Obesity In Children – Where Do We Go From Here?

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Rapidly Increasing Obesity

Obesity Trends* Among U.S. Adults
BRFSS, 1990, 2000, 2010
(*BMI ≥30, or about 30 lbs. overweight for 5’4” person)

1990

2000

2010

Source: Behavioral Risk Factor Surveillance System, CDC.
Pediatric Obesity Trends 2003-2007 (10-17yrs)

• Obesity = body mass index (BMI) > 95th percentile of the 2000 Centers for Disease Control and Prevention BMI-for-age growth charts. Children with BMI 85th - 95th = overweight. BMI = weight (Kg) / height (m2)
• Children age 10-17 are included in this data.

Increase in Overweight, Obesity, and Severe Obesity 1976-2004

NHANES: US POPULATION 2-19 YEARS

Severe Obesity continues to grow among school age boys.

NHANES reported in:
Wang Y AJCN 2002
Ogden CL Gastroenterology 2007, Ogden JAMA 2010
Cook SR Academic Pediatrics 2009
Objectives

• Why Worry

• Why Intervene Early

• What to do
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• What to do
U.S. OBESITY: A HEAVY LOAD

An illustrated report by Craig Schaffer

35.7% of U.S. adults are obese

According to the Centers for Disease Control and Prevention, annual medical costs for obesity-related diseases total $190 billion

Annual health care costs attributed to smoking $96 billion

Annual health care costs attributed to alcohol-related diseases $24.6 billion

$4 billion
Additional gasoline cost as cars carry heavier passengers, compared to 1960:

$5 billion
Additional jet fuel cost as planes fly heavier passengers, compared to 1960:

$73.1 billion
Annual sum employers pay for obesity-related issues for full-time employees

Adults over 60 are more prone to obesity than younger adults.

For every 5-point body mass index increase ...

Highest age-adjusted rates of obesity
Non-Hispanic blacks 49.5%
Mexican-Americans 40.4%
All Hispanics 39.1%
Non-Hispanic whites 34.3%

Non-Hispanic black men and Mexican-American men with higher incomes are more likely to be obese than those with low income.

There is no significant relationship between obesity and education among men.

Higher-income women are less likely to be obese than low-income women.

Women with college degrees are less likely to be obese than with less educated women.

52% risk of esophageal cancer
59% risk of endometrial and gallbladder cancer
24% risk of colon cancer
12% risk of post-menopausal breast cancer

Sources: Reuters, KEAS, Centers for Disease Control and Prevention
What Happens with Obesity

• Affects every system
• Morbidity and mortality
• Pre-pubertal obesity increased mortality from all causes including Ca breast in women, ischemic heart disease in men
• First generation to live sicker and die younger

Obesity and Growth

- Breast development, pubarche and menarche earlier in girls with BMI >85th compared to normal BMI
- No association of pubarche and male adiposity
Obesity Increases Co-morbidities Risk

- OSA in > 50% of extremely obese adolescents – screen for OSA (daytime sleepy, snoring, breathing pauses)

- NAFLD occurs in ~ 80% of extremely obese adolescents, and 20% have NASH; ALT>AST; less in Blacks

- Prediabetes is 3-5x more likely among severely obese adolescents compared with obese adolescents
Obesity and Heart

• Most obese children have dyslipidemia
• Systolic BP higher and LV thickened in obese kids
• Increased risk of Coronary Heart Disease as adults

BMI Increases CV Risk-Factor Clusters


1/3rd kids at BMI 99thile had ≥3 risks indep of age & sex

LDL
Insulin
Triglyceride
HDL
BP
Orthopedic Issues

- Fracture and MSS discomfort: obese > non-obese
- Most common joint complaint is knee
- These negatively affect participation in physical activities

Taylor et al. Pediatrics 2006;117:2167
SCFE and Blount’s

- Slipped capital femoral epiphysis (SCFE): hip (or referred knee) pain; limited hip abduction and internal rotation. Often bilateral
- **Low threshold for x-ray**
- Blount’s disease: tibia bowing from growth plate pressure. Have knee pain and ?bowing
- **Can recur if obesity persists**
Endocrine Causes of Obesity

- Rare and have growth failure
- Growth hormone deficiency
- Hypothyroidism
- Hypercortisolism
  - moon facies, muscle loss, striae, visceral obesity, HTN, glucose intolerance, dyslipidemia
- Primary hyperinsulinism
  - expect hypoglycemia first
- Pseudohypoparathyroidism
  - low Ca, high phos, short, round face, short metacarpals, basal ganglia calcification, developmental delay
- Acquired Hypothalamic
  - brain injury/tumor/radiation

Endocrine Effects of Obesity

- Insulin resistance in $\frac{1}{3}$rd pre- and $\frac{2}{3}$rd post-pubertal
- Acanthosis nigricans
- Impaired glucose tolerance in about 25% of obese kids; 4% have NIDDM (which accounts for 10-45% of newly-diagnosed diabetes in youth)

NIDDM and Pediatric Obesity

Age-adjusted Percentage of U.S. Adults Who Were Obese or Who Had Diagnosed Diabetes

Obesity (BMI $\geq 30$ kg/m$^2$)

- **1994**
- **2000**
- **2007**

Diabetes

- **1994**
- **2000**
- **2007**

Polycystic Ovarian Syndrome

• Obesity is risk factor for PCOS

• Symptom: oligo/amenorrhea, hirsutism, acne, abdominal obesity, insulin resistance, acanthosis, infertility

• Treatment: combination of lifestyle changes and OCP/anti-androgens/metformin
NAFLD and NASH

- Adults (Children): >10% (3%) general population; >50% (>20%) of obese
- Mild-moderate rise: ALT > AST
- Levels correlate poorly with liver histology
- U/S, CT: Fatty infiltration
- Less in Black obesity surgery patients vs non-Hispanic Whites and Hispanics (which were similar; n=238)

Kallwitz ER et al. Nature 2009;104:64-69
Obesity and GERD

- Obesity: low LES pressure, and higher hiatal hernia, Barrett esophagus, and esophageal adenocarcinoma risk
- Gastric banding may worsen GERD

Friedenberg FK. Am J Gastroenterol 2008;103:2111
Psychological Distress & Pediatric Obesity

• High risk of bullying victim

• 3x more depression and anxiety in obese kids compared to controls

• Screen time and physical activity level associated with psychological distress

Laboratory Data – So Deranged 😞

- CBC: Low Hemoglobin in 13% and low MCV 30%
- CMP: low albumin 12%; high ALT/AST 8%; high glucose 7%
- Lipid panel: low HDL 61%; high LDL 34%; high triglyceride 20%; high cholesterol 8%
- High insulin 26%; high HgbA1C 9%; high TSH 10%
- Overall, >90% have one or more of above (Riley Hospital)
Race and Obesity

- Variable data
- Obesity: AA > Hispanic > Caucasian
- Hypertension: AA > Hispanic > Caucasian
- IR: Hispanic > AA > Caucasian
- Diabetes: Hispanic > AA > Caucasian
- Liver: Hispanic > Caucasian > AA
- Dyslipidemia: Caucasian > Hispanic > AA
- Not all differences due to environmental/social factors; genetic makeup

Cossrow N. J Clin Endo Metab 2004;89:2590
## Table III. Relation of childhood BMI to adult obesity

<table>
<thead>
<tr>
<th>N</th>
<th>MV</th>
<th>Age</th>
<th>BMI</th>
<th>% BMI ≥30</th>
<th>B</th>
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<tbody>
<tr>
<td>1161</td>
<td>0-49</td>
<td>13 ± 2*</td>
<td>22.7 ± 4</td>
<td>5%</td>
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<tr>
<td>832</td>
<td>50-84</td>
<td>12 ± 2</td>
<td>27.1 ± 5</td>
<td>23%</td>
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<td>130</td>
<td>85-89</td>
<td>13 ± 2</td>
<td>30.3 ± 5</td>
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<tr>
<td>121</td>
<td>90-94</td>
<td>12 ± 2</td>
<td>32.4 ± 6</td>
<td>64%</td>
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<td>122</td>
<td>95-98</td>
<td>13 ± 2</td>
<td>37.1 ± 7</td>
<td>84%</td>
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</tr>
<tr>
<td>26</td>
<td>≥99</td>
<td>12 ± 3</td>
<td>43.6 ± 9</td>
<td>100%</td>
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</tr>
</tbody>
</table>

*Values are mean ± SD.

Metabolic Health Concept

• Not all Obese have same metabolic derangements – concept of Metabolic Health
• Metabolically Normal/Abnormal Lean, Obese, Over-weight concepts
• Metabolically Healthy Obese (MHO): favorable metabolic profile of BP, high insulin sensitivity and good lipid and inflammation profile
• 2% to 40% obese may be MHO
• Need studies to identify and dissect these
Objectives

• Why Worry

• Why Intervene Early

• What to do
Why Intervene Early?

• Parents often under-report weight; also, only 22.4% report being told their child was overweight (BMI >85\textsuperscript{th}) (1999-2008)

• If crossed ≥ 2 major percentiles before 2yrs:
  – 50% more likely to be obese at age 5 years
  – 75% more likely to be obese at 10 years
  – It isn’t just baby fat

• Do lifestyle changes early to prevent co-morbidities

Life-style Changes: Kids but not Teens

BMI reduction with lifestyle changes happened in young kids but faded away in Teens (6-16 yr old; 3 yr study)

How Early to Start Prevention

Predicted Probability of Obesity at 7 to 10 Years of Age for 16 Combinations of Four Modifiable Prenatal and Postnatal Risk Factors

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History Taking - SPEEDS

- **Snacks and Sodas/beverages**
- **Physical activity**: exercise/activity/screen
- **Eating habits**: portion, speed, TV, outside meals
- **Empower them** – reason and problems of obesity
- **Daily Routine**
- **Sleep** - habits, timing, hygiene, snoring
(em)Power Them

• Processed/Junk
• Only eat while sitting
• Water/Drinks – plain milk and plain water
• Exercise – break a sweat for 60 minutes daily as tolerated, screen <2 hours
• Rewire – other hand, 10 chews, put fork down, cut not bite, smaller portions, buy small bags, how you cook: beef it up without beef, 2 whites one yellow, “open sandwich”; use daily schedule
All Activity Counts!

Health Benefit

Intensity

Curtsey of Dr R Kushner.
CANINE CONSTITUTIONAL

A brisk walk in the park keeps Marcy B in shape between dog shows. Her owner, Columbus resident Cathy Stanko, gets up early to give her 3-year-old Doberman his regular workout. They typically log 18 miles in Berlineer Park.
Surgery

Lap Band

Gastric bypass

Vertical Sleeve Gastrectomy

Lap band is adjustable

Brandt M. Nat Rev Endocrinol 2010;6:637
Aspiration Therapy

Figure 1. Components of AT. (A) Internal components and Skin-Port and (B) external components.

Figure 2. Subject performing aspiration.

Sullivan et al. Gastroenterology 2014;145:1245
Endoscopic Devices

The ReShape Duo intragastric balloon pair takes up space in the stomach.

EndoBarrier creates a barrier from the duodenum to the proximal jejunum.
ReShape – FDA Approved July 2015

1. **CATHETER**
   - Catheter tube inserted into stomach via mouth

2. **Balloons introduced via catheter**
   - Balloons

3. **Balloons filled with gel, via separate tube**
   - Balloons inflated

4. **Catheter removed leaving implant in place – which can then be deflated and removed later**
Finally, Who Becomes Obese?

• Followed KG class of 1998-1999 (n7738) till 8\textsuperscript{th} grade

• Obese KG x4 more likely to be obese at 8\textsuperscript{th} grade vs. normal weight KG

• 1/3\textsuperscript{rd} of high birth weight (>4 kg) became obese 8\textsuperscript{th} grader
We all need to work together!

- Community environmental supports and policies for healthy lifestyles
- Community services for at-risk and overweight children
- Primary care and early ID and management of at-risk and less complex cases
- Medical management of complicated patients
- Specialty diagnosis services including surgery

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**Community-Based Services**

**Weight Management Clinic, Specialty Services**

**Primary Care Practices**
Summary

1. Increasingly children are severely obese
2. Leads to high levels of CV disease risk factors, NAFLD, OSA, and pre-diabetes
3. Behavior modification has modest efficacy, is partner in all other interventions, but not readily available and resource-intense
4. Remember SPEEDS and emPower!
Children’s Hospital Association Consensus Statements for Comorbidities of Childhood Obesity

Elizabeth Estrada, MD,1 Ihuoma Eneli, MD, MS, FAAP,2 Sarah Hampl, MD, FAAP,3 Michele Mietus-Snyder, MD,4 Nazrat Mirza, MD, ScD,4 Erinn Rhodes, MD, MPH, FAAP,5 Brooke Sweeney, MD, FAAP,6 Lydia Tinajero-Deck, MD, FAAP,7 Susan J. Woolford, MD, MPH, FAAP,8 and Stephen J. Pont, MD, MPH, FAAP9

Amount of gold, in grams, that Dubai is offering to families for every kilogram of weight they lose this summer, in an effort to curb obesity (especially among kids)

Sources: New York Times (2), AP (2), CNN, Twitter