TOO MUCH OF A GOOD THING: OBESITY AND DIABETES

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OBESITY ETIOLOGY

• An energy imbalance between calories consumed and calories expended
  • Global shift in diet towards energy-dense foods high in fat and sugars
  • Decreased physical activity due to the increasingly sedentary work, changing modes of transportation, and increasing urbanization.
Overweight and obesity ranges are determined by calculating the "body mass index" (BMI).

- BMI = Weight (kg)/height (m^2) or
- BMI = Weight (lb)/height (in^2) x 703
BMI

• BMI correlates with the amount of body fat.
• BMI does not directly measure body fat.
  • Athletes may have a high BMI due to muscle mass without excess body fat
  • Waist circumference >40in men or >35in women is abn’l
### Classification of Overweight and Obesity by BMI

<table>
<thead>
<tr>
<th>Class</th>
<th>BMI kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>&lt;18.5</td>
</tr>
<tr>
<td>Normal</td>
<td>18.5-24.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>25-29.9</td>
</tr>
<tr>
<td>Obesity I</td>
<td>30-34.9</td>
</tr>
<tr>
<td>Obesity II</td>
<td>35-39.9</td>
</tr>
<tr>
<td>Obesity III</td>
<td>≥40</td>
</tr>
</tbody>
</table>
NORMAL WEIGHTS FOR BMI <25

<table>
<thead>
<tr>
<th>Height</th>
<th>Normal Weight Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>&lt;128</td>
</tr>
<tr>
<td>5’2”</td>
<td>&lt;136</td>
</tr>
<tr>
<td>5’4”</td>
<td>&lt;145</td>
</tr>
<tr>
<td>5’6”</td>
<td>&lt;155</td>
</tr>
<tr>
<td>5’8”</td>
<td>&lt;164</td>
</tr>
<tr>
<td>5’10”</td>
<td>&lt;174</td>
</tr>
<tr>
<td>6’</td>
<td>&lt;184</td>
</tr>
</tbody>
</table>
OBESITY TRENDS* AMONG U.S. ADULTS
BRFSS, 1985

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
OBESITY TRENDS* AMONG U.S. ADULTS
BRFSS, 1990

(*BMI $\geq 30$, or $\sim 30$ lbs. overweight for 5’ 4” person)
OBESITY TRENDS* AMONG U.S. ADULTS

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

BRFSS, 1995

No Data           <10%          10%–14% 15%–19%
OBESITY TRENDS* AMONG U.S. ADULTS
BRFSS, 2000

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)
OBESITY TRENDS* AMONG U.S. ADULTS

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

BRFSS, 2005
OBESITY TRENDS* AMONG U.S. ADULTS

(*BMI ≥30, or ~ 30 lbs. overweight for 5’ 4” person)

BRFSS, 2010
PREVALENCE OF SELF-REPORTED OBESITY AMONG U.S. ADULTS

BRFSS, 2015

Four states actually decreased: MN, MT, NY and OH!

* Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.
PREVALENCE OF SELF-REPORTED OBESITY AMONG U.S. ADULTS
BRFSS, 2016

MT and OH worse again. AK, DE, CA, UT, AR worse but SD, OR, ME better

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.
PREVALENCE OF SELF-REPORTED OBESITY AMONG U.S. ADULTS

BRFSS, 2017

Down to just CO, HI, and DC at 20%
OK and IA >35%
No one got better.

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.
## Obesity Trends* Among U.S. Adults


(*BMI ≥30, or about 30 lbs. overweight for 5’4” person)

<table>
<thead>
<tr>
<th>Year</th>
<th>&lt;10%</th>
<th>10%-14%</th>
<th>15%-19%</th>
<th>20%-24%</th>
<th>25%-29%</th>
<th>≥30%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>No Data</td>
<td>&lt;10%</td>
<td>10%-14%</td>
<td>15%-19%</td>
<td>20%-24%</td>
<td>25%-29%</td>
</tr>
<tr>
<td>2000</td>
<td>10%-14%</td>
<td>15%-19%</td>
<td>20%-24%</td>
<td>25%-29%</td>
<td>≥30%</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>20%-24%</td>
<td>25%-29%</td>
<td>≥30%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>25%-29%</td>
<td>≥30%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Map showing obesity trends by state for different years (1990, 2000, 2010, 2017)]
Self-Reported Adult Obesity
BRFSS, 2015-2017

Whites

Blacks

Hispanics
OBESITY STATS NHANES 2016

• Over one-third of U.S. adults (39.8%) are obese (BMI≥30)
• 71.6% of adults age ≥20 years are overweight or obese (BMI≥25)
  • Black 55% and Hispanic 51% women have the highest risk
  • 18.5% of children age 2-19 years are obese
• 2008 medical costs from obesity: $209 billion
• Annual medical costs for people with obesity $2,741 higher than those of normal weight.

OBESITY RISKS

• Type 2 Diabetes
• High Blood Pressure
• Increased Cholesterol
• Heart Disease
• Stroke

• Osteoarthritis
• Sleep Apnea
• Gallbladder Disease
• Breast, Colon, Prostate, & Uterine Cancers
Hypertension

BMI

Diabetes

• Diabetes Mellitus results when the pancreas produces insufficient insulin, or the body’s cells fail to respond appropriately to insulin.
• Diabetes is diagnosed when the fasting blood glucose level is >126mg/dl
• Pre diabetes is a fasting glucose >100 but <126mg/dl
TYPES OF DIABETES

• **Type 1 Diabetes** (DM1)
  Autoimmune destruction of insulin producing cells in the pancreas with a subsequent failure of insulin production.

• **Type 2 Diabetes** (DM2)
  Insulin resistance (a condition in which the body fails to properly use insulin), combined with relative insulin deficiency.

• 5-10% of diabetes is DM1, 90-95% DM2
Age-Adjusted Prevalence of Obesity and Diagnosed Diabetes Among U.S. Adults

Obesity (BMI ≥30 kg/m²)


Diabetes

1994

2000

2010

2015

□ No Data □ <14.0% □ 14.0-17.9% □ 18.0-21.9% □ 22.0-25.9% □ >26.0%

□ No Data □ <4.5% □ 4.5-5.9% □ 6.0-7.4% □ 7.5-8.9% □ >9.0%
Number and Percentage of U.S. Population with Diagnosed Diabetes, 1958-2015

[Graph showing the number and percentage of U.S. population with diagnosed diabetes from 1958 to 2015]

2015 US DM FACTS

• 30.3 million people had DM, or 9.4% of population of 321 million.
  • 8.3% in 2010
  • 23 million diagnosed, 7.2 million undiagnosed

• Age ≥18 years, 12.2% with DM
• Age ≥65 years, 25.2% with DM

• 7th leading cause of death

34% of U.S. adults aged 18 years or older had prediabetes 2005–2008.

48% of adults aged 65 years or older had pre DM.
COMPLICATIONS OF DIABETES

**Macrovascular**

**Brain**
Cerebrovascular disease
- Transient ischemic attack
- Cerebrovascular accident
- Cognitive impairment

**Heart**
Coronary artery disease
- Coronary syndrome
- Myocardial infarction
- Congestive heart failure

**Extremities**
Peripheral vascular disease
- Ulceration
- Gangrene
- Amputation

**Microvascular**

**Eye**
Retinopathy
- Cataracts
- Glaucoma

**Kidney**
Nephropathy
- Microalbuminuria
- Gross albuminuria
- Kidney failure

**Nerves**
Neuropathy
- Peripheral
- Autonomic
EVERY 24 HOURS...

• 4,192 new cases of diabetes are diagnosed
• 296 non-traumatic lower limb amputations are performed
• 142 people begin treatment for end-stage renal disease
• 50 people develop blindness
• 693 people die of diabetes or diabetes is a contributing cause of death
• The majority of these were preventable!

Derived from:
National Diabetes Statistics Report 2017
US COST OF DM IN BILLIONS

32% increase in 2007 and 41% increase in 2012

1 in 5 health care dollars and 1 in 3 Medicare dollars spent on DM
DM pts spend 2.3x more on health care

HEALTH BENEFITS OF WEIGHT LOSS

• Decreased glucose and insulin levels
• Decreased cardiovascular risk
• Decreased blood pressure
• Decreased bad cholesterol and triglycerides, increased good cholesterol
• Decreased severity of sleep apnea
  • A 10% weight reduction is associated with a 50% reduction in severity of sleep apnea.
• Reduced symptoms of degenerative joint disease
DAILY CALORIE INTAKE

• **For active males to maintain weight:**
  Wt (in pounds) x 15 (inactive x 13) = calories/day

• **For active females to maintain weight:**
  Wt (in pounds) x 13 (inactive x 10) = calories/day
  • Male 170# x 15 = 2550cal/d (2210)
  • Female 140# x13= 1820cal/d (1400)

Big Mac = 570cal, Large fry = 540cal, McFlurry= 630cal Total = 1740 cal meal

Grande Frappuccino 400-500 cal
• Calories in – calories burned = weight gained or lost
• Each pound = 3500 calories
• To lose ½ lb/wk, decrease 250 cals/day, for 1 lb/wk, decrease 500 cals/day
• You MUST count calories!
<table>
<thead>
<tr>
<th>Weight lbs</th>
<th>Calories for Inactive Weight Maintenance</th>
<th>Calories for Inactive Weight Loss</th>
<th>Calories for Active Weight Maintenance</th>
<th>Calories for Active Weight Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>1200</td>
<td>700 - 950</td>
<td>1560</td>
<td>1060-1310</td>
</tr>
<tr>
<td>140</td>
<td>1400</td>
<td>900-1150</td>
<td>1820</td>
<td>1320-1570</td>
</tr>
<tr>
<td>160</td>
<td>1600</td>
<td>1100-1350</td>
<td>2080</td>
<td>1580-1830</td>
</tr>
<tr>
<td>180</td>
<td>1800</td>
<td>1300-1550</td>
<td>2340</td>
<td>2090-2120</td>
</tr>
<tr>
<td>200</td>
<td>2000</td>
<td>1500-1750</td>
<td>2600</td>
<td>2100-2350</td>
</tr>
<tr>
<td>220</td>
<td>2200</td>
<td>1700-1950</td>
<td>2860</td>
<td>2360-2610</td>
</tr>
<tr>
<td>240</td>
<td>2400</td>
<td>1900-2150</td>
<td>3120</td>
<td>2620-2870</td>
</tr>
</tbody>
</table>
# Nutrition Facts

**Serving Size**: 1 cup (228g)  
**Servings Per Container**: 1

## Amount Per Serving

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Value</th>
<th>% Daily Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Calories from Fat</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>Total Fat</td>
<td>12g</td>
<td>18%</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>3g</td>
<td>15%</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>30mg</td>
<td>15%</td>
</tr>
<tr>
<td>Sodium</td>
<td>470mg</td>
<td>20%</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>31g</td>
<td>10%</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>0g</td>
<td>0%</td>
</tr>
<tr>
<td>Sugars</td>
<td>5g</td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td>5g</td>
<td></td>
</tr>
</tbody>
</table>

## Vitamin Content

- Vitamin A: 4%  
- Vitamin C: 2%  
- Calcium: 20%  
- Iron: 4%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

<table>
<thead>
<tr>
<th>Calories:</th>
<th>2,000</th>
<th>2,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat</td>
<td>Less than 65g</td>
<td>80g</td>
</tr>
<tr>
<td>Sat Fat</td>
<td>Less than 20g</td>
<td>25g</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Less than 300mg</td>
<td>300mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>Less than 2,400mg</td>
<td>2,400mg</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>300g</td>
<td>375g</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>25g</td>
<td>30g</td>
</tr>
</tbody>
</table>

Calories per gram:  
- Fat 9  
- Carbohydrates 4  
- Protein 4
WHAT IS THE BEST DIET?
<table>
<thead>
<tr>
<th>DietM</th>
<th>Carbs</th>
<th>Fat</th>
<th>Wt loss</th>
<th>1yr Drop out rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone</td>
<td>Moderate decrease</td>
<td>Moderate decrease</td>
<td>3.5#</td>
<td>23-35%</td>
</tr>
<tr>
<td>Ornish</td>
<td>High</td>
<td>Low</td>
<td>4.8#</td>
<td>22-32%</td>
</tr>
<tr>
<td>Weight Watchers</td>
<td>Decreased</td>
<td>Decreased</td>
<td>8.8#</td>
<td>35-39%</td>
</tr>
<tr>
<td>Jenny Craig</td>
<td>Decreased</td>
<td>Decreased</td>
<td>10#</td>
<td>35-40%</td>
</tr>
<tr>
<td>Atkins</td>
<td>Low</td>
<td>High</td>
<td>10.3#</td>
<td>12-42%</td>
</tr>
<tr>
<td>Mediterranean</td>
<td>Decreased</td>
<td>Healthy fats</td>
<td>7.3#</td>
<td>7%</td>
</tr>
</tbody>
</table>
MEDITERRANEAN DIET

- Fruits and vegetables, whole grains, legumes and nuts
- Replacing butter with olive oil and canola oil
- Using herbs and spices instead of salt
- Limiting red meat to a few times a month
- Eating fish and poultry at least twice a week
- Drinking red wine in moderation (optional)
- Getting plenty of exercise
• Don’t drink any calories
  • NO juice, milk, soda, alcohol, sweetened or sports drinks

• Cut down on total calories
  • Less breads, pastas, potatoes, rice, tortillas
  • Increase portions of green vegetables
  • Eat healthy fruits: berries, cherries, grapefruit, apples, pears (avoid pineapple, watermelon, mango)
  • Eat lean meats – chicken and fish, less red meat
Physical Activity: Impact on Comorbidities

• Enhances cardiorespiratory fitness
• Improves cholesterol and triglycerides
• Reduces blood pressure
• Increases insulin sensitivity
• Improves blood glucose control
• Decreases anxiety & depression
• Improves insomnia

• Combined diet and exercise is most successful for weight loss and maintenance
<table>
<thead>
<tr>
<th>Activity</th>
<th>Calories Burned in an Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Man</td>
</tr>
<tr>
<td>Light Activity:</td>
<td></td>
</tr>
<tr>
<td>Cleaning house</td>
<td>300</td>
</tr>
<tr>
<td>Office work</td>
<td></td>
</tr>
<tr>
<td>Playing baseball</td>
<td></td>
</tr>
<tr>
<td>Playing golf</td>
<td></td>
</tr>
<tr>
<td>Moderate Activity:</td>
<td>460</td>
</tr>
<tr>
<td>Walking briskly (3.5 mph)</td>
<td></td>
</tr>
<tr>
<td>Gardening</td>
<td></td>
</tr>
<tr>
<td>Cycling (5.5 mph)</td>
<td></td>
</tr>
<tr>
<td>Dancing</td>
<td></td>
</tr>
<tr>
<td>Playing basketball</td>
<td></td>
</tr>
</tbody>
</table>

## Calories Burned during Physical Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Calories Burned in an Hour</th>
<th>Man</th>
<th>Woman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strenuous Activity:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jogging (9 min/mile)</td>
<td>730</td>
<td></td>
<td>580</td>
</tr>
<tr>
<td>Playing football</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swimming</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Strenuous Activity:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running (7 min/mile)</td>
<td>920</td>
<td></td>
<td>740</td>
</tr>
<tr>
<td>Racquetball</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skiing</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drug</th>
<th>Class</th>
<th>Side Effects</th>
<th>Wt loss</th>
<th>$/mn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phentermine</td>
<td>Amphetamine Derivative</td>
<td>Anxiety, hallucinations, irregular heart beats, pulmonary HTN, heart valve abn’l (12wk treatment only)</td>
<td>10#</td>
<td>$45</td>
</tr>
<tr>
<td>Orlistat All/Xenical</td>
<td>Lipase inhibitor</td>
<td>Diarrhea, 25% fecal incontinence and malabsorption of vitamins</td>
<td>3%</td>
<td>$164</td>
</tr>
<tr>
<td>Lorcaserin (Belviq)</td>
<td>Serotonin agonist</td>
<td>HA, dizzy, addictive, cognitive impairment, suicidal ideation, heart valve abn’l</td>
<td>3-5%</td>
<td>$200</td>
</tr>
<tr>
<td>Phentermine/Topiramate (Qsymia)</td>
<td>Amphetamine/Seizure med</td>
<td>30-40%drop out, Tachycardia, acidosis, cognitive impairment, increase suicide</td>
<td>7-9%</td>
<td>$180</td>
</tr>
<tr>
<td>Naltrexone/ bupropion (Contrave)</td>
<td>Opioid antagonist/Antidepressant</td>
<td>Increased suicide, HTN, constipation, headache, vomiting, dizziness, insomnia, dry mouth and diarrhea</td>
<td>5%</td>
<td>$234</td>
</tr>
<tr>
<td>Liraglutide (Saxenda)</td>
<td>GLP-1</td>
<td>Nausea, abdominal pain, ?thyroid cancer, pancreatitis</td>
<td>5-10%</td>
<td>$1000</td>
</tr>
</tbody>
</table>
WEIGHT LOSS SURGERY

Option for limited number of patients with clinically severe obesity.

• BMI >40 or >35 with comorbid conditions
• Reserved for patients in whom medical therapy has failed
• Gastric restriction or gastric bypass
## WEIGHT LOSS SURGERY

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Excess wt loss</th>
<th>Side effects</th>
<th>Resolution of DM</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banding</td>
<td>36-87%</td>
<td>Nausea/vomiting</td>
<td>54-65%</td>
<td>17-25K</td>
</tr>
<tr>
<td>Sleeve</td>
<td>50-60%</td>
<td>Nausea/vomiting, staple release</td>
<td>50%</td>
<td>15-25K</td>
</tr>
<tr>
<td>Bypass</td>
<td>60-80%</td>
<td>Nausea/vomiting, diarrhea, malnutrition, vitamin malabsorption</td>
<td>80-100%</td>
<td>25-35K</td>
</tr>
</tbody>
</table>
DIABETES TREATMENT

• Diet, Diet, Diet and Exercise – DM can be cured with wt loss. No med cures Diabetes

• First line – Metformin

• Second line - add GLP-1 and/or SGLT-2
  - GLP-1 Liraglutide (Victoza), Semaglutide (Ozempic) Dulaglutide (Trulicity), Exenatide (Bydureon)
  - SGLT-1 – Empagliflozin (Jardiance), Canagliflozin (Invokana)

• All treatment now about decreasing risk of heart attack and stroke so even if on insulin should be on the above meds and all have weight loss.

• Education is key! Go to a DM education class.
CATHY

THE HAMBURGER, 1957:

THE HAMBURGER, 1997:

THE COOKIE, 1957:

THE COOKIE, 1997:

THE BEVERAGE, 1957:

THE BEVERAGE, 1997:

THE MUFFIN, 1957:

THE MUFFIN, 1997:

THE CONSUMER, 1957:

WANT TO SPLIT MY SALAD? IT'S SO HUGE!

THE CONSUMER, 1997:

IS THE DRESSING NON FAT?? WE'RE ON DIETS!!

By Cathy Guisewite
THANK YOU!

Questions?

Tamis.Bright@ttuhsc.edu