



HHS Public Access

Author manuscript

Patient Educ Couns. Author manuscript; available in PMC 2016 November 01.

Published in final edited form as:

Patient Educ Couns. 2015 November ; 98(11): 1393–1401. doi:10.1016/j.pec.2015.06.007.

Engaging children in the development of obesity interventions: exploring outcomes that matter most among obesity positive outliers

Mona Sharifi, MD, MPH¹, Gareth Marshall, BA¹, Roberta E. Goldman, PhD^{2,3}, Courtney Cunningham, MPH¹, Richard Marshall, MD⁴, and Elsie M Taveras, MD, MPH.^{1,3}

¹Division of General Academic Pediatrics, Department of Pediatrics, Massachusetts General Hospital for Children, Boston, MA

²Warren Alpert Medical School, Brown University, Providence, RI

³Harvard School of Public Health, Boston, MA

⁴Harvard Vanguard Medical Associates, Boston, MA

Abstract

Objective—To explore outcomes and measures of success that matter most to 'positive outlier' children who improved their body mass index (BMI) despite living in obesogenic neighborhoods.

Methods—We collected residential address and longitudinal height/weight data from electronic health records of 22,657 children ages 6–12 years in Massachusetts. We defined obesity “hotspots” as zip codes where >15% of children had a BMI 95th percentile. Using linear mixed effects models, we generated a BMI z-score slope for each child with a history of obesity. We recruited 10–12 year-olds with negative slopes living in hotspots for focus groups. We analyzed group transcripts and discussed emerging themes in iterative meetings using an immersion/crystallization approach.

Results—We reached thematic saturation after 4 focus groups with 21 children. Children identified bullying and negative peer comparisons related to physical appearance, clothing size, and athletic ability as motivating them to achieve a healthier weight, and they measured success as improvement in these domains. Positive relationships with friends and family facilitated both behavior change initiation and maintenance.

Corresponding author at: Mona Sharifi, MD, MPH, Division of General Academic Pediatrics, Department of Pediatrics, Massachusetts General Hospital for Children, 100 Cambridge Street, 15th floor, Suite 1523, Boston, MA 02114. msharifi@mgh.harvard.edu. Phone: 617-724-4007. Fax: 617-726-1812.

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Financial Disclosures: The authors have no financial relationships relevant to this article to disclose.

Conflicts of Interest: The authors have no conflicts of interest to disclose.

Conclusions—The perspectives of positive outlier children can provide insight into children’s motivations leading to successful obesity management. Practice implications: Child/family engagement should guide the development of patient-centered obesity interventions.

Keywords

obesity; overweight; positive deviance; children; attitude to health; qualitative

1. Introduction

Despite a recent leveling off in the rapidly increasing rate of childhood obesity, the high prevalence of children with obesity remains a major public health issue with alarming socioeconomic, racial, and geographic disparities [1]. Promising approaches to address childhood obesity and associated health disparities exist, such as multi-sector strategies that support change at the individual, family, and community levels [2, 3], yet their effectiveness is often limited by the complex social and environmental factors that modify and mediate obesity-related behaviors.

The “positive deviance” or “positive outlier” theoretical approach offers avenues for identifying solutions to public health problems that are highly adaptive to social-environmental context because the strategies emerge from within the context of interest [4]. This strategy seeks to identify individuals who perform better than the majority of their peers on some outcome of interest and applies qualitative exploration to identify the potential mechanisms underlying their success. While prior investigators have studied successful individuals with respect to obesity [5, 6], most studies have taken a quantitative approach to test the predictors of success; yet, it is precisely these *a priori* assumptions that must be limited in a positive outlier theoretical approach in order to identify unique and novel strategies [7]. We have previously suggested that the positive outlier approach may advance progress in childhood obesity by identifying and learning from successful children and families within obesogenic socio-environmental contexts [8]. We have also applied the approach to examine the perceptions and strategies of parents of positive outlier children who have improved their weight status despite living in neighborhoods with high obesity prevalence [9].

Qualitative methods, particularly focus groups, can be an effective tool for exploratory research among children, with some researchers even finding valuable information from children as young as 4–6 years old [10]. While methodological challenges and ethical considerations must be taken into account when working with children, it is important to acknowledge and include children’s voices when evaluating and addressing the health issues that affect them.

In this study, we sought to explore the perspectives of the positive outlier children themselves. Specifically, we examined the factors that motivated change and the outcomes that mattered most to these successful children. Such patient-centered insight into successful childhood obesity management can be used by health care systems and communities to address childhood obesity in a language and manner that is relevant and accessible to children with obesity and their families.

2. Methods

2.1. Sampling

We recruited focus group participants from among children seen for well-child care at the 14 practices of Harvard Vanguard Medical Associates (HVMA), a multi-specialty group practice in eastern Massachusetts. Using up to 5 years of longitudinal height and weight data from the electronic health records of 22,443 Massachusetts children ages 6 to 12 years-old in February 2013, we used linear mixed effects models and a purposive sampling approach [11] to identify 521 positive outlier children with a negative BMI-z score slope living in obesity hotspots (i.e., zip codes with > 15% prevalence of childhood obesity), as previously described in greater detail [9]. We excluded children with medical problems affecting growth or nutrition documented in their electronic health record problem list or billing record. We calculated BMI as kg/m² and used participants' age- and sex-specific BMI percentiles and z-scores. [12] We defined obesity as a BMI percentile 95th percentile.

We further limited the recruitment sample to children who were 10–12 years-old at the time of study recruitment in February 2014 (n=193) and had maintained a negative BMI z-score slope through October 2013 (n=174). The study was limited to this age group of children rather than younger children or adolescents, who are distinct in their levels of autonomy over their behaviors and environments.

Among this sample, 12 children's parents had participated in parent focus groups the prior year and had agreed to be contacted, and two had previously indicated interest in attending parent focus groups but had been unable to attend. The Institutional Review Boards of Partners Health Care approved the study protocol.

2.2. Recruitment and Enrollment

Study staff sent out recruitment letters to the children's parents explaining the study and providing an opt-out phone number. Two families called the study hotline to opt out. We ranked the remaining 172 children in our recruitment sample by BMI z-score slope. Children with the most negative slopes and parents who participated in previous focus groups were contacted for recruitment first. One week after the letters were mailed, study staff began to contact parents by phone to explain the study, confirm their child's eligibility, conduct a brief demographic survey, answer questions about the study, and schedule children for focus groups. Staff recruited 6–10 participants for each focus group and discontinued calls upon thematic saturation. Ultimately, all 172 parents were called, 36 participants were recruited, and 21 children attended four focus groups.

2.3. Qualitative Protocol

Our study team of pediatricians, health services and public health researchers, and an anthropologist developed a focus group discussion guide (Table 1) through an iterative process. The guide was informed by a review of prior studies exploring child perspectives related to obesity as well as literature describing methodological considerations unique to child focus groups with respect to both structure and content. In particular, we used drawings and activities [13], included breaks [14], minimized age variation within groups,

and limited the total time of each group to 90 minutes [15]. The guide was designed using an adaptation of Sorenson's social contextual model [16] to help identify context and mediating mechanisms around improvement of BMI. Core questions were supplemented with spontaneous follow-up questions during the groups to provide a more robust exploration of relevant topics. We completed four 1.5-hour focus groups at three HVMA locations selected for accessibility to obesity hot spot neighborhoods (Figure 1). We provided participants and their accompanying parents with a light meal and one \$50 gift card per participating child as an incentive for participation.

The groups were moderated by the project team anthropologist (R.G.), and started with an exploration of rules and limits in the children's homes around obesity-related behaviors (e.g., sugar-sweetened beverage consumption, screen time, and sleep) and then moved to three activities. In the first activity, children were asked to discuss and compare their projections of the experiences and perceptions of two fictional groups of children in an illustration labeled groups J and K (Figure 2). The images represented different races/ethnicities and genders and the pictures in groups J and K were identical in all ways except weight status. The J image portrayed children with a healthy BMI while the K image portrayed children with obesity. In the second activity, children were given an illustration with 4 quadrants representing family, the doctor's office, schools, and neighborhoods, and they were asked to place stickers on the domains they thought could help children get to healthier weights; each child received 10 stickers and was instructed that placing more stickers on a domain would mean it was more important. The moderator used the activity to drive discussion around ways in which each domain could serve as a facilitator or barrier to healthful behavior change. In the final activity, we investigated how the children would measure success getting to a healthier weight. The children verbally created a list of successful outcomes and these were recorded by the moderator on a flip chart. Then the children were asked to vote on which outcomes were most important, again using stickers, and then discuss their choices. Both voting exercises were designed to stimulate rich, comparative discussion of key topics rather than to provide quantitative value, although we did record voting outcomes.

2.4. Piloting

We conducted a pilot focus group with a convenience sample of seven children ages 7–11 years in order to test the feasibility of our planned activities and the age appropriateness of the focus group guide. Based on observations from this pilot focus group, we discovered that the comments and discussion points from the 10 and 11 year-olds were clear, focused, and insightful compared to those of the 7 to 9 year-olds. Children in the younger group had more difficulty staying focused and expressing their thoughts clearly. During the pilot we produced large poster size illustrations for the activities and presented them to the whole group. We found that this resulted in significant peer-pressure and social-desirability bias among participants, particularly during the voting activities. Therefore, for the subsequent groups, we provided individual copies of the illustrations for each child, allowing them to vote individually and then share their thoughts with the group.

2.5. Analysis

The audio recording of each group was sent to an independent company for transcription. After transcription, a group data analysis process was conducted in iterative meetings using an immersion-crystallization approach [17]. This involved repeatedly reading and discussing the transcripts to identify emerging themes and salient topics. The four member analysis team (M.S., G.M., R.G., and C.C.) individually read and took notes on the transcripts before discussing them in team meetings. During these discussions, a list of themes was generated and representative quotes were collected. After we developed this initial list of themes and clarified definitions, the transcript texts were subjected to line-by-line coding using a spreadsheet. The list of themes was modified by team consensus as the need for new themes emerged. Transcripts were once again reviewed individually by the analysis team, and we used the spreadsheet of coded quotations to facilitate further analysis discussions, develop links between themes, finalize data interpretation, and identify representative quotations. Three members of the analysis team attended all of the focus groups in person and added input from their observations and notes from the groups to corroborate theme development and quote selection. Analysis was considered complete when no new themes were generated from transcript review and discussion. Consensus among the analysis team on theme selection and theme organization was used as quality check on data interpretation.

3. Results

We reached thematic saturation after four focus groups with a total of 21 children of diverse race/ethnicity. We determined that had reached data saturation when we began to hear repetitive comments, with few new data and no new themes generated in the final focus groups. The socio-demographic characteristics of children who were recruited (i.e., parent agreed to have the child attend) and children who ultimately participated are similar in all domains (Table 2). In all 4 groups, we noted a dramatic increase in participation and robust discussion among the children with all three activities involving illustrations and voting with stickers. They were clearly more comfortable discussing illustrations of fictional characters than talking about their own experiences.

3.1. Child Reported Motivation for Change

Children described negative psychosocial pressure in different ways, which sometimes served as motivation for change in BMI (Table 3). The children viewed obesity in negative moralistic terms; being at a healthier weight was described as a better state and children perceived obese children as inferior to their normal weight peers in both ability to participate in athletic and social contexts. Representative descriptions of the illustrations comparing healthy weight children to those same children with obesity are shown in Figure 2, with a clear predominance of negative descriptions of children with elevated BMI as opposed to positive descriptions of healthy weight children. All the children, whether by direct statement or nonverbal agreement, expressed that bullying was a major issue for obese children, and some specifically articulated this as motivation for getting to a healthier weight. The children identified authority figures, such as doctors or parents, as providing motivation to change behaviors.

3.2. Child Reported Influences on Initiation and Maintenance of Behavior Change

Relationships with peers and family dominated the children's descriptions of influences on initiation and maintenance of healthful behavior change (Table 4). According to the children, peer engagement served as a key facilitator to improved health, with some reporting collaboration with overweight friends to get to a healthier weight and others noting that their healthy weight friends were supportive. Additionally, children said that healthy weight children served as models. The children stated that simply having fun was a positive influence, especially in reference to participating with peers in physical activity.

The children discussed family as a positive influence through imposed limits and rules around eating, providing guidance and support, or implementing family level change by modifying shopping and family diet and physical activity. Children also said that parents could be a negative influence by providing unhealthy food at home or lacking knowledge regarding healthy choices. Children described doctors as an expert source of information about how to be healthier, while emphasizing that doctors needed to be direct and serious when talking about weight as opposed to "sugar-coating it."

In considering the role of neighborhoods, children discussed both positive features supporting healthy behavior change, such as grocery stores, parks, and gyms, as well as negative features such as unhealthy food options in convenience stores and the lack of safe areas to be physically active. Children described schools in similarly contrasting terms, with gym classes, team sports, and school nurses being positive influences and bullying and poor lunches being negative factors. Technology was mentioned by children as providing an opportunity to exercise in the home through video game systems, and some children said that they used apps to track their exercise and dietary intake.

3.3. Child Reported Measures of Success

Children measured success getting to healthier weight in both concrete and abstract ways (Table 5). Many children focused on progress in athletic performance and being able to wear preferred styles and age-appropriate sizes of clothing. Several described taking pride in overcoming challenges and reaching a difficult goal, noting that behavior change was hard at first but got easier over time. The children also very frequently discussed social outcomes such as fitting in with their peers and avoiding weight-related stigmatization and bullying.

4. Discussion and Conclusions

4.1. Discussion

In this qualitative study of 10 to 12 year-old positive outlier children who successfully improved their BMI despite living in obesogenic neighborhoods, we explored ways that children perceived and measured success in obesity management as well as potential contributors to that success. Overall, peer and family support proved to be critical influences on the initiation and maintenance of weight-related behavior change. Children were motivated to improve their BMI by negative psychosocial pressure including fear of bullying and negative views of obesity from their peers and themselves. Children measured success getting to a healthier weight by tracking their progress in both abstract ways such as

fitting in socially, and concrete ways such as improved athletic performance. Psychosocial pressure, both positive and negative, was ubiquitous and presented itself as a meta-theme.

The positive outlier approach has been used to study adult obesity [7] and childhood obesity from the perspective of parents [9]. We believe, however, that this is the first study utilizing a positive outlier approach to explore the perspectives of children with respect to obesity. Children with obesity and their families live within complex socio-environmental contexts that include elements impacting energy intake and expenditure but that are often beyond their control and not easily modified. In this study, we specifically sought to identify the strategies and perceptions of successful children that helped them surmount potentially challenging aspects of living in neighborhoods with high obesity prevalence.

Among the positive outlier children in this study, family and peer support were critical and potentially modifiable facilitators of success. While social support from parents, siblings, and peers has been extensively studied as a predictor of physical activity participation [18–20] and dietary behavior change [21, 22], our findings lend support to mounting evidence that children’s family and social networks can be leveraged to cultivate and reinforce improvements in weight status [23, 24]. The social learning theory stresses that individuals learn their behavior and new skills from observing others, termed modeling [25]. Our findings also suggest that positive outlier children may learn to make healthful behavior changes through observation and modeling of influential and respected characters in their lives, including parents and peers. This process of learning may also be enhanced by a dynamic interaction with intrapersonal factors such as wanting to fit in and not be bullied. A comprehensive understanding of these social learning and interpersonal factors may help inform the design of effective interventions to improve childhood BMI.

One notable feature of the positive outlier children in our study was that they measured their success by tracking their progress socially and physically. Several other studies have shown that obese children experience bullying, social stigma, and exercise intolerance [26]. The results of our study corroborate these findings, as well as that these challenges, which are commonly present in the lives of children with obesity, are mitigated by improving BMI. It follows that bullying, social stigma, and exercise intolerance could be considered *symptoms* of childhood obesity which are ameliorated as the disease declines. Our findings suggest that these are also the symptoms that matter most to children who have achieved a healthier weight. Resolution of these symptoms was described by our participants as the most meaningful outcome of improved BMI. Emphasizing these outcomes to both children and their parents in family-centered obesity interventions may help to secure higher levels of engagement and buy-in from families to effect behavior change.

Furthermore, the ubiquity of negative social pressure and bullying in the experience of the children in our focus groups was perhaps most clear in the ways in which the children described the illustrations of healthy weight children and children with obesity. This observation highlights the imperative for interventions targeting obesity to acknowledge and address social and emotional well-being [27, 28].

Strengths of the study design included carefully considered eligibility criteria utilizing longitudinal, objective growth data from electronic health records and mixed effects linear regression modeling to purposively define the recruitment sample of positive outlier children living in obesity hot spot zip codes. The moderator's guide and analysis process were informed by a theoretical framework, and combined with a positive outlier approach which seeks to limit a priori assumptions. The content analysis of participants' statements was conducted by a group of researchers with varying perspectives and backgrounds. The study also has a few limitations. First, it is possible that children who participated in the groups could have more motivated families which could have biased our findings. Second, our sample population represents insured, English-speaking patients presenting routinely for well child visits, and the parents of participants reported relatively high education levels compared to state and national census reports [29]. Findings may have differed had our study population been of lower socio-economic status and non-English speakers. Parental education has been linked to child obesity [30] and could play a role in mediating positive outlier status, yet our study is not designed or equipped to examine this hypothesis. Further, the educational attainment reported by the parents of participants is comparable to past studies among overweight and obese children at the same HVMA practices so it does not appear that these parents of positive outliers were more highly educated than other HVMA parents [31]. Third, as is the nature of qualitative research, our results are not intended to be generalizable or to determine percentages of children holding a given belief, but rather we aimed to explore concepts and stimulate hypotheses to guide the development of childhood obesity interventions. Nonetheless, themes repeatedly emerged across multiple groups, which supports their salience in this study population.

4.2. Conclusion

Children who successfully improved their BMI despite living in neighborhoods with high obesity prevalence focused on psychosocial and physical obesity-related symptoms as outcomes of interest, and they tracked improvement in these domains to measure their success. Social support from parents, families, and peers was a dominant facilitator of success in achieving healthy behavior change.

4.3. Practice Implications

These findings can be used to design and test patient and family-centered childhood obesity interventions that better address the outcomes that matter most to children and measure success in a relevant and accessible way. The perceptions and experiences of the children in this study could be used to aid and encourage other children with expressing their concerns and preferences and allow care providers to center discussions about weight on the specific outcomes that are most relevant to patients and families. Doing so may enhance patient and family engagement and in turn optimize intervention success. Such interventions should also consider the influence of interpersonal factors on the motivation to change behavior and leverage the influence of social networks and support. Finally, the management of obesity in children would be incomplete without a careful approach to fostering social and emotional well-being. Interventions should include measures of quality of life and social and emotional health in evaluating intervention success.

Acknowledgements

We are grateful to Chompunut Ditchaiwong for developing the illustrations, Sheryl L Rifas-Shiman and Renata Koziol Smith for data analysis, and the children who participated in the pilot group and study groups as well as their parents.

Funding Sources: This study was supported through a Patient Centered Outcomes Research Institute (PCORI) Award (IH-1304-6739) and by Harvard Catalyst | The Harvard Clinical and Translational Science Center (National Center for Research Resources and the National Center for Advancing Translational Sciences, National Institutes of Health Award UL1 TR001102) and financial contributions from Harvard University and its affiliated academic healthcare centers. Dr. Sharifi is supported by an AHRQ Mentored Career Development Award for Child and Family Centered Outcomes Research (1 K12 HS 022986-01). All statements in this report, including its findings and conclusions, are solely those of the authors and do not necessarily represent the views of the Patient-Centered Outcomes Research Institute (PCORI), its Board of Governors or Methodology Committee, Harvard Catalyst, Harvard University, Harvard Catalyst, Harvard University and its affiliated academic healthcare centers, or the National Institutes of Health. These sponsors played no role in study design; in the collection, analysis and interpretation of data; in the writing of the report; or in the decision to submit the paper for publication.

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Highlights

- We conducted focus groups with children identified as obesity positive outliers.
- We defined positive outliers using longitudinal growth and obesity prevalence data.
- We present weight-related outcomes most salient to this purposive sample of children.
- Children focused on bullying, physical appearance, clothing size and athleticism.
- These findings can guide more effective, patient-centered obesity interventions.

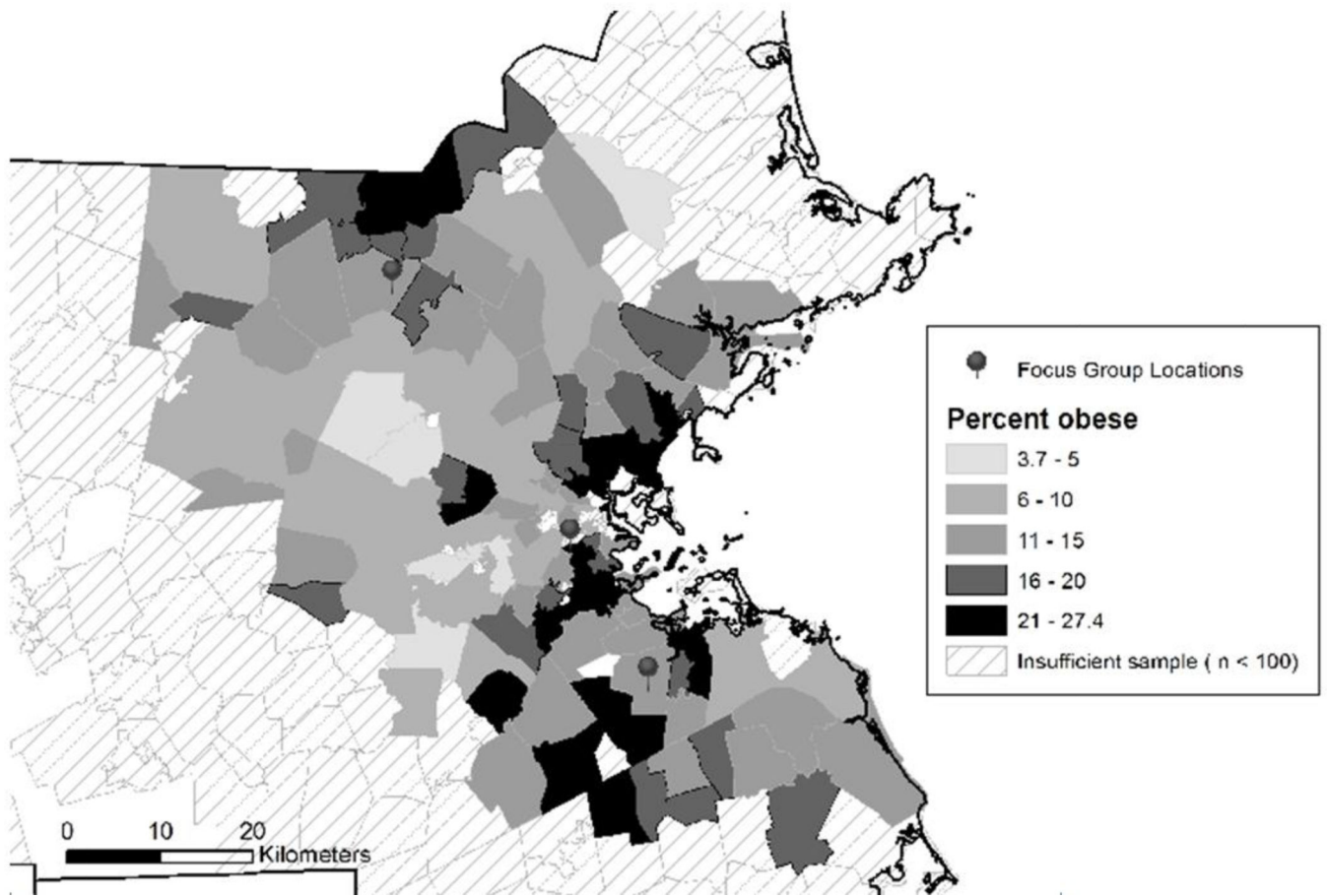
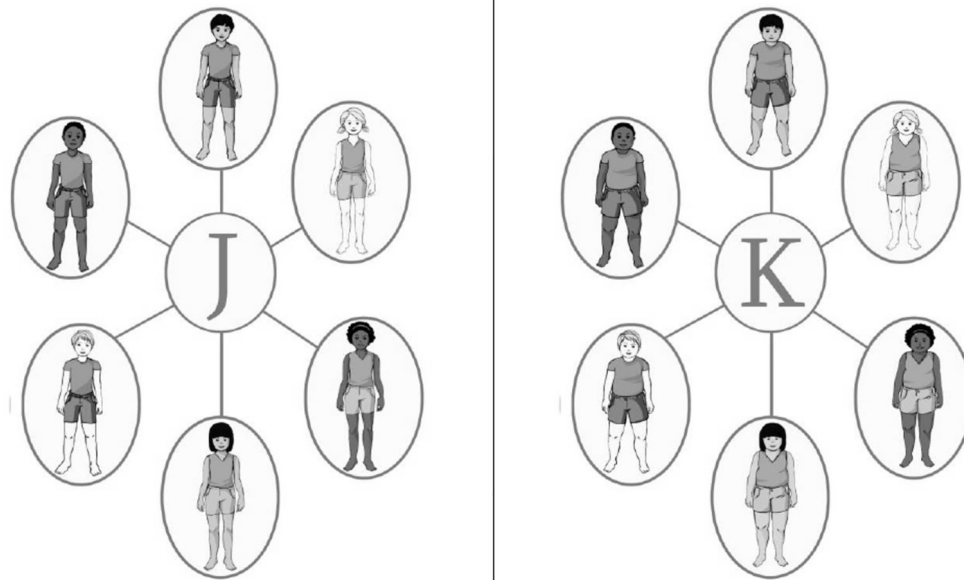


Figure 1. Prevalence of Childhood Obesity by Zip Code Among 22,443 Massachusetts Children ages 6–12 years-old and Focus Group Locations



Psychosocial

- “confident”
- “more friendly”
- “cool”
- “part of the group”

Physical

- Athletics
 - “faster”
 - “energetic”
 - “fit”
- General Health
 - “healthy”
 - “feel better”

Psychosocial

- “sad”, “left out”, “nervous”, “shy”, “lazy”, “self-conscious”
- “not as good as the other kids”
- “too scared to get friends”
- “[people/kids] make fun of them”
- “afraid (of) people”, “afraid I couldn’t do much”
- “not as motivated”
- “don’t have the right mindset”
- “can’t do as much”
- “harder to make friends...kids might think they’re not going to be nice”
- “she feels pressure, like she’s too—she has too much weight”
- “almost overweight, that’s not good”

Physical

- Athletics
 - “less athletic”
 - “run out of breath really fast”
 - “not able to keep up with the team”
- Appearance
 - “can’t fit in to their friend’s clothes”
 - “overweight”
- General Health
 - “tired”
 - “not as healthy”

Figure 2. Descriptive Phrases Used by Child Focus Group Participants in Reference to Illustrations of Healthy Weight Children and Children with Obesity

Table 1

Focus Group Discussion Guide Topics and Sample Questions on Perceptions, Strategies and Suggestions among Positive Outlier Children

Topic	Discussion Guide Questions
Changes in rules/limits	<ul style="list-style-type: none"> • When you are at home and you want to have a snack, who gets to decide if you can have a snack? And who decides what you are going to eat or drink? <ul style="list-style-type: none"> ○ Have there been any changes in these rules over the last 2 or 3 years? <ul style="list-style-type: none"> ▪ Why do you think these changes happened? How did you feel about these changes? • And what about the time you spend looking at a screen like a TV, does anybody put any rules on what you can watch and how much time you spend on the computer or video games? <ul style="list-style-type: none"> ○ Have there been any changes in these rules in the last 2 or 3 years? • And how about sleep, like what time you go to bed at night or when you get out of bed in the morning, do any of you have to follow rules about that? <ul style="list-style-type: none"> ○ Have there been any change is these rules?
Changes in physical activity	<ul style="list-style-type: none"> • Who has started a new activity that gets your body moving in the last 2–3 years or so? What were they and how did you come up with them? • How did it happen that you started doing [activity]? • So remember back to when you first started, how did that feel? How did it go in the beginning? • Was there anything that helped you get started? Why? • And was there anything that made it difficult for you to keep doing the activity at the beginning? Why did that make it difficult? • How do you feel now and why do you keep doing it?
Activity 1: Child Reported Outcomes of Interest^a	<ul style="list-style-type: none"> • How do you think a child in picture K feels compared to a child in picture J? • What are some things that might be hard for a child in picture K to do that might be easier for a child in picture J? • What might be some reasons that a child in picture K might want to get to a lower weight? • What are some ways a child could do that?
Activity 2: Facilitators, Barriers, and Potential Intervention Strategies^b	<ul style="list-style-type: none"> • Here we have Families, Schools, and things in your Neighborhood – like parks, YMCAS, gyms, grocery stores, and here we have the Doctor’s Office. What we want each of you to do is think about what could help a child in picture K to get to a healthier weight. After thinking about this, you can use your stickers to vote on what you think can be most helpful. • Why did you put your stickers on [family/community/ doctor’s office]? • How do we think that [family/community/doctor’s office] could help K get to a healthier weight?
Activity 3: Child Reported Measures of Success^c	<ul style="list-style-type: none"> • Imagine that all of the suggestions about ways that the family, schools, community and the doctor’s office could help the children in K that you all just gave really worked and they helped a child in picture K get to a healthier weight. • How do you think that child would feel? • What do you think they would be most proud of? Excited or happy about?

^aTwo illustrations were presented to the children (Figure 2): 6 children with healthy BMIs (labeled **J**) and the same 6 children with obese BMIs (labeled **K**).

^bEach child received another handout (with illustrations of families, the doctor’s office, neighborhoods, and schools) and 10 stickers.

^cAnswers generated in this section were written on a flip chart, and the moderator asked the children to use stickers to vote on the items that would be most important to them.

Table 2

Sociodemographic Characteristics Reported by the Parents of Positive Outlier Children Recruited for Focus Groups and Focus Group Participants

	Recruited Children N=36	Participants N=21
Sociodemographic Characteristics	Mean (S.D) or N (%)	
Positive outlier child age, years	10.8 (.75)	10.9 (.73)
Relationship to positive outlier child		
Mother	30 (83%)	17 (81%)
Father	4 (11%)	3 (14%)
Other Guardian	2 (6%)	1 (5%)
Race/Ethnicity		
Non-Hispanic White	4 (11%)	3 (14%)
Non-Hispanic Black	20 (56%)	10 (48%)
Hispanic	9 (25%)	6 (29%)
Other	3 (8%)	2 (10%)
Education		
Post-graduate	7 (19%)	4 (19%)
College graduate	12 (33%)	6 (29%)
Some College	13 (36%)	8 (38%)
High School or less	4 (11%)	3 (14%)
Primary language spoken at home		
English	29 (81%)	17 (81%)
Spanish	4 (11%)	2 (10%)
Other	3 (8%)	2 (10%)
2 children living in the household	28 (78%)	19 (90%)

Table 3

Themes and Representative Quotes for Patient-Reported Motivation for Change

Motivation for Change: Social Pressure	Illustrative Quotations
Negative perceptions of obesity	<ul style="list-style-type: none"> “I do want to be healthy...I really don't want to be a couch potato, just sitting there and doing nothing.... Because you'll just eat and you'll just put on weight. That's just not right.” (10yo girl, Group #1)
Peer comparisons	<ul style="list-style-type: none"> “Whenever your friends are thin and you're bigger and they're able to do things that you aren't able to do, you kinda try working hard to reach that.” (12yo boy, Group #4)
Avoiding Bullying/Teasing	<ul style="list-style-type: none"> “People making fun of you and stuff. All they do is really motivate me and I can do it now.” (12yo boy, Group #4)
Authority figures (Doctor/Parent)	<ul style="list-style-type: none"> “Well, my mom keeps encouraging me to do that, because she doesn't really want me to put on a lot of weight.” (10yo girl, Group #1) “You have to listen to your doctor...” (11yo boy, Group #2) “When I was told [<i>by the doctor</i>], it opened up the, “Wow, I was and I need to get healthier.” (12yo girl, Group #2)

Table 4

Topics, Themes, and Representative Quotes for Key Influences on the Initiation and Maintenance of Healthy Behavior Change

Influences on Initiation of Change and Maintenance: Key Relationships, Schools and the Neighborhood	Illustrative Quotations
Peers	
<ul style="list-style-type: none"> Peer Support and Engagement 	<ul style="list-style-type: none"> “You might go to a certain social group with a group of people who have weight issues. They talk about how they could lose some weight. They might do it together.” (12yo girl, Group #1) “It was hard at first because at that time I always had—when I used to see something I just wanted to eat it. I had that in my mindset. What really motivated me to keep going and not go on that path and stop what I was doing was my classmates and my real close friends.” (12yo boy, Group #4) “Your friend are there, and they can motivate you to do better, too.” (10yo girl, Group #1)
<ul style="list-style-type: none"> Having fun 	<ul style="list-style-type: none"> “We ask my mom, “Hey, can we get the Wii and play Just Dance?” It’s fun stuff. I play outside because I like playing tag and stuff like that. I really wasn’t thinking about how much I weighed or something. I just wanted to have fun.” (11yo girl, Group #4) “Run with your friends, and talk if you want to. Have fun while you’re doing it, not just pressured to doing it.” (10yo girl, Group #1)
Family	
<ul style="list-style-type: none"> Food and Drink Purchases 	<ul style="list-style-type: none"> “My mom, she doesn’t like to put soda in the fridge. She mostly buys milk, and water, and orange juice.... I mostly get like two cups (<i>of juice</i>). When it comes to milk and water, I can have as much as I want.” (10yo boy, Group #3) “Then my mom started getting fruits, and I got really, really mad... I just said, ‘who cares, I’m so hungry.’ I just ate.” Moderator: “What do you think now?” Participant: “I’m okay with it.” (10yo girl, Group #1)
<ul style="list-style-type: none"> Rules 	<ul style="list-style-type: none"> “I usually just ask what I want. If they say, ‘no,’ I find something else. If I don’t find anything, then I just don’t eat. I realize that I’m not hungry at all, sometimes... Sometimes you can eat something unhealthy, but it has to be something specific and a specific amount.” (12yo girl, Group #1) “We try not to eat the junk food, but we might have a little bit here or there, and just get a little bit of a taste, but not a whole lot at a time.” (11yo boy, Group #3)
<ul style="list-style-type: none"> Guidance/Support 	<ul style="list-style-type: none"> “I put family because they can say stuff that your friends can’t about you, and your weight... Because they know you more, and they know you love them... you probably won’t care as much if the family says something about that. If your friend does, you’d be probably hurt about your weight.” (10yo girl, Group #1) “At first I was gonna give up until my mom and my sister, they helped me keep going.” (12yo boy, Group #4) “I didn’t really wanna talk about me trying to lose weight and all that, but I kinda opened up to my family and it kinda made me feel more comfortable about what I was doing to lose weight. It didn’t bother me much after a while.” (12yo boy, Group #4)
<ul style="list-style-type: none"> Family/Household Barriers 	<ul style="list-style-type: none"> “My mom, she buys soda, but she hides it from me....[I feel] left out.” (10yo boy, Group #3)

Influences on Initiation of Change and Maintenance: Key Relationships, Schools and the Neighborhood	Illustrative Quotations
	<ul style="list-style-type: none"> “Sometimes the parents need to know more than the kids do about it because when the parents don’t know, then they think they can be helping their kids by telling them to eat healthier when the parents are eating unhealthy things.” (12yo girl, Group #2) “Cause it’s like your parents say, ‘oh, I put this amount on your plate. You have to eat it all.’” (12yo girl, Group #2)
<ul style="list-style-type: none"> Parent modeling/Family-level engagement 	<ul style="list-style-type: none"> “I just walk with my mom a long way. We just walk, or we run. We go a long way, and then come back home, walking. That’s what I do to lose weight, too.” (10yo boy, Group #3) “Having my mom with me really motivates me.” (10yo girl, Group #1)
Doctor’s office	
<ul style="list-style-type: none"> Expert/authoritative educator 	<ul style="list-style-type: none"> “They can tell you about your weight and what you should do to lose weight.... They know all about your health.” (11yo boy, Group #2) “The doctor office, it teaches you. It tells you what to do for your body, make your body feel better.” (11yo boy, Group #3) “They’ll tell you some techniques that you can use to lose weight.... [But] they don’t motivate you as much as your family does.” (12yo boy, Group #4)
<ul style="list-style-type: none"> Need to be direct/serious 	<ul style="list-style-type: none"> “The first doctor I went to, she kinda like sugar coated it.... I’d much rather her have said it, ‘you need to lose weight. You need to be healthier.’” (12yo girl, Group #2) “Being a little more serious.... they could just say, ‘you really do need to lose some weight.’” (12yo boy, Group #2)
Neighborhoods	
<ul style="list-style-type: none"> Neighborhood Resources, Safety/Crime 	<ul style="list-style-type: none"> “It’s helpful because at the playground you can run and play, go on swings and stuff. At the grocery store you can get healthier food and drink water and buy more water and food.” (11yo girl, Group #4) “Like at my neighborhood we have a local pool where the kids can work out ... it also can be tempting with a lot of stores, like CVS with a lot of candy.” (12yo girl, Group #2) “It’s not so high on my rating because you don’t, for example, around here in Boston, it’s not the safest place. I would say because of that reason that you can’t really do much because you can get hurt out here.” (12yo boy, Group #4)
<ul style="list-style-type: none"> Schools 	<ul style="list-style-type: none"> “...you’re in the school 180 days. It depends on what they give you, cuz not all families can make their own lunches to bring to school.” (11yo boy, Group #3) “I think schools can help you because they give you exercise and gym fitness and stuff like that.” (11yo girl, Group #4) “A lot of teachers they support kids if they get frustrated sometimes at the sport....the teacher supports them.” (11yo girl, Group #4) “The [school] nurse would also help... she would say, ‘You can stop eating this, or stop eating that. Maybe you won’t be so tired.’ ... Keep weighing them in, and then if we lose weight, she might say, ‘Oh, good job,’ or, ‘You’re doing a good job, just keep it up.’ You’ll feel better cuz someone at the school’s helping you.” (11yo boy, Group #3) “School is a bad place because maybe some of your friends eat unhealthy and they want you to eat unhealthy.” (11yo boy, Group #2)
Technology	

Influences on Initiation of Change and Maintenance: Key Relationships, Schools and the Neighborhood	Illustrative Quotations
<ul style="list-style-type: none"> • Obesity in the media 	<ul style="list-style-type: none"> • “Cuz all these other people did it. Like if they can do it, they had no hope that they could, but the actually did it. Mostly what go to me was <i>The Biggest Loser</i>. I like that show. At the beginning, they told their stories. They thought that they could not do it, some of them not all. That’s what really got me. Because in the end, they actually did lose a lot of weight, and their lives are getting better.” (12yo girl, Group #1)
<ul style="list-style-type: none"> • Facilitating Exercise 	<ul style="list-style-type: none"> • “I like to do a lot of games on it. It’s one of my favorites.... Like Kinect Sports. I like being competitive in that sort of way. Not like running competitive, because most of the time I lose.” (12yo girl, Group #1) • “Get a game that you have to get active to play it. Like you don’t have to go outside, you can stay in the house and get active.” (11yo boy, Group #3) • “There’s like youtube videos of just made for kids to actually work out. If you don’t wanna work out in front of people or you’re too afraid to do sports and be judged, you could do.... a bunch of workout videos for kids. She has a whole book on recipes and stuff.” (12yo girl, Group #2)

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Table 5

Themes and Representative Quotes for Patient-Reported Measures of Success

Measures of Success: Sense of Progress	Representative Quotations
Emotional	<ul style="list-style-type: none"> • “One thing they [<i>children who got to a healthier weight</i>] would be happy about is that of all of the progress of exercising and eating healthier has paid off.” (11yo boy, Group #1) • “You just feel better. And about yourself of course. You feel better about yourself that you made an accomplishment that you knew you was going for.” (12yo boy, Group #4)
Appearance	<ul style="list-style-type: none"> • “They feel proud ... that they lost all the weight so they can fit into things.” (11yo boy, Group #2) • “If they go to school they won’t be sad to wear the clothes they have.” (10yo boy, Group #3)
Social	<ul style="list-style-type: none"> • “They can <i>finally</i> fit in.” (11yo boy, Group #1) • “Just won’t make fun of them because he’s one of them now.” (10yo boy, Group #3) • “They will be more social. They’ll get out and talk to people more and stop being so shy.” (11yo boy, Group #3)
Physical Fitness	<ul style="list-style-type: none"> • “After a while, I’ve been noticing that my knees never started hurting after I’ve been losing weight and stuff... I felt happy because ... I got to be with the other kids that could run fast and stuff.” (10yo boy, Group #3)