Obesity Prevention and Youth Sport: What do we really know?

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Career Development award to T.F. Nelson from the National Cancer Institute Transdisciplinary Research in Energetics and Cancer (R Jeffrey, PI).
Childhood obesity is a serious problem in the US.
Obesity Fundamentals

Weight gain results when intake exceeds expenditure over time
Small daily energy surplus drives childhood obesity

Energy surplus:
• 110-165 kcal/day among children aged 2-7
• older youth and adolescents 678-1017 kcal/day — accounts for prior weight gain…

Wang, Gortmaker & Kuntz (2006)
Surgeon General Recommendations for preventing overweight among youth

√ increase physical activity
√ promote healthful eating
Physical Activity Recommendations

• 1 hour (60 minutes) or more of Aerobic activity:
  – Most should be either moderate- or vigorous-intensity PA
  – Vigorous-intensity PA at least 3 days a week

• Encourage participation in PA:
  – Age appropriate
  – Enjoyable
  – Offers variety
Few Meet Recommended Activity Levels

Note: Adherence: for ages 6–19 years - 60 or more minutes of moderate- or greater-intensity activity on 5 of 7 days; for ages 16 years and older – 30 or more minutes of moderate- or greater-intensity activity on 5 of 7 days, accumulated in 10-min “bouts.” I = 95% confidence interval.
A national priority to increase physical activity

Recommendations:

• Provide access to community and recreation sports for all children

• Provide proper training to deliver high-quality experiences to youth sport participants for youth coaches and recreation staff

But what does the research say about sport and obesity prevention?
Youth who participate in sport are more physically active

Consistent findings across 8 studies

- Cross sectional
- 7/8 studies used self-report measures

1 study measured PA in 6-12 boys with accelerometers

- Sport contributed an additional 30 minutes of MVPA compared to non-sport days

*However, most (52%) time in youth sport spent in sedentary or light-intensity activities.*
Influence of sport participation on weight status is mixed

- 11 studies examined
- **No difference** in BMI between sport participants and non-participants (6/11 studies)
- Sport participants have lower BMI than non-participants (5/11 studies)
  - Differed by sex
Sport participation does not create immunity from obesity

1 in 4 (26% male; 27% female) youth sport participants (ages 8-16) are overweight (85th percentile)

Source: Dowda et al. (2001) NHANES III
Type of sport matters

Assessed BMI of adolescents in:
  – Power team sports (hockey, soccer, football)
  – Weight control (wrestling, gymnastics, ice skating)
  – Non-participants

Females
  – Power sport and no-sport group had similar BMI; weight control had slightly lower BMI

Males
  – No differences in BMI observed among groups

Surgeon General Recommendations

- increase physical activity
- promote healthful eating

How does youth sport do?
Sport Participation and Nutrition

- Research is limited
- Mostly focuses on elite performers
- Few have compared sports participants and non-participants
- Focus is on nutrient deficiency, not overconsumption
Sport Participation and Nutrition

Existing studies have produced mixed results

Sport participants report

• Higher consumption of:
  – Fruits/vegetables
  – Milk
  – Sport drink
  – Fast food
  – Total Calories

• No difference observed in consumption of dietary fat
Limitations

- Small sample sizes
- Cross-sectional study design
- Use of BMI to assess weight status
- Self-report measures
- Nuanced questions not addressed
- Provides little direction for how to intervene
Summary

Youth sport participants…

• Get more physical activity
• Evidence about overweight is mixed
• Preliminary findings suggest
  – Some positive dietary habits
    • fruits and vegetables
    • milk
  – And some not so positive
    • more overall calories
    • more sport drinks
    • more fast food
Sport drinks are now ‘standard equipment’ in youth sport
Gatorade is specially formulated to give athletes what water cannot. **it’s science... it’s proven**

Studies have shown that athletes who hydrate with Gatorade outperform athletes who hydrate with just water in a number of key performance measures, including the ability to exercise longer and maintain a faster pace in the second half of competition.

**Hydrate safely**
How much hydration do kids really need?

Recommendations:
Before exercise:
– At least 4 hours before, ~2-3 mL/lb body weight
During exercise:
– Depends on
  • sweat rate
  • exercise duration
  • opportunities to drink.
– Carbohydrate-containing beverages (Gatorade, Powerade) recommended for exercise longer than 1 hour
After exercise:
– 16-24 ounces for every pound of body lost

What are the implications for youth sport?

# How Many Calories Do Athletes Need?

## Females

<table>
<thead>
<tr>
<th>Age</th>
<th>Sedentary</th>
<th>Moderately Active</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-8</td>
<td>1,200</td>
<td>1,400-1,600</td>
<td>1,400-1,800</td>
</tr>
<tr>
<td>9-13</td>
<td>1,600</td>
<td>1,600-2,000</td>
<td>1,800-2,200</td>
</tr>
<tr>
<td>14-18</td>
<td>1,800</td>
<td>2,000</td>
<td>2,400</td>
</tr>
</tbody>
</table>

Source: Dietary Guidelines for Americans 2005 (Institute of Medicine equation)
## Discretionary Calories

### Daily Amount of Food From Each Group (vegetable subgroup amounts are per week)

<table>
<thead>
<tr>
<th>Calorie Level</th>
<th>1,000</th>
<th>1,200</th>
<th>1,400</th>
<th>1,600</th>
<th>1,800</th>
<th>2,000</th>
<th>2,200</th>
<th>2,400</th>
<th>2,600</th>
<th>2,800</th>
<th>3,000</th>
<th>3,200</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits</td>
<td>1 c   (2 srv)</td>
<td>1 c   (2 srv)</td>
<td>1.5 c  (3 srv)</td>
<td>1.5 c  (3 srv)</td>
<td>1.5 c  (3 srv)</td>
<td>2 c   (4 srv)</td>
<td>2 c   (4 srv)</td>
<td>2 c   (4 srv)</td>
<td>2.5 c  (5 srv)</td>
<td>2.5 c  (5 srv)</td>
<td>2.5 c  (5 srv)</td>
<td>2.5 c  (5 srv)</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1 c   (2 srv)</td>
<td>1.5 c  (3 srv)</td>
<td>1.5 c  (3 srv)</td>
<td>1.5 c  (3 srv)</td>
<td>2.5 c  (5 srv)</td>
<td>2.5 c  (5 srv)</td>
<td>2.5 c  (5 srv)</td>
<td>2.5 c  (5 srv)</td>
<td>3.5 c  (7 srv)</td>
<td>3.5 c  (7 srv)</td>
<td>4 c   (8 srv)</td>
<td>4 c   (8 srv)</td>
</tr>
<tr>
<td>Dark green veg., Orange veg., Legumes</td>
<td>1 c/wk</td>
<td>1.5 c/wk</td>
<td>1 c/wk</td>
<td>1.5 c/wk</td>
<td>2 c/wk</td>
<td>2 c/wk</td>
<td>2.5 c/wk</td>
<td>2.5 c/wk</td>
<td>3 c/wk</td>
<td>3 c/wk</td>
<td>3 c/wk</td>
<td>3.5 c/wk</td>
</tr>
<tr>
<td>Starchy veg., Other veg.</td>
<td>1.5 c/wk</td>
<td>2.5 c/wk</td>
<td>2.5 c/wk</td>
<td>2.5 c/wk</td>
<td>3 c/wk</td>
<td>3 c/wk</td>
<td>3 c/wk</td>
<td>3 c/wk</td>
<td>3.5 c/wk</td>
<td>3.5 c/wk</td>
<td>3.5 c/wk</td>
<td>3.5 c/wk</td>
</tr>
<tr>
<td>Grains</td>
<td>3 oz-eq</td>
<td>4 oz-eq</td>
<td>5 oz-eq</td>
<td>5 oz-eq</td>
<td>6 oz-eq</td>
<td>6 oz-eq</td>
<td>7 oz-eq</td>
<td>8 oz-eq</td>
<td>9 oz-eq</td>
<td>10 oz-eq</td>
<td>10 oz-eq</td>
<td>10 oz-eq</td>
</tr>
<tr>
<td>Whole grains</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Other grains</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
<td>3.5</td>
<td>4</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Lean meat and beans</td>
<td>2 oz-eq</td>
<td>3 oz-eq</td>
<td>4 oz-eq</td>
<td>5 oz-eq</td>
<td>5 oz-eq</td>
<td>6 oz-eq</td>
<td>6.5 oz-eq</td>
<td>6.5 oz-eq</td>
<td>7 oz-eq</td>
<td>7 oz-eq</td>
<td>7 oz-eq</td>
<td>7 oz-eq</td>
</tr>
<tr>
<td>Milk</td>
<td>2 c</td>
<td>2 c</td>
<td>2 c</td>
<td>2 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
<td>3 c</td>
</tr>
<tr>
<td>Oils</td>
<td>15 g</td>
<td>17 g</td>
<td>17 g</td>
<td>17 g</td>
<td>22 g</td>
<td>24 g</td>
<td>27 g</td>
<td>29 g</td>
<td>31 g</td>
<td>34 g</td>
<td>36 g</td>
<td>44 g</td>
</tr>
<tr>
<td><strong>Discretionary calorie allowance</strong></td>
<td>165</td>
<td>171</td>
<td>171</td>
<td>132</td>
<td>195</td>
<td>267</td>
<td>290</td>
<td>362</td>
<td>410</td>
<td>426</td>
<td>512</td>
<td>648</td>
</tr>
</tbody>
</table>

Source: Dietary Guidelines for Americans, 2005
How much added sugar can you consume?

<table>
<thead>
<tr>
<th>Food Guide calorie level</th>
<th>1,000</th>
<th>1,200</th>
<th>1,400</th>
<th>1,600</th>
<th>1,800</th>
<th>2,000</th>
<th>2,200</th>
<th>2,400</th>
<th>2,600</th>
<th>2,800</th>
<th>3,000</th>
<th>3,200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discretionary calories¹</td>
<td>165</td>
<td>171</td>
<td>171</td>
<td>132</td>
<td>195</td>
<td>267</td>
<td>290</td>
<td>362</td>
<td>410</td>
<td>426</td>
<td>512</td>
<td>648</td>
</tr>
</tbody>
</table>

Example of division of discretionary calories: Solid fats are shown in grams (g); added sugars in grams (g) and teaspoons (tsp).

<table>
<thead>
<tr>
<th>Solid fats²</th>
<th>11 g (5 tsp)</th>
<th>14 g (4 tsp)</th>
<th>14 g (4 tsp)</th>
<th>11 g (3 tsp)</th>
<th>15 g (5 tsp)</th>
<th>18 g (8 tsp)</th>
<th>19 g (9 tsp)</th>
<th>22 g (12 tsp)</th>
<th>24 g (14 tsp)</th>
<th>24 g (15 tsp)</th>
<th>29 g (18 tsp)</th>
<th>34 g (24 tsp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Added sugars³</td>
<td>20 g (5 tsp)</td>
<td>16 g (4 tsp)</td>
<td>16 g (4 tsp)</td>
<td>12 g (3 tsp)</td>
<td>20 g (5 tsp)</td>
<td>32 g (8 tsp)</td>
<td>36 g (9 tsp)</td>
<td>48 g (12 tsp)</td>
<td>56 g (14 tsp)</td>
<td>60 g (15 tsp)</td>
<td>72 g (18 tsp)</td>
<td>96 g (24 tsp)</td>
</tr>
</tbody>
</table>

Source: Dietary Guidelines for Americans, 2005
Added Sugar: Gatorade

2 servings = 28 g sugar, 220 mg sodium
Nutrients of Concern: Female Athletes

- **Iron**
  - Oxygen transport, muscle function and work capacity

- **Calcium and Vitamin D:**
  - Bone-mineral density and stress fractures

- **Protein**

_Are female athletes getting enough of some things and too much of others?_
# Actual Nutrient Intake: Females

<table>
<thead>
<tr>
<th>Age</th>
<th>Energy (kcal)</th>
<th>Total Sugars</th>
<th>Total Fat</th>
<th>Calcium</th>
<th>Sodium</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-11</td>
<td>1,879</td>
<td>124 g</td>
<td>71.6 g</td>
<td>946 mg</td>
<td>2,966 mg</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>High</td>
<td>High*</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>12-19</td>
<td>1,906</td>
<td>124 g</td>
<td>72.3 g</td>
<td>849 mg</td>
<td>2,950 mg</td>
</tr>
</tbody>
</table>

Data source: What We Eat in America, NHANES, 2005-2006, individuals 2 years and older, day 1 dietary intake data
Too much of the wrong stuff; Not enough of the good stuff

Active 10 year old girl; approximately 2,000 calories

Data source: What We Eat in America (NHANES 2005-2006), Dietary Guidelines for Americans (2005), IOM
How are youth sport participants getting these extra calories that have low nutritional value?
Kids are socialized to associate it with sport
Adults give it to them!
Adults model the behavior!
Sport leagues sell it to them!
Sugar, Salt and/or Fat…

The concessions stand will not offer hot items this evening due to the extreme weather. Thank you for your understanding and respect for the volunteers running the booth tonight.
Walking Taco 3.00
Burger 2.00 - Burger Slam 3.00
Ch Burger 2.50 - Cheeseburger Slam 4.00
Hot dog - Beef 1.50 - Hotdog Slam 2.00
Brat 2.00 - Brat Slam 3.00

Slam includes: chips & pop/water
Gatorade upgrade add 1.00

Water/Pop 1.00
Gatorade 2.00
Coffee 1.20

Fruit .50
Muffin 1.00
Trail mix 1.00
Pickle .75
Sunflower seeds 1.00

Cookies 1.00
Chips .75
Candy bar 1.00

Ring pops .25
Mega pixi stick .75
Frozen mini milk 1.00

Sport leagues promote it

ROSEVILLE BASEBALL
CHAMPIONSHIP WEEK SPECIAL

25% OFF ANYTHING AT COLD STONE CREAMERY THIS WEEK!
Sponsorships reinforce it
Sport schedules demand convenience
its widely available
Typical snacks at youth sport events

- Sunny Delight: 135 kcal*
- Coca-Cola: 140 kcal*
- Hostess Donettes: 270 kcal+
- Capri-Sun: 124 kcal*
- Gatorade: 78 kcal*
- Fruits in the Foot: 80 kcal+
- Hawaiian Punch: 118 kcal*
- Pop Rocks: 270 kcal+
- Snickers: 280 kcal+
- Cinnamon Toast Crunch: 180 kcal+
- Doritos: 140 kcal+

*per 12 oz; +per single serving
Fast Food

550 kcal
Energy Expenditure and Intake in Youth Sport

- High intensity (MET=8)
- Medium Intensity MET=6
- Low intensity (MET=4)
- 50 kcal snack
- 250 kcal snack

50th percentile girl
- age 6 yrs 20.3 kg
- age 8 yrs 25.7 kg
- age 10 yrs 33.1 kg
- age 12 yrs 41.8 kg
- age 14 yrs 49.5 kg

Energy Intake (kcal) vs. Weight (kg) graph.
Conclusions

Youth sport participants may be in energy *surplus* after a sport event!
The toxic food environment in youth sport is undermining its health promoting benefits

*We can do better!*
There is much we don’t know

• Very few studies
• Energy balance has not be directly observed/document
• Substitution of calories among athletes
• Variation in physical activity & diet by:
  – Sport
  – Skill level
  – Age
• Contribution to disparities in health
What can we do?

• Have a better understanding through research
• Be aware
• Create guidelines
• Prepare and plan ahead
Questions?

http://www.sph.umn.edu/