The Smart Moms Study

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Background

• Primary Research Interest:
  ◦ Family-based interventions to reduce obesity risk in young children

Who is at risk?
• Children of overweight/obese mothers
• Children who consume high amounts of sugar-sweetened beverages and juice (SSB/juice)

How can we intervene?
• Target mothers as agent of change to (1) reduce child SSB intake and (2) help mothers lose weight
Key Ingredients

Target Drivers of Child Obesity

Simple Goals

Maximize Engagement

Adapting Standard Intervention

• Adapt to enhance accessibility and adherence of parents

• Emerging technologies
  ◦ Websites
  ◦ Mobile phones/text messaging
  ◦ Evidence for feasibility among mothers

Study Design

• 6-month RCT
  ◦ Smart Moms intervention vs. waitlist control

• Population
  ◦ Mother-child dyads
  ◦ Child ages 3-5

• Primary outcome
  ◦ Child SSB/juice intake

• Secondary outcome
  ◦ Maternal weight
Eligibility Criteria

• Child criteria
  ◦ Ages 3-5
  ◦ Consumes at least 12 ounces of SSB/juice per day
  ◦ Without medical condition that would affect participation

• Maternal criteria:
  ◦ BMI of 25-50 kg/m\(^2\)
  ◦ Own a smartphone with data and text messaging plan
  ◦ Without medical condition that would affect participation
Recruitment

• Target Area
  ◦ Within 20 miles of Raleigh, Durham, or Chapel Hill

• Traditional Methods
  ◦ UNC informational listserv
  ◦ Flyers in over 75 community locations
  ◦ Letters to 400+ peds offices, daycares, preschools
  ◦ Flyers with WIC staff

Are you a mom of a preschooler?
Do you want to make healthy choices for you and your child?

Sign up for a no-fee research study at the University of North Carolina at Chapel Hill that is designed to help mothers of children ages 3-5 make small behavior changes and lose a little weight. The program will be delivered primarily through online contacts and text messages to fit your busy schedule. More information is available online at www.smartmomsstudy.org or call us at 919-966-5852.

Learn more at www.smartmomsstudy.org

Or call us at (919) 966-5852
Online Recruitment

• Local parents groups
• Carolina Parent Ad
• Facebook

Screeners Completed Before and After Facebook Post

Before (3.5 months)  During (2 weeks)

0  100  200  300  400  500
Completed Online Screening  
N = 629

Ineligible (n = 539)  
- Child SSB < 12 fl. oz./day (n = 428)  
- Could not contact (n = 44)  
- Child age not 3-5 (n = 21)  
- Other (n = 46)  
Did not complete baseline visit (n = 39)

Randomized  
N = 51

Smart Moms Group  
n = 27

3-Month Assessment  
n = 24  
- Unable to contact (n = 2)  
- Medical withdrawal (n = 1)

6-Month Assessment  
n = 23  
- Unable to contact (n = 3)  
- Medical withdrawal (n = 1)

Analyzed  
n = 27

Waitlist Group  
n = 24

3-Month Assessment  
n = 20  
- Unable to contact (n = 2)  
- Medical withdrawal (n = 2)

6-Month Assessment  
n = 19  
- Unable to contact (n = 3)  
- Medical withdrawal (n = 2)

Analyzed  
n = 24
Conceptual Model

Intervention

- Outcome Expectations
- Perceived Barriers
- Self-Regulation
- Self-Efficacy

Positive Reinforcement

Home Environment

Maternal SSB

Observational Learning

Limit Setting

Child SSB/juice
## Intervention Strategies

<table>
<thead>
<tr>
<th>Determinant</th>
<th>Strategies</th>
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</thead>
<tbody>
<tr>
<td><strong>Self-efficacy</strong></td>
<td>Set short-term goals</td>
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<tr>
<td></td>
<td>Prompt self-monitoring</td>
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<tr>
<td></td>
<td>Provide tailored performance feedback</td>
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<td></td>
<td>Prompt review of goals</td>
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<tr>
<td><strong>Outcome Expectations</strong></td>
<td>Provide general information about risk of obesity in young children</td>
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<tr>
<td></td>
<td>Provide general information on relationship between SSBs and obesity</td>
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<tr>
<td><strong>Perceived Barriers</strong></td>
<td>Prompt barrier identification</td>
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<td></td>
<td>Provide strategies to overcome barriers</td>
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<td></td>
<td>Prompt behavior change with cues to action/encouragement</td>
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<tr>
<td><strong>Self-Regulation</strong></td>
<td>Set short-term goals</td>
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<td></td>
<td>Prompt self-monitoring</td>
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<tr>
<td><strong>Home Environment</strong></td>
<td>Environmental restructuring</td>
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<tr>
<td><strong>Limit Setting</strong></td>
<td>Provide tailored performance feedback</td>
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<tr>
<td></td>
<td>Stress management</td>
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<tr>
<td><strong>Positive Reinforcement</strong></td>
<td>Provide contingent rewards</td>
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<td></td>
<td>Praise child for behavior</td>
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<tr>
<td><strong>Observational Learning</strong></td>
<td>Provide information on mother as behavioral role model for child</td>
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</table>
Smart Moms Program Delivery

**Weeks 1-12**
- Kick-Off Session
- Weekly Website Lessons
- 4 Text Messages/Week
- Self-monitor daily, submit weekly
- Weekly Personalized Email Feedback
- Monthly Online Barrier Checks

**Weeks 13-24**
- Biweekly Website Lessons
- 3 Text Messages/Week
- Self-monitor daily, submit weekly
- Biweekly Personalized Email Feedback
- Monthly Online Barrier Check
Overview

• Goals

**Child Goal**
- Gradually reduce SSB/juice intake to 4-6 fl. oz./day (1 serving)

**Mother Goals**
- Reduce caloric beverage intake to ≤ 8 fl. oz./day
- Reduce intake of high-calorie foods ("red" foods)
- Weigh daily

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**Weekly Beverage Goals**

<table>
<thead>
<tr>
<th>Mother's Meals</th>
<th>Weekly Beverage Goals</th>
<th>Weekly Beverage Goals</th>
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<tbody>
<tr>
<td>Monday</td>
<td>Tuesday</td>
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<td>Friday</td>
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**Traffic Light Food Guide**

**Weekly**

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**Smart Moms S**

**William**

- I drank ___ servings or less of juice and sugary beverages today.

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**Weekly Text Messaging**

- You can expect to receive approximately 1-2 messages each week. Some will be informational, tips for behavior change or nutrition tips, and some will ask you to respond to a multiple-choice question about your progress that week. Text Towel and Text Towels! on page 9.!
Lesson 18: Staying in Control - Life After Smart Moms

Congratulations on making it to the final week of the Smart Moms program! Smart Moms was uniquely designed to help you make two specific changes that can have a big impact on your weight. During the past 6 months, we have encouraged you to reduce your beverages to 1 per day and to reduce your consumption of red foods. We also asked that you help your child reduce their consumption of juices and sugary beverages, because that’s one simple change that can make their diet healthier and help them stay at a healthy weight.

Although the Smart Moms program is ending, your focus on managing your beverage and food intake doesn’t have to end! In this lesson we’ll review the specific strategies that we used to target your beverage and red foods intake so that you can continue with your healthy behavior changes. These are basic skills that are essential for adopting habits that you can sustain over a lifetime.

Strategies for Managing Your Food and Beverage Intake

1. Self-Monitoring. Research shows that monitoring your food intake and physical activity are associated with weight loss and weight maintenance. Whether you want to lose more weight or maintain your weight, you will benefit from recording your daily food and beverage intake in a way that works best for you: on paper, or using a calorie tracking website or smartphone application.

The Culprit: Sugar

Fruit drinks, some juices, and other sugary beverages are high in empty calories, and most provide little or no nutrients. However, the biggest concern for your child’s health is the high levels of sugar they contain.

Research has shown that:

- 48% of children’s added sugar intake comes just from beverages.
- Children 2-5 are recommended to consume only 1 tsp of added sugar per day. However, they actually consume about 13 tsp.

Though almost half of children’s added sugar intake comes from beverages, the rest of...
Self-Monitoring

• Simplified monitoring

<table>
<thead>
<tr>
<th></th>
<th>Tuesday</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td>Child Servings</td>
<td><img src="#" alt="Checkmarks" /></td>
<td><img src="#" alt="Checkmarks" /></td>
</tr>
<tr>
<td>Mom Servings</td>
<td><img src="#" alt="Checkmarks" /></td>
<td><img src="#" alt="Checkmarks" /></td>
</tr>
<tr>
<td>Mom Red Foods</td>
<td><img src="#" alt="Checkmarks" /></td>
<td><img src="#" alt="Checkmarks" /></td>
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</tbody>
</table>

Mom Weight: __________ lbs

<table>
<thead>
<tr>
<th></th>
<th>Weekly Totals</th>
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<tbody>
<tr>
<td>Day</td>
<td>Child Servings</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Monday</td>
<td></td>
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<td>Saturday</td>
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<td>Sunday</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

Mom Most Recent Weight: __________ lbs.
Text Messaging

• Self-monitoring prompt
• Lesson prompt
• Assessment of goal progress
• Tips/Motivational messages
Email Personalized Feedback

• Feedback messages created based on weekly and monthly progress toward goals

Your Week 5 Feedback:

Great job! Leigh met her beverage goal for Week 5, with an average of 1 serving per day. Have they been drinking any more water since you started the program? Not only is it important to reduce how many sugary beverages they're drinking, but learning to consume water every day is a valuable healthy habit as they get older. Remember to use the water sticker chart to help reinforce this healthy habit. If you need more water charts, let us know and we'll send you some!

You had a great week, losing 2 pounds. Fantastic! To keep moving toward your personal weight goals, stay aware of your beverage and red foods goals and be consistent in your changes.

Good job: you met your beverage goal this week! Keep making the extra effort to select the options that help you achieve your weight loss goals.
Monthly Progress and Barrier Checks

- Desktop and mobile Qualtrics
  - Link to Qualtrics questionnaire in feedback email
Child Sticker Charts

- Weeks 1-12
- Study-provided stickers and prizes for meeting weekly goals

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
</tr>
</thead>
<tbody>
<tr>
<td>I drank ___ servings or less of juice and sugary beverages today!</td>
<td>I drank ___ servings or less of juice and sugary beverages today!</td>
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</tr>
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</table>

Goal: 2/day (14/week)

July 21-27
<table>
<thead>
<tr>
<th>Program Delivery</th>
<th>Weeks 1-12</th>
<th>Weeks 13-24</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kick-Off Session</td>
<td>Biweekly Website Lessons</td>
<td>75 minutes</td>
</tr>
<tr>
<td></td>
<td>Weekly Website Lessons</td>
<td>3 Text Messages/Week</td>
<td>10-15 minutes/week</td>
</tr>
<tr>
<td></td>
<td>4 Text Messages/Week</td>
<td>Self-monitor daily, submit weekly</td>
<td>2 minutes/week</td>
</tr>
<tr>
<td></td>
<td>Self-monitor daily, submit weekly</td>
<td>Biweekly Personalized Email Feedback</td>
<td>5 minutes/day</td>
</tr>
<tr>
<td></td>
<td>Weekly Personalized Email Feedback</td>
<td>Monthly Online Barrier Checks</td>
<td>3-5 minutes/week</td>
</tr>
<tr>
<td></td>
<td>Monthly Online Barrier Checks</td>
<td>Monthly Online Barrier Checks</td>
<td>3 minutes/month</td>
</tr>
</tbody>
</table>
In-Person Assessments

• Baseline, 3 months, 6 months
• Height and weight (mother and child)
• Sugar-sweetened beverage/dietary intake
  ◦ One 24-hour dietary recall (mother and child)
    ◦ Child fluid ounces of SSB/juice per day
## Baseline Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Smart Moms (n = 27)</th>
<th>Control (n = 24)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mothers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>36.6 (5.7)</td>
<td>36.2 (4.3)</td>
<td>.78</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>33.1 (4.8)</td>
<td>32.0 (5.9)</td>
<td>.47</td>
</tr>
<tr>
<td>White (%)</td>
<td>81.5%</td>
<td>66.7%</td>
<td>.45</td>
</tr>
<tr>
<td>Income ≥ $50,000/y</td>
<td>85.2%</td>
<td>78.3%</td>
<td>.53</td>
</tr>
<tr>
<td>Education (college or more)</td>
<td>81.5%</td>
<td>79.2%</td>
<td>.84</td>
</tr>
<tr>
<td>Married</td>
<td>92.3%</td>
<td>87.5%</td>
<td>.54</td>
</tr>
<tr>
<td><strong>Children</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (months)</td>
<td>56.4 (10.5)</td>
<td>51.3 (9.2)</td>
<td>.07</td>
</tr>
<tr>
<td>Male %</td>
<td>40.7%</td>
<td>56.0%</td>
<td>.21</td>
</tr>
<tr>
<td>BMI z-score</td>
<td>0.30 (1.02)</td>
<td>0.49 (0.90)</td>
<td>.49</td>
</tr>
<tr>
<td>Child SSB/ juice (fl. oz./d)</td>
<td>15.28 (9.72)</td>
<td>12.45 (7.95)</td>
<td>.26</td>
</tr>
</tbody>
</table>
Child SSB/Juice Reduction in Smart Moms

**Average Change in SSB/Juice Fl. O.z./Day**

- **Baseline**
- **3 Months**
- **6 Months**

**Smart Moms**

- **Waitlist**

*Both group x time interactions p < .01*
Beverages by Time and Group

Average Fluid Ounces/day

Beverage Type

100% Fruit Juice  SSBS  Water

Intervention Baseline  Intervention 6 Months  Control Baseline  Control 6 Months

$p = .08$  $p = .06$  $p = .23$
Maternal Weight Loss in Smart Moms

![Graph showing maternal weight change over time for Smart Moms and Waitlist groups.](image)

- Baseline: -2.3
- 3 Months: 1.1
- 6 Months: 0.9

*Both group x time interactions p < .01
Mothers with 3% and 5% Weight Loss

DONNELLY ET AL., 2009
Maternal Caloric Beverages

Maternal Beverage Change (fl. oz./day)

Baseline 3 Months 6 Months

Smart Moms

Waitlist

*Both group x time interactions $p < .01$
Maternal Dietary Intake

![Graph showing Maternal Dietary Intake](image)

- **Total Caloric Intake (kcals/day)**
- **Baseline**, **3 Months**, **6 Months**
- **Smart Moms** vs **Waitlist**

*Both group x time interactions* $p < .01$
Program Participation

• Text Messages
  ◦ Average of 21.5 (±4.3) of 24 self-monitoring texts completed
  ◦ Average of 15.4 (± 1.7) of 18 goal progress assessment texts completed

• Website
  ◦ Average of 11.7 (±4.9) of 18 lessons read (self-reported)
Intervention Feedback

• Average time per week: 50 minutes

Satisfied with Program
- Yes: 91%
- No: 9%

Recommend Program to Friend
- Yes: 100%
- No: 0%

Confident in Child SSB Changes
- Yes: 100%
- No: 0%

Lessons
- Smartphone: 45%
- Tablet: 15%
- Computer: 40%

Feedback Emails
- Smartphone: 59%
- Tablet: 14%
- Computer: 27%
Public Health Impact

Highest reduction in SSBs

145 calories a day

27g added sugar

Conclusions

• Evidence that a novel mobile-delivered program can change dietary behaviors of mothers and children

• High program participation and satisfaction

• Potential in targeting maternal behaviors to promote child behavior change

• Mothers are interested in low-burden programs
  ◦ Study similar methods to reach families and underserved populations
Strengths and Limitations

• Strengths
  ◦ Innovative RCT
  ◦ Low burden
  ◦ Low cost
  ◦ Grounded in theory
  ◦ Adequately powered
  ◦ Potential for dissemination

• Limitations
  ◦ Beverage data: one day only
  ◦ Limited validated measures
  ◦ Homogenous sample population limits generalizability
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