfeeding is not an exposure that can easily be tested experimentally, evidence of its ability to prevent obesity arises from observational studies. In such studies, it often remains unclear whether there is some other factor associated with breastfeeding, and not breastfeeding itself, that protects against obesity.

Multiple hypotheses have been suggested to explain how breastfeeding may protect against later obesity.<sup>166,172,173</sup> One hypothesis is that, in comparison to bottle feeding with formula, breastfeeding allows the infant to respond to its own hunger and satiety cues and exert more control over breastfeeding initiation and termination.<sup>173</sup> Allowing this self-regulation of food intake throughout a critical period in brain development may be important for establishing long-term patterns of healthy appetite regulation that would protect against the development of obesity.

***Could improve other aspects of child health and well-being.*** Despite the mixed evidence about whether breastfeeding protects against the development of later obesity, breastfeeding can be recommended on the basis of its multiple other benefits to mother and child.<sup>174</sup>

***Could do harm.*** A potential harm could arise from “overselling” breastfeeding on the basis of its ability to prevent obesity. Most bottle-fed infants will never become obese children. Many mothers choose not to breastfeed because, despite our efforts and theirs, there is too little support for breastfeeding in the home or the workplace.

### 15. Not feeding children in response to their emotional states

***Could prevent or treat obesity.*** Adults are known to eat in response to affective states such as boredom, sadness, anger, or anxiety, rather than in response to the physiologic sensation of hunger. Such a pattern of eating may lead to obesity if these emotions override the endogenous satiety and hunger cues in the brain that occur from the body’s metabolic signaling about its caloric requirements.<sup>175</sup> It has been theorized that such “emotional eating” behavior might also be entrained in children based on how parents should feed children or on how children observe their parents eating. Specifically, it has been suggested that parents feed children only in response to “true hunger,” rather than in response to their children’s emotional states. A single study has attempted to characterize both “emotional feeding” in parents (e.g., I give my child something to eat to make him feel better when he is upset) and an “emotional eating” style in their children (e.g., my child eats when he is upset).<sup>176</sup> Scores for parent “emotional feeding” and child “emotional eating” were significantly correlated. However, obese mothers were no more likely than non-obese parents to exhibit “emotional feeding,” and emotional feeding was not related to children’s body weight. There was also no greater tendency for children with obese parents to exhibit an “emotional eating” style. Another study that characterizes this

parental feeding construct as “using food to calm the child” (e.g., I give the child something or eat or drink if he is upset), found that scores for this construct were not higher for obese mothers or for obese children.<sup>177</sup>

***Could improve other aspects of child health and well-being.*** How the human brain confuses food- or energy-related hunger with “emotional hunger” is unclear, but eating results in stimulating brain regions that respond broadly to different “hedonic” pleasures, including those that can arise from social interaction and even physical activity.<sup>178</sup> To the extent that children’s emotional needs, such as the need to socialize, play, and be touched, can be addressed with activities other than feeding or eating snacks, child well-being will be promoted.

***Could do harm.*** In pre-verbal children, it may be difficult for parents to correctly “read” when their children are hungry. It is possible that some emotion (“fussiness” or “irritability”) could be misinterpreted as arising from another cause, when the true cause is hunger. In reality, however, parents often first try feeding as a method to soothe their pre-verbal child and will rarely fail to try feeding if other methods of soothing fail.

## **16. Not using food to reward children**

***Could prevent or treat obesity.*** The basis for this recommendation is that foods often used for rewards are high in sugar, fat, salt, or calories and/or are low in micronutrients. Simply stated, these are tasty foods that children enjoy eating but they are of low nutritional value. The social-affective context in which children are given foods can affect their liking for those foods.<sup>179</sup> One potential problem with using food as a reward, especially if the food is tasty but of low nutritional value, is that access to the food may, at other times, be restricted by parents for “health” reasons. Other research has shown that this restriction may actually increase the child’s liking for that food.<sup>180,181</sup> However, there is no evidence that using food as a reward is related to either children’s or parents’ weight. Even the evidence suggesting that a mother’s tendency to restrict her daughter’s access to snack food is associated with her daughter’s adiposity comes from a cross-sectional study.<sup>180</sup> It is highly possible that this “restricting” behavior is a response to the child’s weight, and not the cause of it.

It is likely that food has been used to reward children for as long as the food supply was sufficient to allow it—long before the obesity epidemic occurred. In the current environment where food is relatively more available and inexpensive than in past generations, the behavior of using food as a reward may have become more common; but there are no secular trend data to support this idea; nor is there much evidence that the behavior is linked to childhood obesity.

***Could improve other aspects of child health and well-being.*** There are no apparent non-obesity benefits.

***Could do harm.*** There are no apparent harms. However, if the message of “not using food to reward children” is pushed too hard, it may come across to parents as “taking the fun out of childhood.”

## **17. Determining what food is offered to children, but allowing children to determine how much of it to eat**

***Could prevent or treat obesity.*** This approach to child feeding has been widely recommended in the secular literature on feeding.<sup>182-184</sup> The approach is based on the theory that children are born with an innate, or “natural,” ability to maintain energy balance by responding to their own internal hunger and satiety cues. Stated differently, children “know” how much to eat to maintain a normal rate of growth without becoming either too thin or too fat.<sup>185</sup> The theory further states that attempts by parents to increase their children’s food consumption (pushing children to eat) or to limit it (restricting children’s eating) may alter children’s natural ability to regulate energy intake.<sup>186</sup>

This theory arose, in part, from the detailed feeding study of Davis in the 1920s, in which children maintained energy balance when given *ad libitum* access to a variety of foods over sustained periods with no control exercised by adults over the amount of food the child consumed.<sup>187</sup> In this study, however, the choices available to children were limited to healthy foods.<sup>188</sup> Thus the assumption that “what food is offered” is healthy food is essential to the theory that allowing children to regulate their food intake will prevent obesity. Nonetheless, the notion that children can successfully self-regulate was further stimulated by the study of Birch and colleagues that showed that children varied greatly in their within-day (between-meal) energy intake but had much lower variability in energy intake across days.<sup>189,190</sup>

Even more support for this theory was based on studies showing that a parent’s tendency to exert a high degree of control over the feeding interaction (both in terms of pushing children to eat or restricting children’s eating) was associated with children having less ability to regulate their appetite.<sup>180,181,191,192</sup> However, in these studies, it is important to note that there were weak to absent relationships between the parent feeding style and the child’s body weight. Other studies using the same or similar constructs have found no relationships to children’s body weight.<sup>176,177,193,194</sup> In summary, despite its popularity, there is little evidence that the application of this behavioral-feeding strategy would be protective against childhood obesity.

***Could improve other aspects of child health and well-being.*** There are no apparent non-obesity benefits.

***Could do harm.*** The major potential harm in the application of this behavior (and in delivering this message) is that parents will not successfully apply the message about “what food is offered.” Common sense would strongly suggest that children may be unable to maintain energy balance or consume a nutritionally balanced diet when given unrestricted access to “unhealthy” foods. It is well established that children are born with an innate preference for sweet and salty tastes,<sup>195-198</sup> and that preferences for other tastes, such as fat,<sup>199</sup> may easily evolve, depending on the foods presented to children. Qualitative research has also shown that parents may feed their children foods of lower nutritional value that children prefer if children reject the healthier foods that are offered first.<sup>34,200</sup> Young children may need to be offered certain unfamiliar but healthy foods, such as fruits or vegetables, up to 10 times before they “accept” these foods into their diet,<sup>201</sup> yet, parents of young children rarely allow their child to reject a food more than 3 to 5 times before abandoning efforts to offer it.<sup>202</sup> Thus, parents, concerned that their children are not eating enough or that their children will get “hungry,” may

tend to offer children unhealthy foods, but foods they like, while failing to control the amount their children consume. Thus, the application of only the second half of the behavioral prescription (“children should determine how much to eat”), without faithful application of the first half of the prescription (“parents should determine what foods are offered”), could promote rather than prevent obesity.

## V. TARGET AUDIENCES

The idea of considering different target audiences for the video is based on the assumption that messages tailored to more narrowly defined groups can be more effective in changing behavior in that group. Even across children the same age, there are significant socioeconomic and cultural differences that will need to be considered in message development. However, the most obvious way to define potential target audiences is by the developmental stage of the child. It is clear that toddlers and adolescents, for example, are not going to be affected by the same kind of message in a video, even if the target behavior, such as eating more fruits and vegetables, is the same at each age. The idea of selecting a single target audience among the many that are possible is based on the assumption of limited resources. However, resources may allow for more than one video (or video segment), with each video devoted to reaching a separate target audience.

The theoretical model for how the video will “work” to achieve its desired results is based on behavior change in the viewer in response to the messages delivered. This model raises many questions that might need to be addressed in thinking about any target audience(s):

- Whose behavior would need to change to achieve the desired outcome (the prevention and treatment of childhood obesity)? Is it the parent, the child, or both who need to change? Would it be possible for the child to change his or her behavior without the parent facilitating the behavior change?
- If both parents and children were targeted, would parents and children view the video at the same time? Is it the parents, the children, or both who would interact with the video?

The answers to these questions cannot be formed by an evidence-based assessment. As suggested earlier in this report, the use of video to change these target behaviors is a relatively novel idea. Therefore, there is little, if any, evidence to suggest how effective this medium (interactive video) will be in changing the specific behaviors that relate to energy balance or the extent to which the medium is better suited for certain ages or messages. Thus, this section suggests only several considerations that might be made in selecting a target audience.

### THE DISTRIBUTION CHANNEL

The primary planned distribution channel for the video is through pediatric primary care providers. Although there are other potential distribution channels for older children (schools and the Internet), it is primarily infants, toddlers, and preschoolers who make up the majority of visits to the primary care clinicians who will be distributing the video. This is a function of the schedule for routine health supervision visits and immunizations.<sup>203,204</sup> Adolescents, in particular, are among those least likely to have health care; they also have the lowest rates of primary care use among all children.<sup>205,206</sup>

## **THE TRACKING OF CHILDHOOD OBESITY**

Epidemiologic data on the natural history of childhood obesity would argue in favor of making younger children, especially those before school age, the target of any interventions to prevent obesity. The tracking of childhood obesity increases with the age of the child, so that at older ages, once obesity develops, it is even more likely to persist than at younger ages.<sup>207,208</sup> Thus, obese adolescents are far more likely to be obese as adults than are obese toddlers. However, before age 10, the probability that an obese child will be obese in adulthood more than doubles if a parent is also obese. Thus, for example, an obese preschooler with an obese parent has more than a 60 percent chance of being obese in young adulthood, compared to an approximately 25 percent chance if neither parent is obese.<sup>209</sup> Even at birth, the presence of obesity in the mother doubles the risk that the newborn will be obese by age four. Among low-income newborns, for example, 30 percent of mothers are obese at conception, and of those obese mothers, one-fourth of their children are already obese by age four.<sup>210</sup> Not surprisingly, the childhood obesity epidemic is occurring even among preschool children.<sup>211</sup> The tracking of obesity with increasing age and the risk of childhood obesity conditional on parental obesity both argue for interventions early in life to prevent obesity. This could be an important consideration in choosing a target audience.

## **THE ROLE OF PARENTS IN CHILDREN'S BEHAVIOR**

While there are multiple spheres of influence that shape children's diet and activity patterns, the earliest and most persisting sphere of influence for a child is the family. A child's parents are the ones who predominantly shape the family sphere of influence. Obesity aggregates within families because family members share the same genes and environments. However, it is the eating and activity environment created in the household that has the ability to either inhibit or induce the development of obesity in a child of any given genetic susceptibility.

Parents are key role models for their children. Like their children, parents are also twice as likely to be obese today as they were 30 years ago, even though genetic susceptibility has not changed over this time. This means that children of today are more likely to observe their parents model eating and activity behaviors that do not promote energy balance (for example, consuming larger portions and watching more television), and it is these behaviors that the video is trying to alter. The major challenge in dealing with these facts about the "nature" and "nurture" components of obesity is that parents are understandably alienated by messages that place blame and responsibility on them for their children becoming obese or for adopting behaviors that can lead to obesity.<sup>34,212</sup> Instead, parents desire constructive, achievable solutions that are communicated in a positive tone and that recognize the constraints of their larger environment and life circumstances.<sup>156,212</sup>

The potential influence of parents on children's obesity-related behaviors is supported by data from obesity treatment trials in children. The longest period of followup is in the studies conducted by Epstein and colleagues. At 10 years of followup, those children in study arms that included parental involvement had significantly better outcomes.<sup>213</sup> In trials with shorter periods of followup, however, the beneficial impact of including parents, though intuitive, has been harder to document.<sup>214-216</sup>



## **DELIVERING MESSAGES TO CHILDREN OF DIFFERENT AGES**

As children approach adolescence, peer influences become important relative to those of parents, and autonomy from parents is a natural developmental drive. Qualitative research has revealed some of the communication challenges faced in addressing preadolescents around healthful lifestyles to prevent obesity.<sup>156</sup> This work concludes that, despite children's emerging desire for autonomy, children also want and need parental support to be successful in behavior change. In addition these children have far greater enthusiasm for engaging in intervention materials that are "fun" and "varied," such as that which might be provided by an interactive video.

### **SUMMARY**

Important claims can be made for trying to target children at any developmental stage, even though each age presents different communication challenges. If a decision is required about targeting one age group of children, the decision may depend most heavily on the level of existing knowledge about how to shape messages for any given age group that can change these behaviors thought to be most strongly associated with obesity. Regardless of which age group is chosen as a target audience, however, the available evidence suggests, indirectly, that the video is more likely to be effective if it targets the children's parents as well. How a single video can be shaped to reach both the parents and the child is a creative challenge that ultimately may influence the decision about which age group to target. Aside from the issue of targeting both parents and children, any decision about selecting an age group of children to target may also be influenced by the fact that primary care clinicians (the distribution source) will reach more younger children than older children.

## VI. SUMMARY RECOMMENDATIONS

While developing the video will involve selecting both a target message and a target audience, it is most efficient to first select the target behavior (or behaviors), which the video’s message would be designed to change. There is little point in producing a behavior that is not likely to produce the desired outcomes.

The table below provides a summary of the 17 behaviors considered in Section IV of this report. The table ranks these behaviors in a semi-quantitative manner on the basis of potential benefits. A score from 0 to 3 is given to each type of benefit—obesity-related and non-obesity related. This score is based on a qualitative summary of the evidence, in which the scoring considers the number of studies showing benefit, the consistency of the findings across studies, and the strength of the study designs. A summary score of benefits was computed with a theoretical score range of 0 to 6, giving equal ranking to obesity and non-obesity benefits. The table ranks the behaviors, within each of the four behavioral domains, based on the summary score.

All harms considered were theoretical, and any scoring of harms could only be based on face validity (e.g., if children spend more time playing outdoors, then more injuries may occur). Therefore, harms were not included in this scoring scheme. Because of the qualitative nature of the scoring system, different readers may wish to apply different scores to each behavior, based on their own weighting of the evidence presented or based on additional evidence that was not presented. Some may also prefer to score potential harms or to weight the obesity and non-obesity benefits differently. As mentioned previously, any weighting of benefits honors the role that human values play in developing any such ranking. The point of this summary is merely to allow some method of selecting among these target behaviors and to facilitate dialogue. The “system” of scoring also allows for the flexibility of (1) incorporating new evidence that arises in the future, (2) reducing scores based on harms, or (3) adding new target behaviors. The highest-ranked behaviors (and scores) in each behavioral domain were:

physical activity/inactivity:	reducing “screen time” (6)
eating context:	limiting portion sizes and eating meals away from home (3)
foods consumed:	limiting sugar-sweetened beverages (5)
parent feeding:	breastfeeding (4)

Because these behaviors achieved the highest ranking in each category does not necessarily mean that they should be the ones chosen for developing target messages in the video. One other behavior had a score of 5 (increasing time spent in gross motor play, indoors or outdoors), and the four other behaviors in the domain of “Foods Consumed” all had a score of 3. Selecting the target behaviors for the video involves more than ranking the strength of the association between the behavior and possible benefits. There are at least two other important considerations that have also been discussed in this report: (1) the feasibility of using the video for creating a message to alter the behavior, and (2) the target audience. The report concludes with some judgments that integrate these added considerations.

TABLE 1

SUMMARY OF POTENTIAL BENEFITS FROM ADOPTING TARGETED BEHAVIORS  
TO PREVENT OR TREAT CHILDHOOD OBESITY

Behavioral Domain	Obesity Benefits	Non-Obesity Benefits	Total
<b>Physical Activity/Inactivity</b>			
1 Reducing “screen time” (time spent watching TV or videotapes, using the computer, or playing video games)	3	3	6
2 Increasing time spent in gross motor play, indoors or outdoors	2	3	5
3 Walking or biking to school	1	1	2
<b>Eating Context</b>			
4 Limiting portion sizes	3	0	3
5 Reducing the number of meals consumed away from home, especially at “fast food” restaurants	3	0	3
6 Increasing the number of meals eaten with family members, especially parents	1	1	2
7 Not skipping breakfast	1	1	2
8 Reducing snacking between meals	1	0	1
<b>Foods Consumed</b>			
9 Limiting the consumption of sugar-sweetened beverages	3	2	5
10 Limiting the consumption of “unhealthy foods” (foods high in fat, high in sugar, and/or low-nutrient density)	2	1	3
11 Increasing the consumption of reduced-fat dairy products	1	2	3
12 Increasing the consumption of fruit and vegetables	1	2	3
13 Increasing the consumption of water	1	2	3
<b>Parent Feeding</b>			
14 Breastfeeding	1	3	4
15 Not feeding children in response to their emotional states	1	1	2
16 Not using food to reward children	1	0	1
17 Determining what food is offered to children, but allowing children to determine how much of it to eat	1	0	1

## **PHYSICAL ACTIVITY/INACTIVITY**

Although “reducing screen time” received the highest of all scores, the video “screen” seems like an inappropriate medium for conveying message about “reducing screen time.” On the other hand, it seems feasible for the video to promote physical activity. This might include promoting interactive gross motor play between parents and their toddlers and preschoolers or promoting aerobic activity, such as dance, in older children. This type of “play” for older children could also be enjoyed with either peers or parents. Thus, rather than convey educational messages about the value of “being active,” the video could actually stimulate gross motor activity. If the activity is perceived as fun by children, and if it could be varied by using an interactive component in the video, the video might be used on repeated occasions. Any ideas presented in the video about interactive games, especially between parents and their young children, could potentially be carried outdoors. An additional benefit of this approach to developing the video is that both parents and their young children could be the target audiences for the same video. Although the concept of the “exercise” video is not a new one for adults, its application to children has only just begun. As previously discussed, reframing the activity as “play,” rather than as “exercise,” may be an important part of building a successful message. Surprisingly, there have been no evaluations of whether adult exercise videos produce beneficial effects on health outcomes. In summary, the video seems better suited for “increasing time spent in gross motor play” than it does for “reducing screen time.”

## **EATING CONTEXT**

Reducing portion sizes and the number of meals eaten away from home are related behaviors. One of the mechanisms by which meals eaten away from home, especially at fast food restaurants, may contribute to obesity is through the portion sizes offered in these meals. One possibility, then, is to create a video whose primary message is about limiting portion sizes. The video could, for example, demonstrate what portion sizes are normal for children of different ages. The “interactive” nature of the video could be used to allow one to choose the content appropriate either for children of different ages or for the parents. An interactive video could also allow one to choose between foods from different ethnic cuisines or foods available at different eating venues, such as fast food restaurants.

## **FOODS EATEN**

Although all five behaviors in this domain have a score of 3 or higher, there are significant challenges to creating messages about limiting or increasing consumption of specific foods. One problem is the aforementioned difficulty of characterizing food into “healthy” and “unhealthy” categories. Even designating some categories of foods as healthy (fruits, vegetables, and dairy) leaves open such ambiguities as the distinction between low-fat and high-fat dairy and that between whole fruits and fruit drinks or french fries. However, messages about sugar-sweetened beverages, especially sodas, are potentially less ambiguous than messages about other foods because these beverages do not come in “healthy” and “unhealthy” varieties. Furthermore, beverage portion size is relatively easy to the target because the drinks are “bottled” in containers that clearly convey information about fluid ounces.

In any case, communication in this area will necessarily be educational in nature. It will be designed to provide information about “what to eat” or why certain foods are “healthy.” It is not clear that the educational message about “what to eat” alone would be sufficient for any sustained behavior change that could alter energy balance, regardless of the medium of conveying the message or the age group targeted.

## **PARENT FEEDING**

Breastfeeding is the highest-ranked behavior in this domain. However, as a target behavior for the video, it seems an unsuitable candidate. First, although there may be effects of breastfeeding on body weight beyond infancy, the message would apply only to infant feeding and would be delivered primarily to parents rather than to children. Second, multiple, other public health campaigns continue to address the promotion of breastfeeding.

## **CONCLUDING RECOMMENDATION**

From this list of 17 behaviors, two emerge as the best candidates for inclusion in the video—increasing time spent in gross motor play and limiting portion sizes. This is because these behaviors appear to have (1) significant potential benefits, and (2) the greatest possibility for being altered through interactive video. As messages are being developed about limiting portion size, limiting portion sizes when eating away from home (and especially at fast food restaurants), and limiting the portion size of sugar-sweetened beverages appear to be other candidate behaviors worthy of focus. When considering target audiences, both “play” and “portion size” are attractive candidates because messages can be developed, if desired, for all age groups and for parents as well.

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Obesity threatens the health of today's children to such an extent that they may, for the first time in US history, have a shorter lifespan than their parents.<sup>1</sup> The considerable challenges of addressing and treating obesity throughout the life cycle have led to increasing interest in preventing obesity altogether. Recent summaries of evidence on the prevention of obesity<sup>2,3</sup> reviewed comprehensively the body of research in this field. Following those efforts, we have focused this report on what health care providers can do to prevent childhood obesity in their clinical practices and in the home. Given the current prevalence of childhood obesity among Hispanic populations, and the importance of parental feeding behaviors, we aimed to assess the impact of the evidence-based Healthy Children, Healthy Families (HCHF) intervention on responsive food parenting practices (FPPs) in a low-income Hispanic population. **Methods.** This community-based pilot study used a non-experimental pre/post within-subjects design. Parents (n = 94) of children aged 3–11 years old were recruited to participate in an 8-week, weekly group-based intervention. The intervention was delivered to nine groups of parents. Effectively preventing obesity in childhood onwards may also prevent the onset of adult obesity and reduce chronic disease. Preventing overweight and obesity requires understanding and addressing the obesogenic environment in which children live. Environmental factors take precedence in prevention efforts because they provide the most potential for the greatest impact.<sup>4</sup> In our review we include all interventions that seek to alter diet and physical activity-related behaviours that have a broad public health base. We include interventions that seek to reduce television viewing because prevention of sedentary behaviour can potentially reduce energy intake as well as increase physical activity. **2 | Research Synthesis** "Preventing Obesity Among Preschool Children" [October 2011](#). Details on Key Research Results. Research in child-care settings has identified opportunities to improve the nutritional quality of foods provided to children, mealtime behaviors of caregivers, and the provision of nutrition education.<sup>5</sup> In 2011, the National Resource Center for Health and Safety in Child Care and Early Education updated previous reviews of states' regulations for child-care settings and evaluated regulations based on a selected set of guidelines from the Caring for Our Children: National Health and Safety Performance Standards.<sup>47</sup> The selected guidelines relating to infant feeding, nutrition, physical activity, and screen time were.