Treating Obesity and Overweight: Learning What Works for Children and Adolescents

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**Overweight & Obesity**

24.5 million children

**Treatment for childhood obesity & overweight**

- Weight Loss Surgery
  - 1,200 Children

- Lifestyle Intervention/Medical Treatment/No Treatment
  - 24.5 million Children
Health Conditions Associated with Childhood Obesity

Psychosocial (Mood)
- Poor self-esteem
- Depression
- Body image disorders
- Eating disorders

Neurological (Brain)
- Pseudotumor cerebri

Cardiovascular (Heart)
- Dyslipidemia
- Hypertension
- Chronic inflammation
- Endothelial dysfunction

Endocrine
- Type 2 diabetes
- Precocious puberty
- Polycystic ovary syndrome

Musculoskeletal
- Slipped capital femoral epiphysis
- Blount’s disease
- Flat feet

Gastrointestinal (stomach and gut)
- Gallstones
- Steatohepatitis
- Gastro-esophageal reflux

Kidney
- Glomerulosclerosis

Pulmonary (Lungs)
- Sleep apnea
- Asthma
Translating the 2007 Expert Committee Stages for Childhood Obesity Management

- **Stage 1**: Prevention Plus in Primary care provider office
  - Behavioral Lifestyle modification

- **Stage 2**: Primary care office with allied health provider (e.g., dietitian)
  - Healthy lifestyle counseling

- **Stage 3**: Intensive care with Multidisciplinary Team
  - Bariatric surgery, very low calorie diets, medications

- **Stage 4**: Child with severe obesity
  - Behavioral Lifestyle modification

Child with severe obesity
Learning what works

Excess weight Categories
- Crossing weight percentiles rapidly
- Overweight ≥ 85th-94th %tile
- Obesity ≥ 95th %tile
- Severe Obesity 120% of 95th %tile

Type of Treatments
- Lifestyle behavior modification
- Medication
- Specialized diets
- Weight loss surgery

Settings
- Preschool/School
- Community/Home
- Primary Care Clinics
- Tertiary Care Center

Stakeholders
- Family
- Child
- Healthcare Providers
- Insurance
- Public

Learning what works
### Summary of Recommendation and Evidence

<table>
<thead>
<tr>
<th>Population</th>
<th>Recommendation</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Children aged 6 years and older</td>
<td>The USPSTF recommends that clinicians screen children aged 6 years and older for obesity and offer them or refer them to comprehensive, intensive behavioral intervention to promote improvement in weight status.</td>
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### Details

<table>
<thead>
<tr>
<th>Screening test</th>
<th>Body mass index (BMI)</th>
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<tr>
<td>Screening interval</td>
<td>No recommended interval</td>
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<tr>
<td>Intervention</td>
<td>Refer patients to comprehensive moderate- to high-intensity programs that include dietary, physical activity, and behavioral counseling components.</td>
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</table>
| Harm vs. benefits    | Modest benefit
                         Harm of screening minimal                                                                                                                     |

Whitlock et al. *Pediatrics* 2010;125:361-367
What is a measure of effective treatment?

*Statistically vs. Clinically significant*

- Standardized measure: BMI z-score
  - Reduction of 0.15-.25 zBMI associated with improved cardiometabolic outcomes
  - Reduction in zBMI score of 0.2 roughly equivalent to 5% decrease in body weight

### 2016 USPSTF Draft Summary: Forest Plot of Change in Weight in Behavior-Based Weight Loss Intervention Trials

<table>
<thead>
<tr>
<th>Study</th>
<th>Est contact hrs thru 12m</th>
<th>Age Range</th>
<th>Tx Duration</th>
<th>Followup, months</th>
<th>Months since tx ended</th>
<th>Outcome</th>
<th>SMD in Change from BL (95% CI)</th>
<th>Change in IG, Mean (SD)</th>
<th>Change in CG, Mean (SD)</th>
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</tbody>
</table>

**Intervention Intensity, hours†**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>zBMI From Baseline (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥52 hrs</td>
<td>-0.31 (-0.16 to -0.46)</td>
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<tr>
<td>26-51 hrs</td>
<td>-0.17 (-0.30 to -0.04)</td>
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</tbody>
</table>

Favors Treatment Favors Control
### 2016 USPSTF Summary

#### Components of Behavioral Interventions

**Table 1: Components of Behavioral Interventions**

<table>
<thead>
<tr>
<th>Contact Time</th>
<th>Number of Trials (N)</th>
<th>Trials With Physical Activity Sessions</th>
<th>Intervention Approach and Target</th>
</tr>
</thead>
</table>
| ≥52 hours    | 7 (1,252)            | 100%                                   | • Group sessions +/- individual sessions  
|              |                      |                                        | • Parent-only + child-only + family sessions  
|              |                      |                                        | • Referral/specialty clinic setting  
|              |                      |                                        | • Frequently provided sessions on healthy eating, safe exercising, and reading food labels; encouraged the use of stimulus control (e.g., limiting access to tempting foods and screen time), goal setting, self-monitoring, contingent rewards, and problem solving |
| 26–51 hours | 9 (838)              | 56%                                    | • Referral/specialty clinic setting  
| 1–5 hours   | 15 (3,781)           | 0%                                     | • Individual sessions  
|              |                      |                                        | • Usually targeted parents + child together  
|              |                      |                                        | • Frequently conducted in primary care settings  
|              |                      |                                        | • Used motivational interviewing  

*Behavioral interventions with ≥26 contact hours were found to be effective.

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### Outcome: Changes in BMI z score

#### Study or subgroup  | Multicomponent intervention N | Mean (SD) [kg/m²] | Control N | Mean (SD) [kg/m²] | Mean Difference IV, Random, 95% CI | Weight | Mean Difference IV, Random, 95% CI
--- | --- | --- | --- | --- | --- | --- | ---
1. **End of intervention (6-12 months)**  
   - Stark 2014 (1)  | 10 | -0.37 (0.42) | 6 | -0.07 (0.18) |  | 12.1% | -0.30 [-0.60, 0.00] 
   - Stark 2014 (2)  | 11 | -0.25 (0.25) | 6 | -0.07 (0.18) |  | 22.9% | -0.18 [-0.39, 0.03] 
   - Quattrin 2012  | 46 | -0.45 (0.3) | 50 | -0.21 (0.4) |  | 41.3% | -0.24 [-0.38, -0.10] 
   - Stark 2011  | 7 | -0.49 (0.36) | 10 | 0.1 (0.32) |  | 9.9% | -0.59 [-0.92, -0.26] 
   - Lanigan 2010  | 36 | -0.2 (0.5) | 28 | 0.01 (0.6) |  | 13.9% | -0.21 [-0.48, 0.07] 
   **Subtotal (95% CI)**  | **110** | **-0.26 [-0.37, -0.16]** | **100** |  |
2. **12-18 months follow-up (6-8 months post intervention)**  
   - Stark 2014 (3)  | 10 | -0.5 (0.43) | 6 | -0.03 (0.36) |  | 15.9% | -0.47 [-0.86, -0.08] 
   - Stark 2014 (4)  | 11 | -0.59 (0.75) | 6 | -0.03 (0.36) |  | 10.4% | -0.56 [-1.09, -0.03] 
   - Bocca 2012  | 32 | -0.6 (0.5) | 25 | -0.3 (0.5) |  | 24.8% | -0.3 (0.5) 
   - Quattrin 2012  | 46 | -0.45 (0.36) | 50 | -0.25 (0.4) |  | 35.3% | -0.20 [-0.35, -0.05] 
   - Stark 2011  | 7 | -0.37 (0.41) | 9 | 0.4 (0.49) |  | 13.6% | 0.77 [-1.21, 0.33] 
   **Subtotal (95% CI)**  | **106** | **-0.38 [-0.58, -0.19]** | **96** |  |
3. **24 months follow-up (12 months post intervention)**  
   - Quattrin 2012  | 46 | -0.5 (0.36) | 50 | -0.25 (0.4) |  |  |  |
   **Subtotal (95% CI)**  | **46** | **-0.25 [-0.40, -0.10]** | **50** |  |

(1) LAUNCH with home visits vs control (control n halved) at end of intervention  
(2) LAUNCH clinic only vs control (control n halved) at end of intervention  
(3) LAUNCH with home visits vs control (control n halved) at 12 months follow-up  
(4) LAUNCH clinic only vs control (control n halved) at 12 months follow-up

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**Cochrane Database of Systematic Reviews**  
10 MAR 2016 DOI: 10.1002/14651858.CD012105  
Translation of zBMI difference to weight change

For an 8 year old Girl **Height 50th percentile

- 0.2 in zBMI
- 0.6 in zBMI

BMI z score decrease of 0.2 units over 12 months
Translation of zBMI difference to weight change

For an 16 year old Girl **Height 50th percentile

BMI z score decrease of **0.2 units** over 12 months

Translation of zBMI difference to weight change

0.2 in zBMI

0.6 in zBMI

-24.7 lbs

-9.4 lbs

-4.7 lbs

Weight Change (lbs)
Cardiometabolic and Psychosocial Outcomes

• **Cardiometabolic outcomes**
  – 2016 USPSTF- mixed results
  – Ho M et al. 2012, 2013- positive results on lipid panel, fasting glucose
  – Bariatric surgery – positive results

• **Psychosocial outcomes**
  – No consistent difference in quality of life, self esteem or depression
  – No increase in Disordered eating between treatment and control

Ho et al. JAMA Pediatr. 2013 Aug 1;167(8):759-68
Learning what works

• Does intervention dose matter?
• Does the sample ethnicity matter?
• Does sample age matter?
• Does intervention length matter?
• Does the structure e.g., parent only vs. parent and child matter?
• Does the effectiveness measure matter?
Meta-analysis of primary care interventions vs usual care or active control on z-BMI

• **Mitchell et al. Health Psychol 2016, (18 studies)**
  
  – The overall effect size for change in body mass index was $d = 0.26$, 95% CI [.14, .38]
  
  – Larger effect size for more treatment contact, contact with pediatrician and treatment duration

• **Sim L et al. Pediatrics 2016, (14 studies)**
  
  – Marginal effect $z$BMI -0.04 [95% CI -0.08 to -0.01] with regard to BMI reduction
  
  – Highest decline in $z$BMI score 0.17
• 2016 Community Preventive Community Taskforce
  Insufficient evidence to support multicomponent interventions to increase availability of healthier foods and beverages in *schools to decrease BMI z-score*

• Mind, Exercise, Nutrition, Do it (MEND) Program
  – Dose >52 hours
  – Compared to the controls:
  – BMI z-score $-0.24; P < 0.0001$ at 6 months
  – BMI z-scores $-0.23 (P < 0.0001)$ at 12 months

[https://www.thecommunityguide.org/sites/default/files/assets/Obesity-School-Interventions.pdf](https://www.thecommunityguide.org/sites/default/files/assets/Obesity-School-Interventions.pdf)
Medications

- Orlistat
- Metformin
- Phentermine (≥ 16 years)
- Topiramate
- Exenatide
- Locaserin
- Phentermine-Topiramate
- Bupropion-Naltrexone
- Liraglutide

Meta-analyses of Metformin trials:

\[ z\text{BMI} -0.10 \ [95\% \text{ CI}-0.17 \text{ to } -0.03] \]

Systematic Review of the Benefits and Risks of Metformin in Treating Obesity in Children Aged 18 Years and Younger.


Specialized diets

High Protein, Low Carbohydrate Diet vs. Low fat diet

Protein Sparing Modified Fast Case Study: Weight and Body Mass Index (BMI) in one year

Weight loss surgery

Gastric Bypass
Restrictive and Malabsorptive

Gastric Sleeve
Restrictive Only

Adjustable Gastric Band
Restrictive and Adjustable
Weight loss three years after adolescent bariatric surgery

Baseline: 97.7% of subjects with BMI at 40 or higher
3-year: 37% of subjects with BMI at 40 or higher

Figure S3, Panel B: Categorical BMI at Baseline and 3 years

Learning what works

• Does intervention dose matter?
• Does implementation setting matter?
• Does age matter?
• Does intervention type matter?
• Does intervention length of follow-up matter?
Opportunities

- Are we using the *right effectiveness* measure?
- Are we training the right people?
- How do we support care delivery and community systems?
- Is there a mismatch between intervention and outcomes?
  - Crossing percentiles
  - Applying stage 3 programs to children who are overweight

Opportunities

• Integrating interventions in different settings
  – Patient-centered medical neighborhood
  – Childhood Obesity Research Demonstration (CORD) projects

Eneli et al. National Collaborative on Childhood Obesity Research (NCCOR)
http://www.nccor.org
Opportunities

- Provider training
- Defining benchmarks for effectiveness
- Research funding
- Integrating technology
- Improving efficiencies and effectiveness
- Linking outcomes to policy on reimbursement and population health
Thank you