Understanding and preventing obesity through early childhood eating behaviors

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Defining Childhood Obesity

1. Calculate body mass index (kg/m\(^2\))*

2. Plot on CDC or WHO growth chart
   - Normal 5-84.99\(^{th}\) %ile
   - Overweight 85-94.99\(^{th}\) %ile
   - Obese ≥95\(^{th}\) percentile

*Age 2+ only. For < 2 years, assess weight for age and weight for length to assess growth.
Can you see risk?

- This boy is 3 years, 3 weeks old.
- What is weight status?
  - Normal <85th %ile
  - Overweight 85-94.99th %ile
  - Obese >95th %ile

Photo from UC Berkeley Longitudinal Study, 1973
Plotted BMI-for-Age

Measurements:
Age=3 y 3 wks
Height=100.8 cm (39.7 in)
Weight=18.6 kg (41 lb)
BMI=18.3
BMI-for-age=>95th percentile obese
Can you see risk?

• This girl is 4 years, 4 weeks old.
• What is weight status?
  • Normal <85th %ile
  • Overweight 85-94.99th %ile
  • Obese >95th %ile

Photo from UC Berkeley Longitudinal Study, 1974
Plotted BMI-for-Age

Measurements:
Age = 4 y 4 wks
Height = 106.4 cm (41.9 in)
Weight = 15.7 kg (34.5 lb)
BMI = 13.9
BMI-for-age = 10th percentile
Normal
Can you *see* risk?

- This girl is 4 years old.
- What is weight status?
  - Normal <85th %ile
  - Overweight 85-94.99th %ile
  - Obese >95th %ile

Photo from UC Berkeley Longitudinal Study, 1973
Plotted BMI-for-Age

Measurements:
Age = 4 y
Height = 99.2 cm (39.2 in)
Weight = 17.55 kg (38.6 lb)
BMI = 17.8
BMI-for-age = between 90th – 95th percentile

Overweight

Girls: 2 to 20 years
Childhood Obesity Complications

Psychological
- Stress and Anxiety
- Eating Disorder Risk
- Poor Self-esteem
- Poor Social Skills
- Social Isolation

Pulmonary
- Asthma
- Exercise Intolerance
- Sleep Disorders
- Sleep Apnea

Gastrointestinal
- Fatty liver
- Gallstone
- Acid Reflux

Musculoskeletal
- Bone and Joint Disorders
- Flat Feet
- Blount’s Disease
- Femoral Epiphysis

Central
- Fatigue
- Skin Infections
- Skin Rashes

Cardiovascular
- Hypertension
- Heart Disease
- Blood Clots
- High Cholesterol
- Endothelial Dysfunction

Renal
- Kidney Disease
- Glomerulosclerosis
- Kidney Failure

Endocrine
- Diabetes
- Early Puberty
- Polycystic Ovary (Girls)
- Hypogonadism (Boys)
Take home message?

- It is very difficult to identify child obesity without measurement
- Implications?
  - Do not assume parents can accurately identify obesity in their children
Figure 5. Trends in obesity prevalence among adults aged 20 and over (age-adjusted) and youth aged 2–19 years: United States, 1999–2000 through 2013–2014

- Adults
  - 1999–2000: 30.5
  - 2001–2002: 30.5
  - 2003–2004: 32.2
  - 2005–2006: 34.3
  - 2009–2010: 35.7
  - 2011–2012: 34.9
  - 2013–2014: 37.7

- Youth
  - 1999–2000: 13.9
  - 2001–2002: 15.4
  - 2003–2004: 17.1
  - 2005–2006: 15.4
  - 2007–2008: 16.8
  - 2009–2010: 16.9
  - 2011–2012: 16.9
  - 2013–2014: 17.2

2Test for linear trend for 2003–2004 through 2013–2014 not significant (p > 0.05).

NOTE: All adult estimates are age-adjusted by the direct method to the 2000 U.S. census population using the age groups 20–39, 40–59, and 60 and over.

SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey.
Figure 4. Prevalence of obesity among youth aged 2–19 years, by sex and race and Hispanic origin: United States, 2011–2014

- **Non-Hispanic white**
  - All: 19.5%
  - Males: 18.4%
  - Females: 15.1%

- **Non-Hispanic black**
  - All: 14.7%
  - Males: 14.3%
  - Females: 15.1%

- **Non-Hispanic Asian**
  - All: 21.9%
  - Males: 22.4%
  - Females: 5.3%

- **Hispanic**
  - All: 20.7%
  - Males: 21.4%
  - Females: 21.4%

Significantly different from non-Hispanic Asian persons.
Significantly different from non-Hispanic white persons.
Significantly different from females of the same race and Hispanic origin.
Significantly different from non-Hispanic black persons.

<table>
<thead>
<tr>
<th>Prevention</th>
<th>Treatment</th>
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</thead>
<tbody>
<tr>
<td><strong>Pros</strong></td>
<td><strong>Cons</strong></td>
</tr>
<tr>
<td>No exposure to obesity</td>
<td>Need to reach many people</td>
</tr>
<tr>
<td>Emphasis on health behaviors that may prevent several conditions</td>
<td>Low motivation</td>
</tr>
<tr>
<td>Scarcity of funding</td>
<td>Individuals may have higher motivation to change</td>
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</table>
Overview

• Who should prevention strategies target?
• What health behaviors prevent or promote obesity?
• What types of interventions and strategies are needed to encourage positive health promotion behaviors in the target audiences?
Figure 3. Prevalence of obesity among youth aged 2–19 years, by sex and age: United States, 2011–2014

<table>
<thead>
<tr>
<th>Age Group</th>
<th>All</th>
<th>Males</th>
<th>Females</th>
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<tbody>
<tr>
<td>2–19 years</td>
<td>17.0</td>
<td>17.5</td>
<td>17.1</td>
</tr>
<tr>
<td>2–5 years</td>
<td>8.9</td>
<td>9.2</td>
<td>8.6</td>
</tr>
<tr>
<td>6–11 years</td>
<td>16.9</td>
<td>17.6</td>
<td>17.5</td>
</tr>
<tr>
<td>12–19 years</td>
<td>20.5</td>
<td>20.1</td>
<td>21.0</td>
</tr>
</tbody>
</table>

*Significantly different from those aged 2–5 years.
Health Behaviors Related to Obesity

- Marketing and screen time
- Physical activity
- Sleep
- Healthy eating
  - What?
  - When?
  - How much?

(Institute of Medicine, 2011: Daniels et al., 2015)
What we eat…

- Energy dense components of the diet are positively related to BMI in children (Ledoux et al., 2011)
  - Reduce sugar sweetened beverages, saturated fat, refined grains, sugar

- Dietary Guidelines for Americans (USDA, 2010), DASH, Mediterranean Diet
  - Emphasize whole grains, fruit and vegetables, low fat dairy, lean protein, healthy fats (Ledoux et al., 2010)
What do preschoolers eat?

Fruit
- .89-.97 cups/1000 kcal/day
- Healthy People 2020 goal is .90 cups/1000 kcal/d
- 38% of total fruit intake is from fruit juice
- 50% do not meet fruit recommendations

Vegetables
- .53-.54 cups/1000 kcal/d
- Healthy People 2020 goal is 1.1 cups/1000 kcal/d
- 78% do not meet vegetable recommendations

Processed foods
- 79% of 1-3 year olds consume more Na+ than recommended
- 39% of preschoolers drink soda regularly
- Among preschoolers intake of processed foods like savory snacks, fruit juice, and pizza have increased over the last 20 years
When and how much?

- **When**
  - Eating in the absence of hunger (e.g., Birch, Fisher, & Davison, 2003)

- **How much**
  - Satiety responsiveness (e.g., Jansen et al., 2012)
  - Food reward (e.g., Temple et al., 2008)
Eating Behavior Development

- Preferences develop with repeated exposure
- Caregiver feeding styles and practices influence appetitive traits (e.g., Ledoux et al., 2010)
- Social norms
- Environment
- Temperament
- Genetics
- Other experiences? (e.g., food insecurity)
Prevention strategies

• Community
  – E.g., WIC

• Early childcare education settings
  – E.g., SAGE, Head Start

• Parents
  – Web-based
  – Face to face
  – Clinic
Sustainable Active Gardening Education (SAGE) Project

- Repeated multisensory exposure to FV through gardening
- Modeling
- Home availability
- Guided educational and MVPA activities
- Parent education

Lee et al., 2017
Welcome to the third issue of the SAGE Newsletter! This weekly newsletter keeps parents informed on the project and garden curriculum activities as well as garden activities such as planting, watering, and harvesting new produce. Enjoy!

**SAGE in the Classroom**

This week, the children were taught the importance of drinking adequate amounts of water in order to stay healthy and hydrated for physical activity. The children were shown how much water they should be drinking daily—5 cups! They were reminded that they could get water from the drinking fountains at school or they can bring a water bottle from home. The children learned that just like plants, if we don’t drink enough water we can feel wilted.

The children then played “Plant Splash Relay” to further reinforce the importance of physical activity and water intake. Using the little water droplets or ping pong balls, each team member had to run down to the plant and toss the water droplet into the splash bucket before running back to their team. The losing team had to do ten jumping jacks!

**Overview**

- SAGE in the classroom
- What’s happening in the garden?
- Getting active in the garden!
- Recipes from the garden!
- Gardening at home!

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**See What's Happening in the Garden!**

This week the children continued to water the garden and watch the fruits and vegetables grow. In order to demonstrate how our bodies absorb water we conducted the water color celery experiment. We placed pieces of celery into colored water and watched the celery absorb the water until the celery changed colors! The children learned that just like the celery, our bodies absorb water and goes to all parts of our bodies.

**Find the Freshness!**

Want to go on a family outing to buy fresh produce right here in Phoenix? From fruits to vegetables to fresh made, whole wheat, bread, the Phoenix Public Market has wonderful healthy food that the entire family will love!

Where: The Phoenix Public Market:
712 N Central Avenue
When: Every Wednesday 4pm-8pm
Every Saturday 8am-12pm.

**Recipes from the Garden!**

**Melon Bites and Yogurt**

Ingredients:
1 diced watermelon
diced cantaloupe
2 cups vanilla yogurt

Instructions:
Place diced watermelon and cantaloupe into bowl and dip pieces into yogurt, or mix melons and yogurt together and eat with a spoon.
SAGE Outcomes

• Feasibility
  – Delivered most program elements successfully
  – Parents and teachers were highly satisfied

• Exploratory outcomes
  – Significant increase in PA
  – No change in FV consumption

Lee et al., 2017
Parents & Eating Behavior Development

- Caregiver feeding practices have been related to preschooler self-regulation, preferences, and weight status (DiSantis et al., 2011; Hurley et al., 2011)
  - Responsive feeding, modeling, authoritative style, and monitoring are positive feeding practices
  - Instrumental reward, pressure, and restriction are negative feeding practices
- Division of Responsibility (Ellyn Satter)
  - Parents are responsible for determining what, when, and where children are offered food
  - Children are responsible for determining how much to eat
Understanding Parent Feeding Behaviors

Ledoux et al., in progress
Happier Meals

• Vicarious Video
  – 20 minutes

• Plot: 3 mothers participating in a nutrition education class with a RD to help them manage their children’s problem eating behaviors. Scenes fluctuated between the class and the moms’ homes to depict problem or success scenarios.
Happier Meals Key Points for Parents

- Create a healthy eating environment
  - E.g., modeling, setting up family meals, include children in food preparation
- Provide children with a variety of nutritious foods when children are hungry in a warm, nurturing environment (repeatedly)
- Acknowledge that children have the right to determine how much to eat
Happier Meals Results

• Decreased positive beliefs about negative parenting practices
• Increased knowledge of key points
• Satisfaction survey
  – Like the vignettes
  – Could relate to the problems featured
  – RD was nonjudgmental
  – Too scripted
  – Recommended parents watch it

Ledoux et al., in press
Little Foodies Project

• 6-week face to face intervention for parents of toddlers

• Change strategies:
  – Instruction (lecture, video)
  – Group discussion
  – Video feedback
  – Role playing
  – Goal setting/planning
  – Healthy snack

LITTLE FOODIES PARENT GROUP

Are mealtimes with your toddler a struggle?

If so, you may be eligible to join a study involving 6 classes and 2 measurement appointments, for which which you will receive $60.

Class Topics: Ficky Eating | Table manners | Creating Healthy Environments

INTERESTED?
Contact: Tracey Ledoux, Ph.D., R.D. | TALedoux@uh.edu | 713-743-1870

Study has been reviewed by the University of Houston Committee for the Protection of Human Subjects, 713-743-2204
Parents will be able to ...

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<tbody>
<tr>
<td>1</td>
<td>Report eating behaviors are learned early in life.</td>
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<tr>
<td>2</td>
<td>Describe the Division of Responsibility &amp; Responsive Feeding</td>
</tr>
<tr>
<td>3</td>
<td>Report that preference for specific foods develops with 10-15 exposures.</td>
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<tr>
<td>4</td>
<td>Describe the optimal feeding context for encouraging preference development.</td>
</tr>
<tr>
<td>5</td>
<td>Identify developmental milestones in independent feeding.</td>
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<tr>
<td>6</td>
<td>Describe ways they can support feeding development.</td>
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<tr>
<td>7</td>
<td>Identify ways to make sure their child’s diet include key nutrients for toddler growth.</td>
</tr>
</tbody>
</table>
LF Results

• Recruitment goals were not met (n=22 vs 30)
  – Childcare and transportation were major barriers

• Exploratory outcomes:
  – Reduced indulgent feeding, caregiver mealtime distress, and toddler picky eating
  – Increased toddler autonomy at meals

• Process outcomes:
  – High degree of fidelity
  – >85% of participants enjoyed, valued, and learned from the program “very much”
  – 100% retention

Ledoux et al., in progress
Conclusions

1. Obesity is difficult to assess without measurement in childhood.
2. Early childhood may be an optimal time to deliver obesity prevention strategies.
3. Consider partnering with early childcare education settings to deliver obesity prevention strategies.
4. Happier Meals is an evidence based tool you can refer all parents of preschool age children.
5. The Little Foodies curriculum is available for use, but methods for overcoming delivery barriers are needed.
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Little Foodies Project
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Anna Kaplan, RD
Angelina Beitzel, BS

Funding Provided by UH Small Grant Program
References


References


• Ledoux, et al. (In progress) Promoting healthy eating habits in early childhood: Pilot test of the Little Foodies parenting program.
References


Resources

Happier Meals
https://www.youtube.com/watch?v=FUwf3GEVcrc

Little Foodies
For more information about the Little Foodies curriculum
call Tracey Ledoux (713) 743-1870 or
email TALedoux@uh.edu