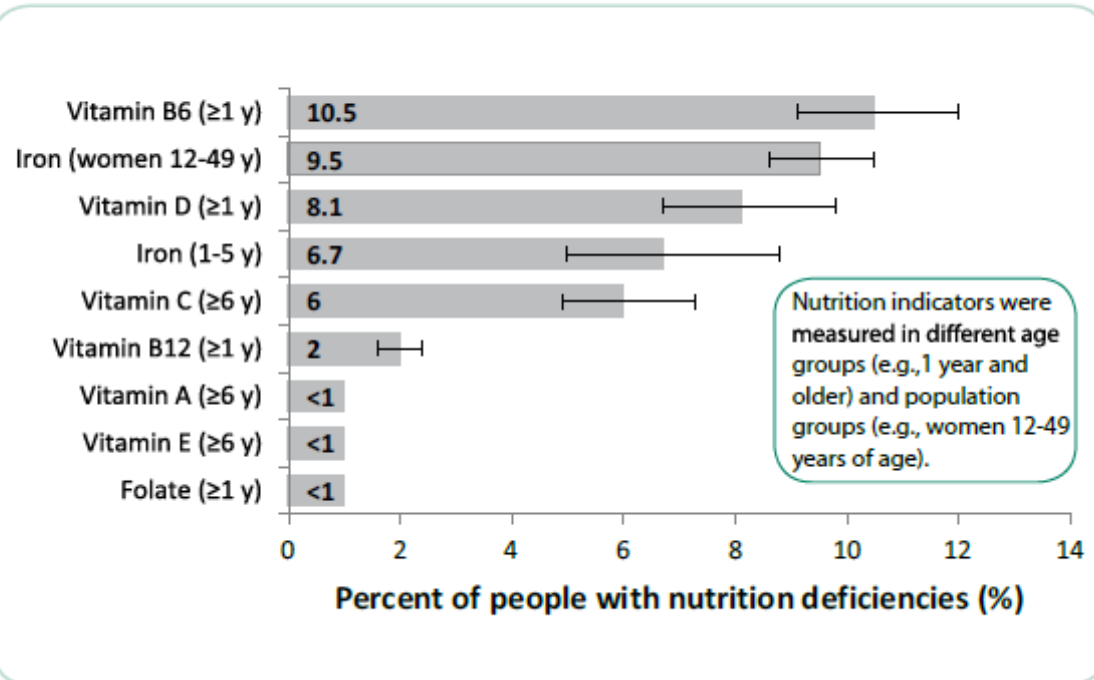# Nutrition and Disease

Kim van Groos, ARNP

Overlake Metabolic and Bariatric Surgery

Nutrient Disorders

Nutrition deficiencies in the U.S. population

	Percent of people with nutrition deficiencies (%)
Vitamin B6 (≥1 y)	10.5
Iron (women 12-49 y)	9.5
Vitamin D (≥1 y)	8.1
Iron (1-5 y)	6.7
Vitamin C (≥6 y)	6
Vitamin B12 (≥1 y)	2
Vitamin A (≥6 y)	<1
Vitamin E (≥6 y)	<1
Folate (≥1 y)	<1

Nutrition indicators were measured in different age groups (e.g.,1 year and older) and population groups (e.g., women 12-49 years of age).

Top 10 causes of death
(according to the CDC)

- Heart disease

- Cancer

- Chronic lower respiratory disease

- Stroke

- Unintentional injury

- Alzheimer's disease

- Diabetes

- Pneumonia/Flu

- Kidney disease

- Suicide

What is the leading cause of preventable life-years lost? Obesity

Obesity

- Definition
- Prevalence/trends
- Systemic effects
  - Metabolic syndrome
- Causes
  - Genetics/epigenetics
  - Environment
    - Movement
    - Food trends
  - Metabolism
- Treatment
  - Non-surgical
  - Surgical

Obesity: definition

- WHO: abnormal or excessive fat accumulation that presents a risk to health
- ASMBS: chronic progressive disease resulting from multiple environmental and genetic factors
- CDC: weight that is higher than what is considered as a healthy weight for a given height
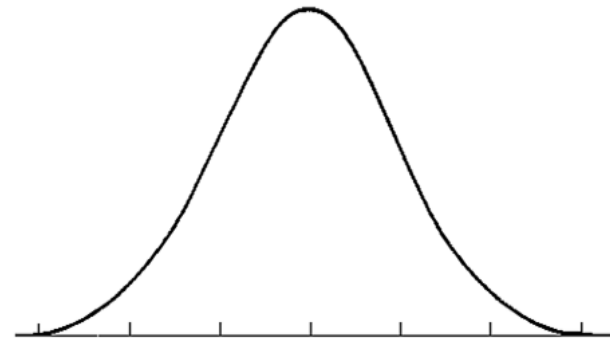
Obesity: BMI

- BMI (Body Mass Index)
  - Weight in kg/height in m^2
    - "normal" 18.5-24.9
    - "overweight" 25-29.9
    - "obese" 30+
  - Same for all genders, ages, ethnicities
  - Created by Aldolphe Quetelet in the 1800s
    - Astronomer and statistician
   - First application of distribution math to humans

BMI 28.7

BMI 18.7

Obesity: BMI

- Mortality and BMI
- Nutr Health Aging. 2012 Jan;16(1):100-6.
  - People aged 70-75 lowest all-cause mortality 27.1
  - Higher for BMIs greater than 31.4 and less than 21.1
- The American Journal of Clinical Nutrition, Volume 99, Issue 4, 1 April 2014, Pages 875–890
  - People aged 65+ mortality increases with BMI over 33 or under 23
- Note from CDC: BMI can be used as a screening tool but is not diagnostic of the body fatness or the health of an individual

Obesity: Body composition

- Braz J Med Biol Res. 2012 Jul; 45(7): 591–600.
  - Body fat better predictor of heart disease
- Hard to measure
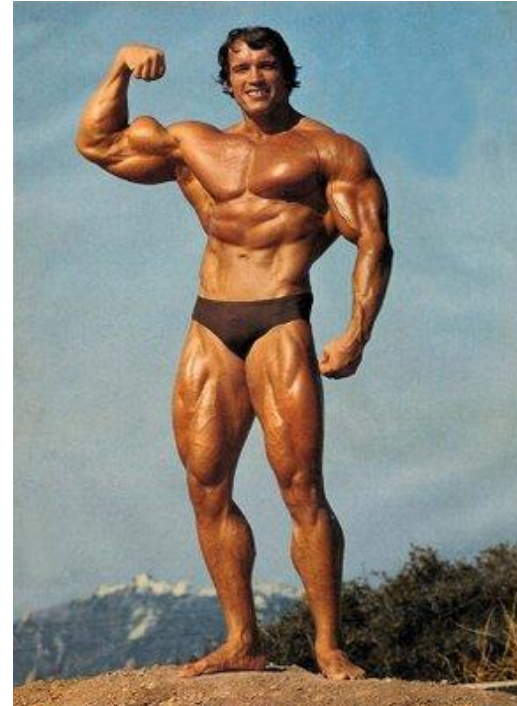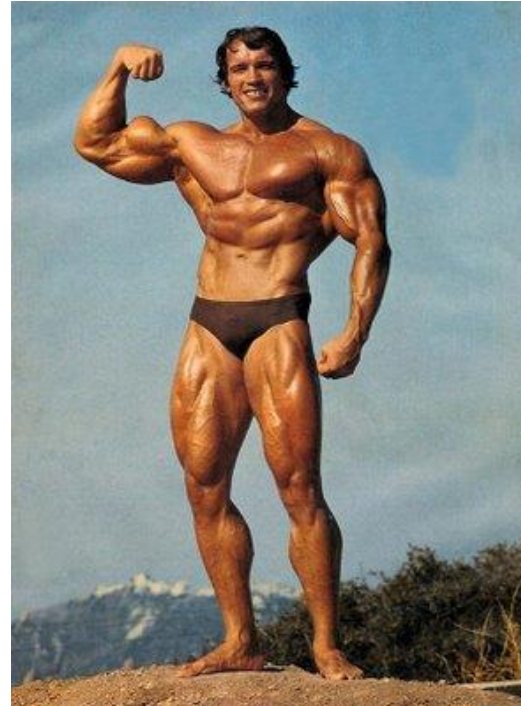

BMI: 33
Body fat: 5-8%

Obesity: Waist Circumference

- Waist circumference
  - <35" For a woman
  - <40" for a man
- J Nutr. 2004 May;134(5):1071-6.
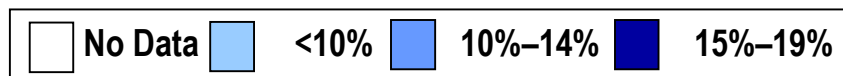 - Better predictor than BMI for heart disease
- BMI and WC highly correlated

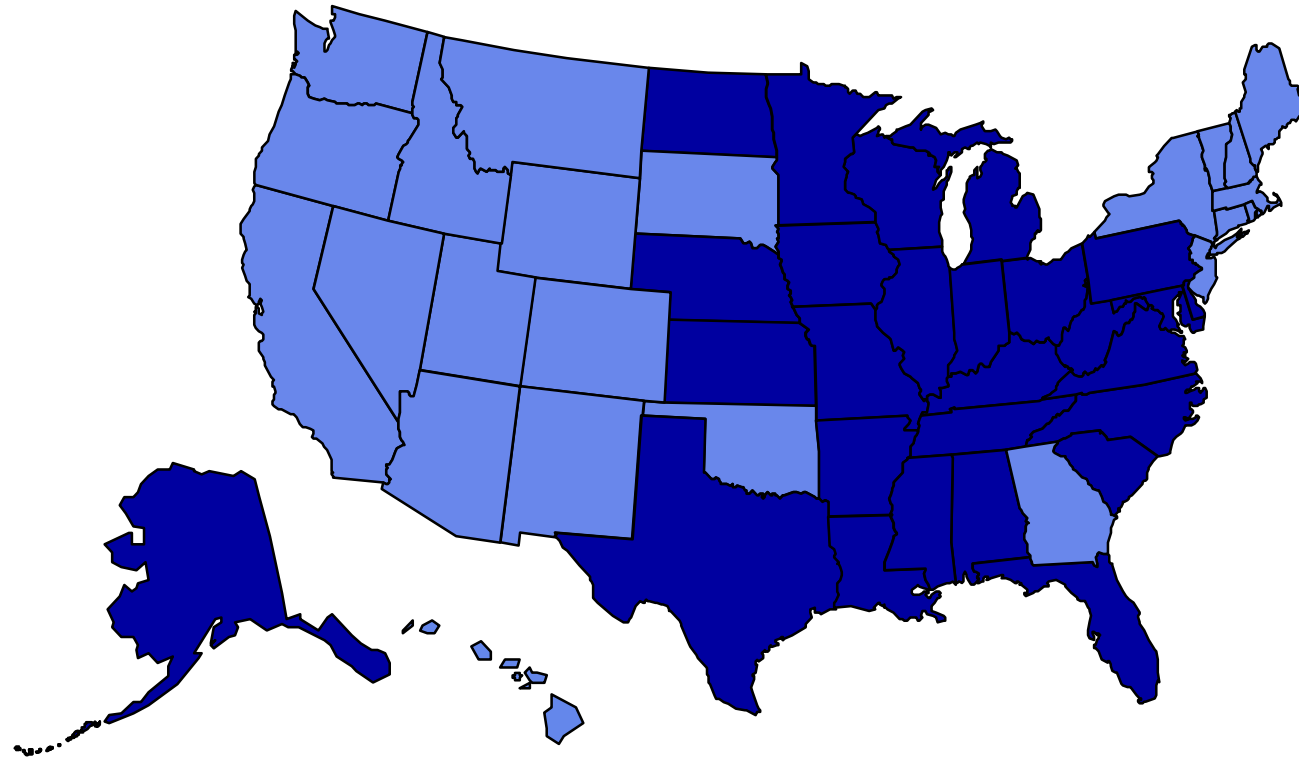http://engineeredinsanity.com/sample-page/losing-weight/bmi-hack-how-accurate-is-it/

Obesity: Trends Among U.S. Adults

BRFSS, 1995

(*BMI ≥30, or ~ 30 lbs overweight for 5' 4" person)

No Data   <10%   10%–14%   15%–19%

Obesity: Trends Among U.S. Adults
BRFSS, 2005
(*BMI ≥30, or ~ 30 lbs overweight for 5' 4" person)

| | No Data | | <10% | | 10%–14% | | 15%–19% | | 20%–24% | | 25%–29% | | ≥30% |
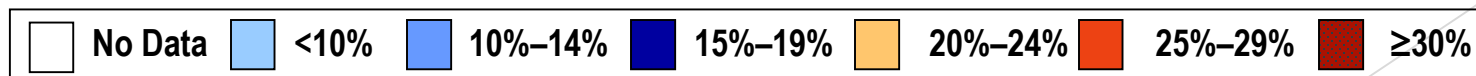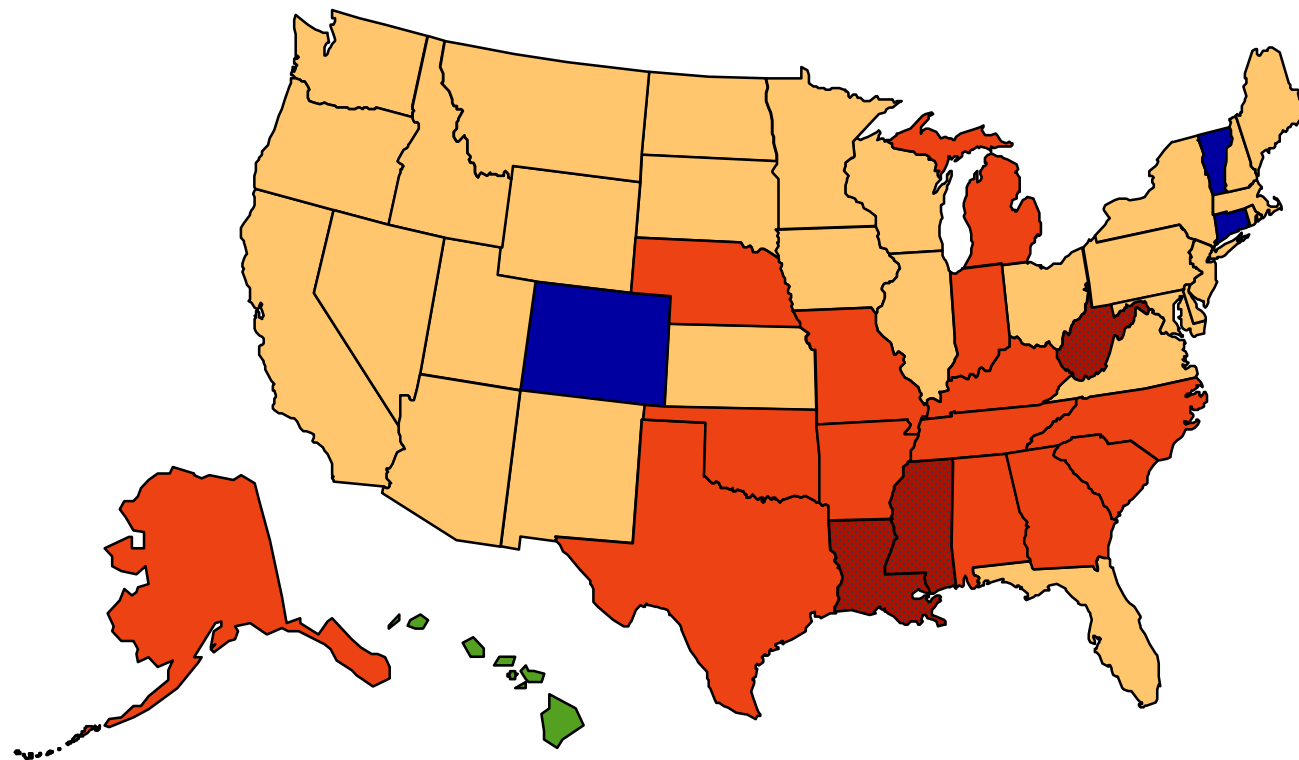
Obesity: Trends Among U.S. Adults
BRFSS, 2010

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

| | No Data | | <10% | | 10%–14% | | 15%–19% | | 20%–24% | | 25%–29% | | ≥30% |

Prevalence[¶] of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2011

[¶] Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.

Legend:
- <20%
- 20% <25%
- 25%-<30%
- 30%-<35%
- ≥35%
- Insufficient data*

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.

Prevalence[1] of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2012

[1] Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.

Legend:
- <20%
- 20% <25%
- 25%-<30%
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Prevalence[1] of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2013

[1] Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.

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- Insufficient data*

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Prevalence¶ of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2014

¶ Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.
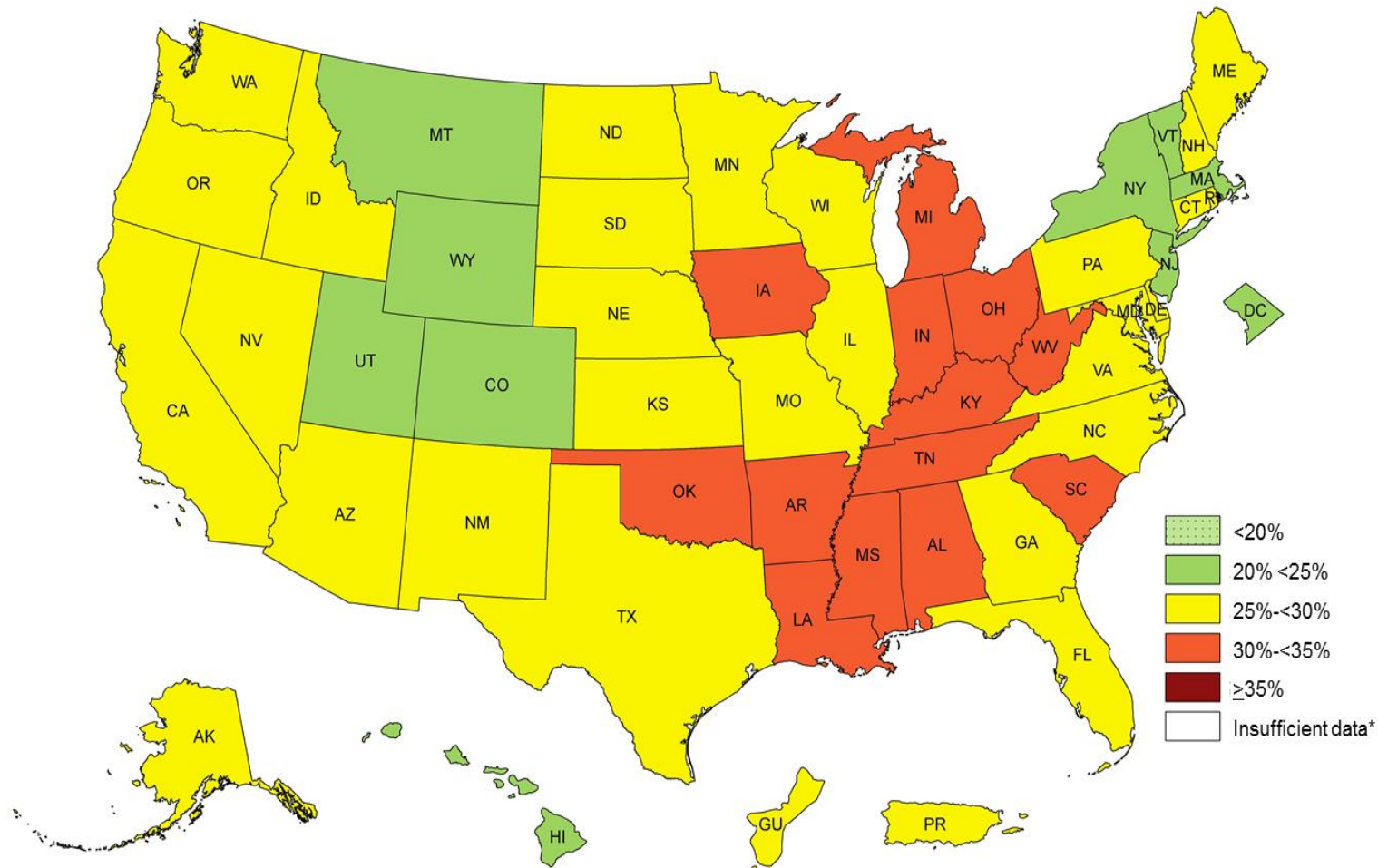

Legend:
- <20%
- 20% <25%
- 25%-<30%
- 30%-<35%
- ≥35%
- Insufficient data*

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.

Prevalence[1] of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2015

[1] Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.
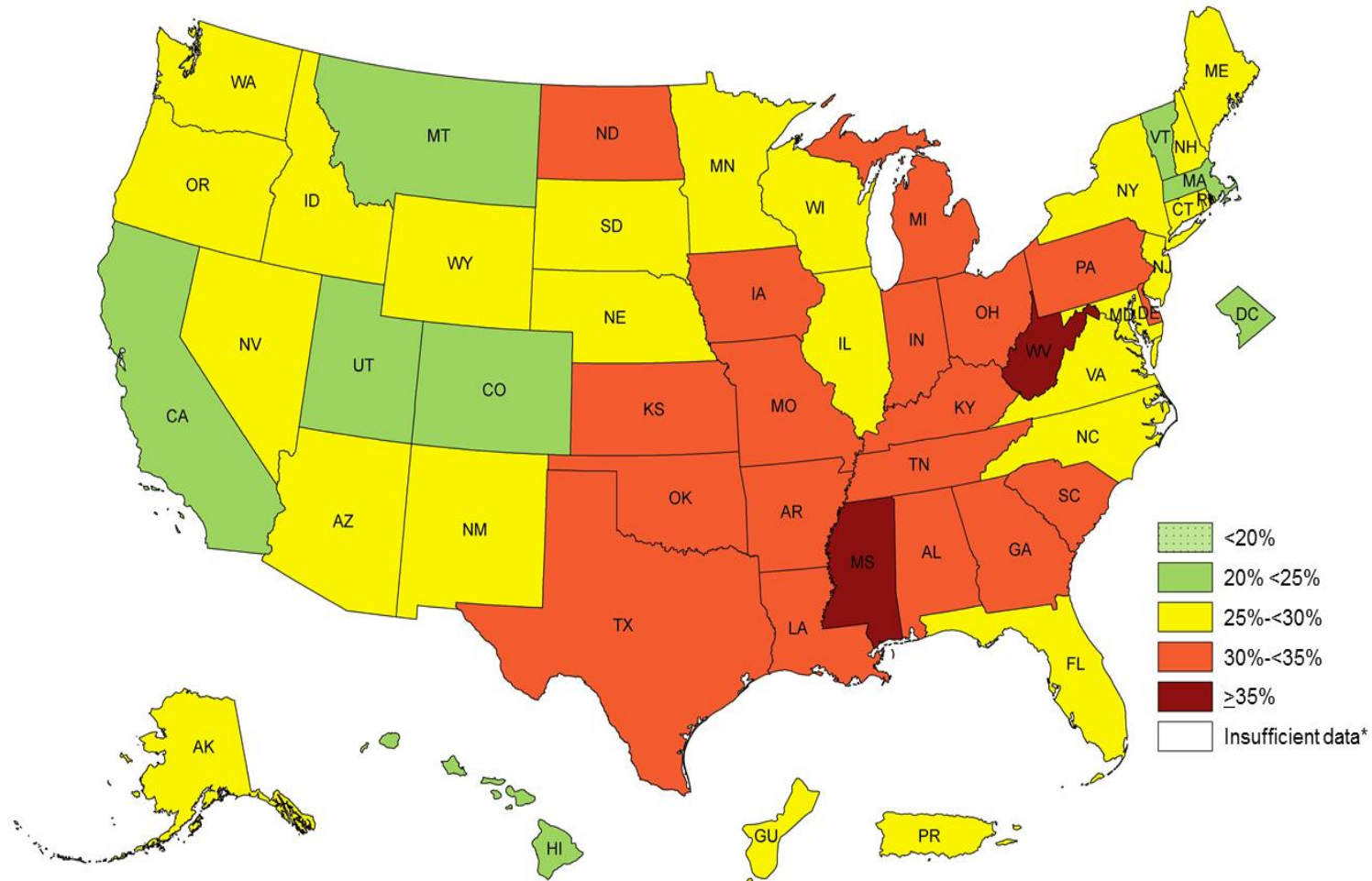

Legend:
- <20%
- 20% <25%
- 25%-<30%
- 30%-<35%
- ≥35%
- Insufficient data*

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.

Prevalence[1] of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2016

[1] Prevalence estimates reflect BRFSS methodological changes started in 2011. These estimates should not be compared to prevalence estimates before 2011.
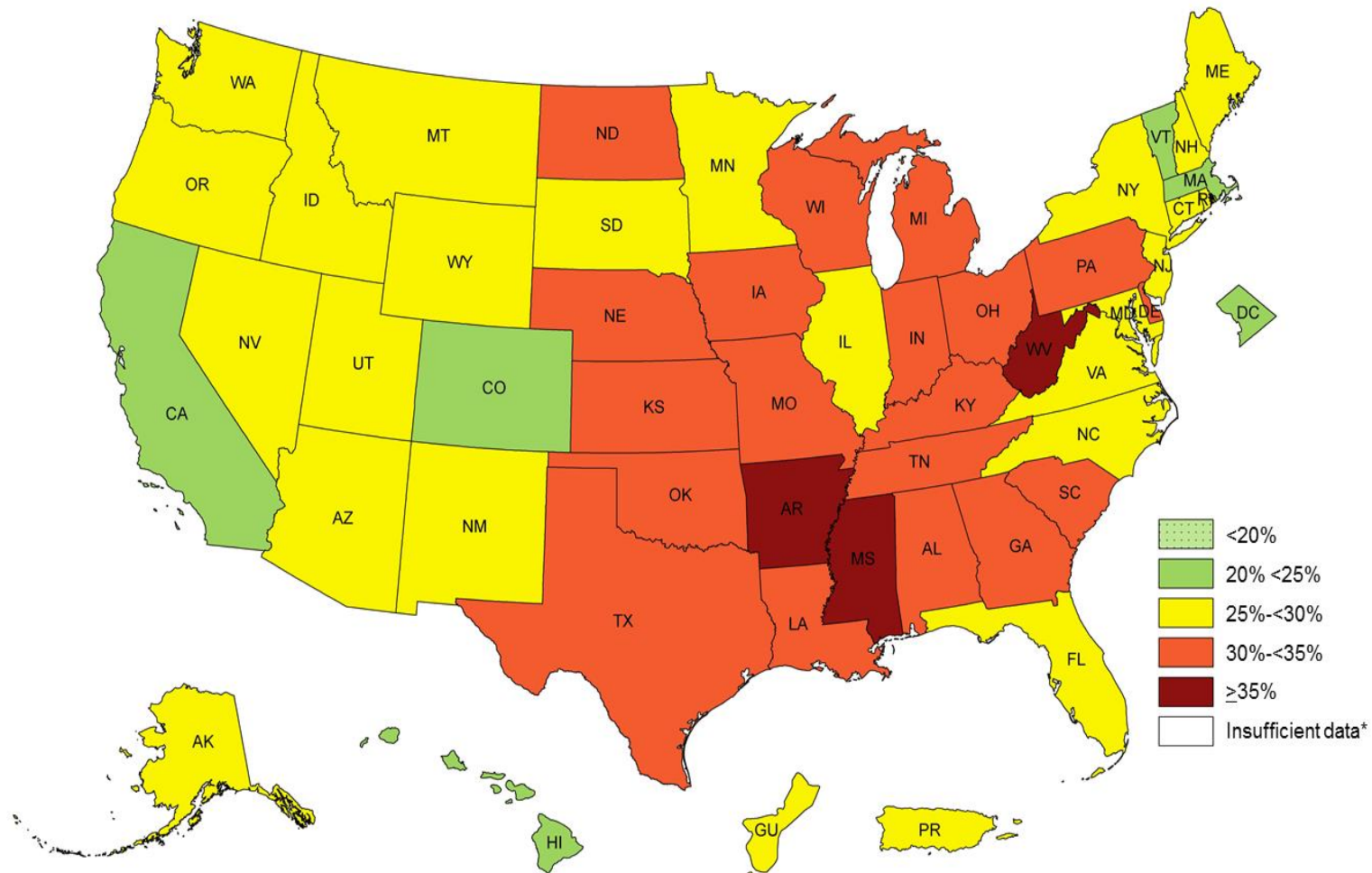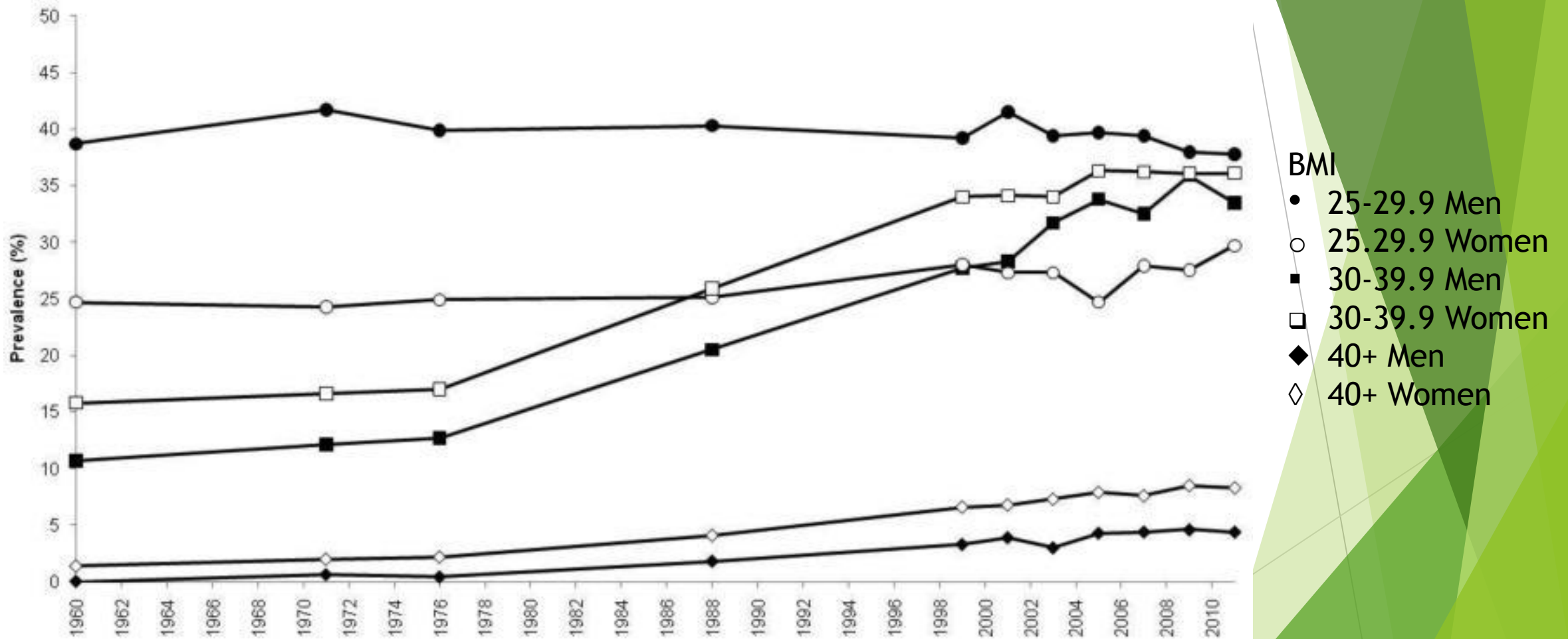

Legend:
- <20%
- 20%-<25%
- 25%-<30%
- 30%-<35%
- ≥35%
- Insufficient data*

*Sample size <50 or the relative standard error (dividing the standard error by the prevalence) ≥ 30%.

Obesity: Trends

- 70.7% of US Adults are overweight or obese

- 39.8% of US Adults are obese

- 20.6% pf 12-19 year olds

- 17.4% of 6-11 year olds

- Estimated annual medical cost in the US is $147 Billion

- Employment Baum CL. Health Econ. 2004

  - Lower wages

    - Women: 2.3 to 6.1% lower pay ($4879)

    - Men: 0.7 to 3.4 % ($2646)

Obesity: Trends

BMI
- 25-29.9 Men
- ○ 25.29.9 Women
- ■ 30-39.9 Men
- □ 30-39.9 Women
- ◆ 40+ Men
- ◇ 40+ Women

▸ Trends in age-adjusted prevalence of overweight, obesity, and extreme obesity in US adults, aged 20-74 years, 1960–2012. Trends in prevalence of overweight as BMI 25-<30 kg/m² (circles), and upward trends in obesity as BMI ≥30 kg/m² (squares), and extreme obesity as BMI ≥40 kg/m² (diamonds) in adult males (closed points) and females (open points). The figure is based on data from NHES I (1960–1962), NHANES I (1971–1974), NHANES II (1976–1980), NHANES III (1988–1994), and NHANES (1999-2000, 2001-2002, 2003-2004, 2005-2006, 2007-2008, 2009-2010, 2011-2012). Data derived are derived from Ogden, *et al.*, and Fryar, *et al.* (16,141). BMI, body mass index; NHANES, National Health and Nutrition Examination Survey; NHES, National Health Examination Survey

Obesity: History of Dieting
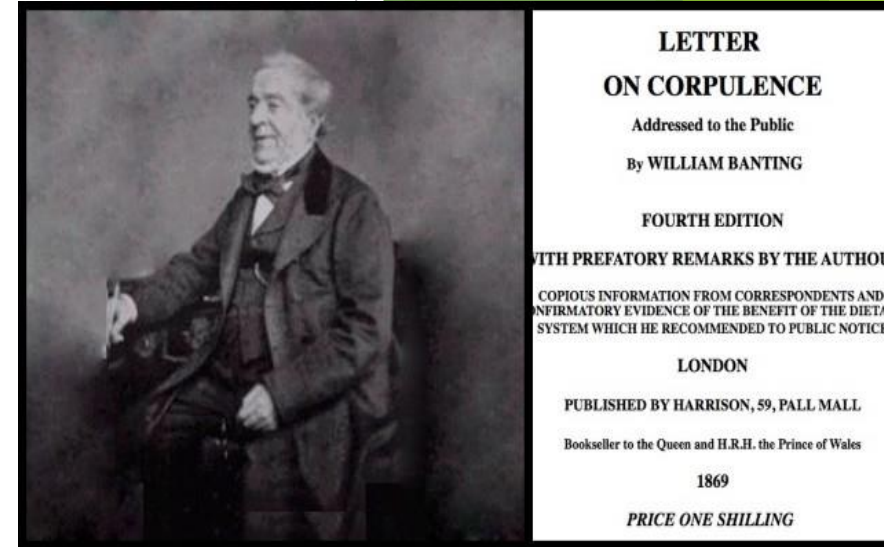

Venus de
Willendorf
26,000 BCE
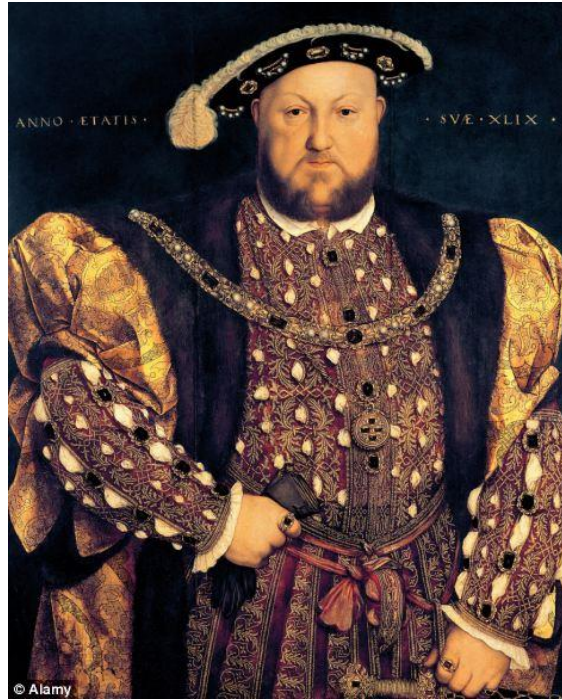
King Henry VIII
1540

William Taft
(27th POTUS)
1910

Obesity: History of Dieting

▶ First diet book "Letter on Corpulence" by William Banting 1869

　▶ 22 page phamphlet

　▶ Struggled with obesity,

　▶ Reportedly 5'5" ,202lbs

　▶ Sugar and starch free diet

　　▶ "abstain as much as possible…: bread, butter, milk, sugar, beer, potatoes"

　　▶ "starch and saccharine matter, tending to create fat"

　▶ "remarks and sneers, frequently painful in society" "subject to public remark"

　▶ "Obesity was not through neglect of necessary bodily activity, nor from excessive eating, drinking or self-indulgence of any kind"

　　▶ Breakfast: 4-5 oz meat, plain tea, 1 oz dry toast

　　▶ Lunch: 5-6 oz fish, any vegetable (except potato), 1 oz dry toast, fruit, 2-3 glasses "good claret, sherry, or madeira"

　　▶ Tea: 2-3 oz fruit, hard biscuit, plain tea

　　▶ Dinner: 3-4 oz meat or fish, 1-2 glasses claret

　　▶ Nightcap: 1-2 drinks claret or sherry, or a tumbler of grog

LETTER
ON CORPULENCE
Addressed to the Public
By WILLIAM BANTING
FOURTH EDITION
WITH PREFATORY REMARKS BY THE AUTHOR
COPIOUS INFORMATION FROM CORRESPONDENTS AND
CONFIRMATORY EVIDENCE OF THE BENEFIT OF THE DIETARY
SYSTEM WHICH HE RECOMMENDED TO PUBLIC NOTICE
LONDON
PUBLISHED BY HARRISON, 59, PALL MALL
Bookseller to the Queen and H.R.H. the Prince of Wales
1869
PRICE ONE SHILLING

Obesity: History of Dieting

- 1820 Lord Byron: apple cider vinegar diet
- 1925: Lucky Strike "reach for a Lucky instead of a sweet"
- 1930s: grapefruit diet
- 1950s: cabbage soup diet, tapeworm diet
- 1958: phentermine
- 1963: weight watchers
- 1970s: Fen-Phen
- 1971: Nutrisystem
- 1977: Slim fast
- 1978: Scarsdale diet
- 1979: Dexatrim
- 1982: Jane Fonda
- 1983: Jazzercise, Jenny Craig

- 1992: Atkins diet
- 1994: nutrition labels
- 1995: Zone diet
- 1997: Fenfluramine banned
- 2003: South Beach Diet
- 2004: Ephedra banned, Biggest loser debuts
- 2007: Alli
- 2011: HCG

Apparently I've been doing it wrong all these years.

Obesity: Metabolic Syndrome

- Syndrome X: group of risk factors that raise your risk for other health problems.
  - Heart disease: 2x risk
  - Stroke
  - Diabetes
  - Kidney disease
  - Fatty liver
  - Breast cancer
  - Liver cancer
  - Glaucoma
  - Sleep apnea
  - Gout

Metabolic Syndrome: Criteria

- Criteria (3/5)
 - Low HDL: <40 for men, <50 for women
  - High triglycerides >150
  - Hypertension >130/85
  - Fasting glucose >100
  - Increased waist circumference: >40" for men, >35" for women
    - Better predictor than BMI for heart disease

Metabolic Syndrome: Treatment

- Management of comorbidities
- Reduce modifiable risk factors
  - Smoking
  - High carbohydrate diet
  - Physical inactivity
- Weight loss
  - 5-10% weight loss can significantly improve parameters

Obesity: Causes

- Genetics (predisposition)
- Epigenetics (switching genes off/on but no DNA changes)
- Metabolism
  - Basal metabolism (BMR, RMR)(60%)
    - Lean body mass (goes up by 2% per pound of muscle)
  - Thermic effect of food (10%)
  - Activity (30%)
    - Exercise
    - Non-exercise activity thermogenesis
- Metabolic disorders (hypothyroidism, Cushing's syndrome, pituitary disorders)
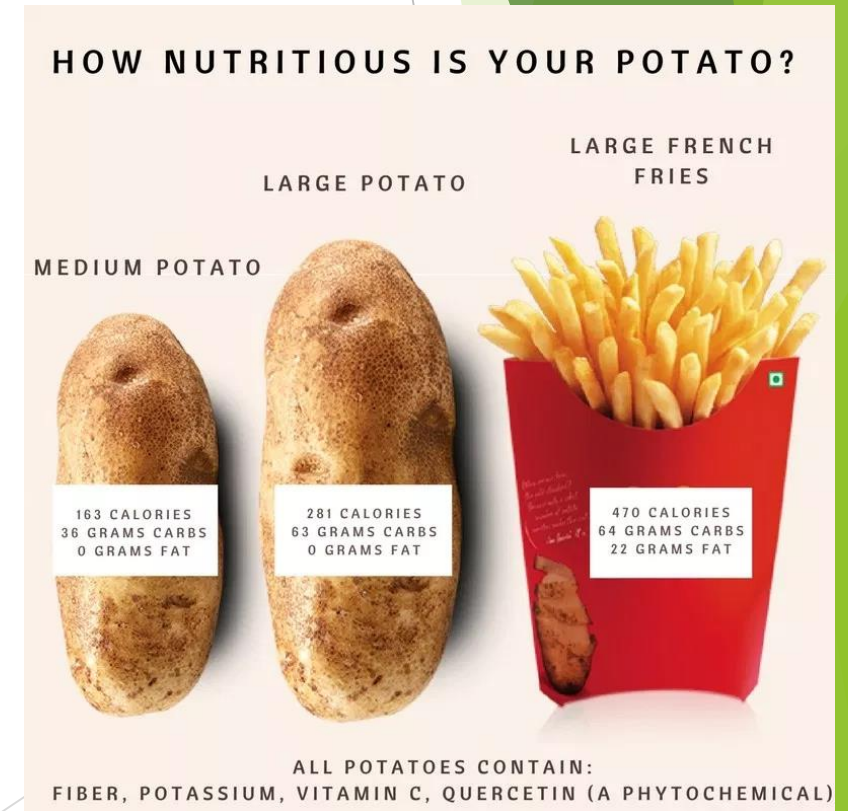- Rare syndromes
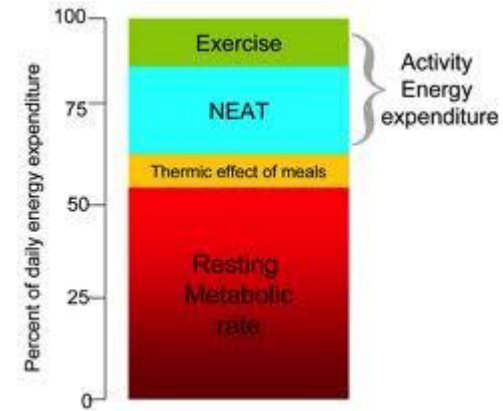
Obesity: Causes

- Beta blockers
  - Propranolol
  - Atenolol
  - Metoprolol
- Calcium channel blockers
  - Nifedipine
  - Amlodipine
  - Felodipine
- Diabetes meds
  - Insulin
  - Sulfonylureas
  - Thiazolidinediones
  - Meglitinides
- Hormones
  - Glucocorticoids/corticosteroids
  - Estrogens
- Progestins
- Testosterone
- Antidepressants
  - TCA
    - Amitriptyline
    - Doxepin
    - Imipramine
    - Desipramine
    - Nortriptyline
    - Protriptyline
  - SSRIs
    - Paroxetine
    - Citalopram
    - Escitalopram
    - Fluoxetine
    - Sertraline
  - MAOIs
    - Isocrboxazid
- Phenelzine
- Tranylcypromine
- Mirtazapine
- SNRI
  - Desvenlafaxine
  - Duloxetine
  - Venlafaxine
- Mood stabilizers
  - Gabapentin
  - Valproate
  - Lithium
  - Vigabatrin
  - Carbamazepine
  - Oxcarbazepine
- Antipsychotics
  - Substantial increase
- Clozapine
- Olanzapine
- Zotepine
- Some increase
  - Asenapine
  - Chlorpromazine
  - Iloperidone
  - Paliperidone
  - Quetiapine
  - Risperdone
  - Sertindole
- Variable
  - Amisulpride
  - Aripiprazole
  - Haloperidol
  - Lurasidone
  - Ziprasidone
- Hypnotics
- Diphenhydramine
- Benzodiazepines
- Melatonergic meds
- Trazodone
- HAART
- Chemo
  - Tamoxifen
  - Cyclophosphamide
  - Methotrexate
  - 5-fluorouracil
  - Aromatase inhibitors

Obesity: Environment

- Early life: forming preferences
  - Amniotic fluid
  - Breast milk
- Trends in America
  - Movement
  - Food trends
    - Portion sizes?
    - Fast food?

Obesity: Food Environment

- Snack calories
  - Men's snack calories increased by 90%
    - All meals together up by 10%
  - Women's snack calories increased by 112%
    - All meals together down by 12%
- Fast food
  - Calories increased from 60 per day to 200 calories per day
- Potatoes
  - Pre WWII: consumed at home baked, boiled, mashed
  - Since 1970 process potato use has surpassed fresh (USDA)
  - 1960: 35% processed
  - 2000: 64% processed

HOW NUTRITIOUS IS YOUR POTATO?

MEDIUM POTATO
LARGE POTATO
LARGE FRENCH FRIES

163 CALORIES
36 GRAMS CARBS
0 GRAMS FAT

281 CALORIES
63 GRAMS CARBS
0 GRAMS FAT

470 CALORIES
64 GRAMS CARBS
22 GRAMS FAT

ALL POTATOES CONTAIN:
FIBER, POTASSIUM, VITAMIN C, QUERCETIN (A PHYTOCHEMICAL)

Obesity: Activity

- Highly active jobs 1910: 68%, 1990: 42%
- Exercise
  - 1965: 27 minutes per day
  - 1995: 47 minutes per day
- All "Active Energy Use"
  - 1965: 261 minutes per day
  - 1995: 216 minutes per day
  - 45 fewer minutes
- Paid work: 24 fewer minutes
- TV: 62 more minutes
- Communication: 54 more minutes

Obesity: Hormones

Roles of Major Brain and Gut Hormones in Appetite Regulation

Brain and Gut Hormones	Appetite-Related Function
Amylin[24]	• Delays gastric emptying • Lowers blood glucose
CCK (cholecystokinin)[2,6]	• Suppresses hunger • Inhibits gastric emptying • Stimulates gallbladder secretion • Influences PYY release
CRF (corticotropin releasing factor)[25]	• Reduces appetite
Dopamine[26]	• Reinforces pleasure from food • Contributes to cravings
Ghrelin[5,6,8,15,16]	• Triggers hunger • Increases preference for fatty and sweet foods • Increases gastric motility • Induces fat production • Stimulates NPY production • Decreases insulin secretion
GIP (glucose-dependent insulinotropic polypeptide)[6]	• Stimulates insulin release with eating; resistance to GIP is seen in diabetes
GLP-1 (glucagonlike peptide 1)[7,15,16,24]	• Slows gastric emptying • Promotes insulin release; inhibits glucagon release • Suppresses appetite
Glucagon[27]	• Increases satiety
Insulin[24,25]	• Lowers blood glucose • Stimulates glycogen synthesis • Stimulates fat synthesis and storage
Leptin[14,24]	• Decreases food intake • Regulates energy metabolism
NPY (neuropeptide Y)[3]	• Stimulates appetite
OXM (oxyntomodulin)[6,15,27]	• Inhibits ghrelin secretion • Suppresses appetite • Slows gastric emptying • Stimulates insulin release after carbohydrate intake
PP (pancreatic polypeptide)[6]	• Slows gastric emptying
PYY (peptide YY)[2,7,15]	• Slows gastric emptying • Stimulates satiety (levels are highest 90 minutes after starting a meal)
Serotonin[3,28]	• Decreases in serotonin are linked with carbohydrate cravings • Provides calm feeling after eating sugary food

theAwkwardYeti.com
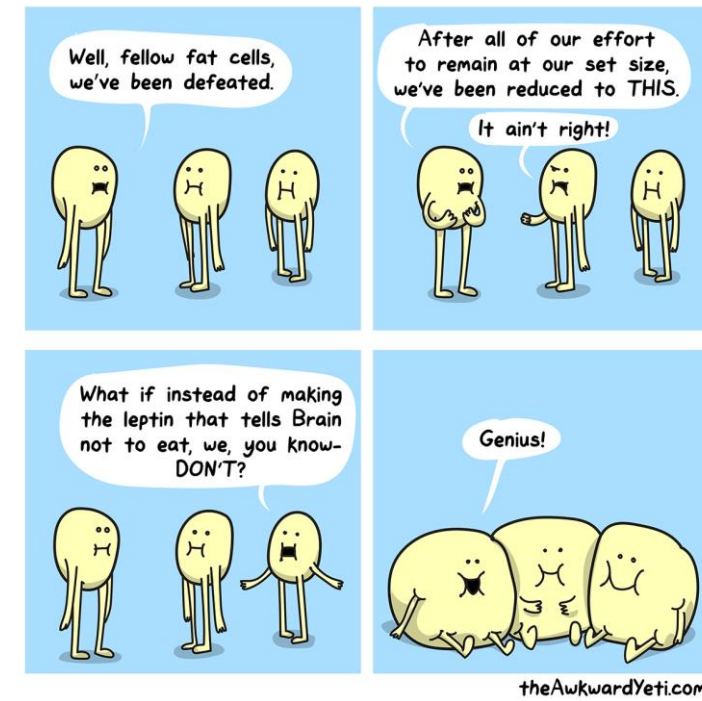
Obesity: Treatment

- Non-surgical/Medical
- Surgical

Medical Weight Management

- Testing for treatable conditions if suspected (rare)
- Addressing weight positive medications
- Tracking weight related health issues
- Education on sustainable lifestyle changes
  - Macronutrient recommendations for optimal health
    - Protein- meat, dairy, eggs, soy products
    - Carbohydrate- plants
    - Fat- avocado, nuts, oil, butter, lard, shortening, egg yolks
- Accountability
- Medications to help with appetite

Surgical Weight Loss

- Lap band
- Sleeve gastrectomy
- RNY gastric bypass

Laparoscopic Adjustable Band
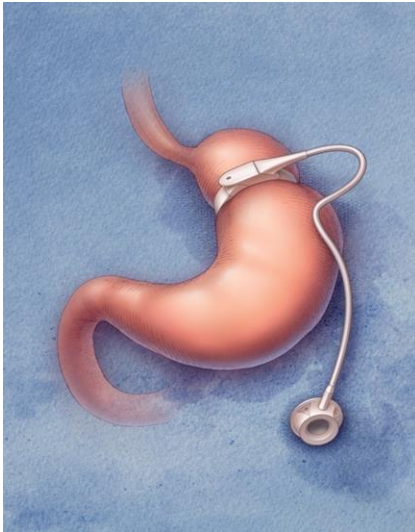
- A silicone band is placed around the upper part of stomach
- Holds less food inducing feeling of fullness
- Tubing connected to port allowing adjustments for saline adjustments
- High failure rate

Sleeve Gastrectomy

- Began as staging procedure for duodenal switch
- 75% of the stomach is removed
- Weight loss 55-60%
- No long term data

Roux En Y Gastric Bypass

- Gold standard procedure
- Small stomach pouch created from stomach (size of small egg)
- Rerouting of small bowel
- Weight loss 60-75%

Surgical Weight Loss

- Is doing nothing safe/no risk?
- Long term Mortality after Gastric Bypass Surgery
  - Adams TJ, et al.: NEJM, Volume 357;:753-761, August 23, 2007 Number 8
    - 7925 surgical/7925 control matched for age, sex, BMI
    - Mean follow up 7.1 years
  - Long term mortality from any cause decreased by 40%
  - Heart Disease deaths decreased by 56%
  - Diabetes deaths decreased by 92%
  - Cancer deaths decreased by 60%

Surgical Weight Loss

- Surgery Decreases Long-Term Mortality, Morbidity, and Health Care Use in Morbidly Obese Patients
  - Christou NV, et al.: Ann. Surg., 240:416-422, 2004
    - 135 surgical/5746 control matched for age, sex (no medical conditions)
    - 5 year follow up
  - Mortality in Surgery group: 0.68%
  - Mortality in Control group: 6.17%
  - Reduction in the relative risk of death by 89%

Surgical Weight Loss

▶ Safety at a Center of Excellence
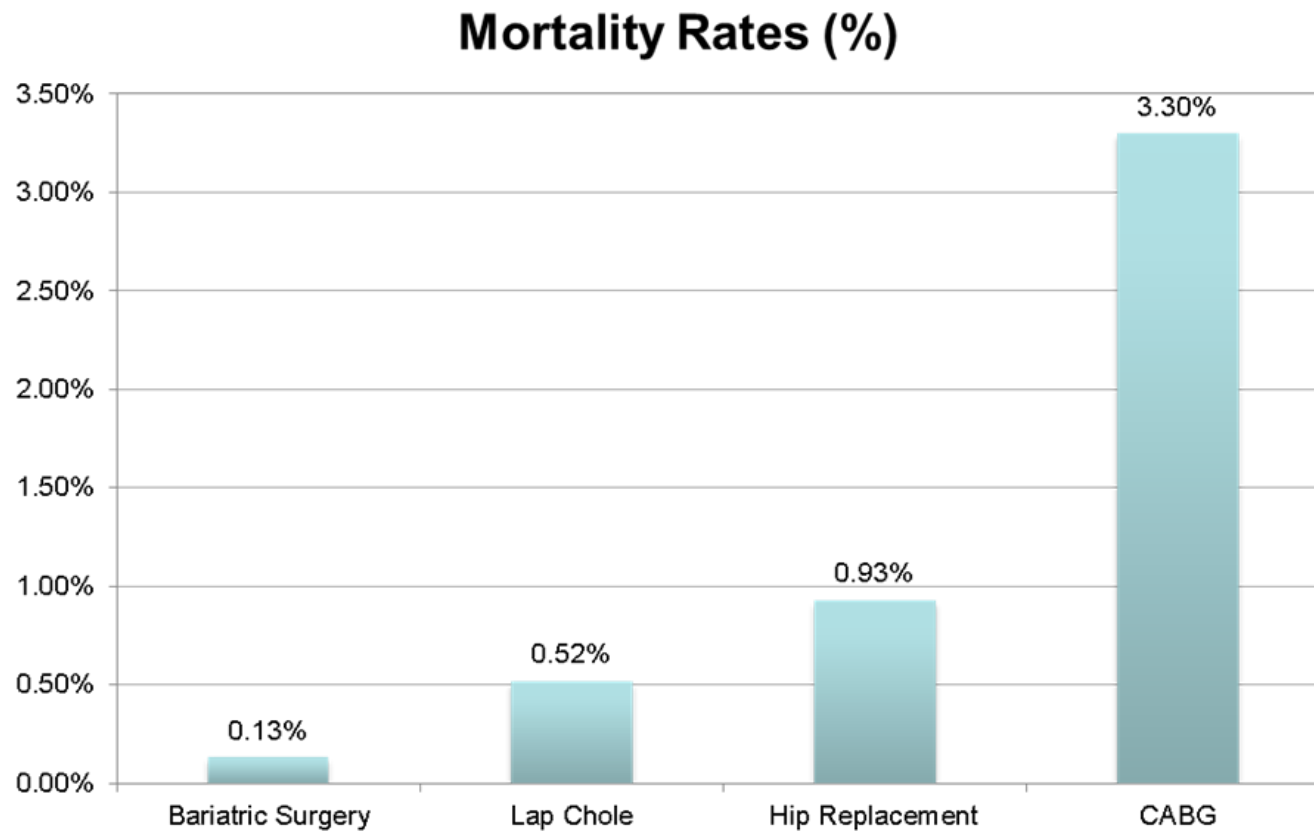
Mortality Rates (%)

[1]Mortality rate when performed at a Bariatric Surgery Center of Excellence; Bariatric Surgery: DeMaria EJ, Pate V, Warthen M et al. Baseline data from American Society for Metabolic and Bariatric Surgery-designated Bariatric Surgery Centers of Excellence using the Bariatric Outcomes Longitudinal Database, Surgery for Obesity and Related Diseases. Article in Press.
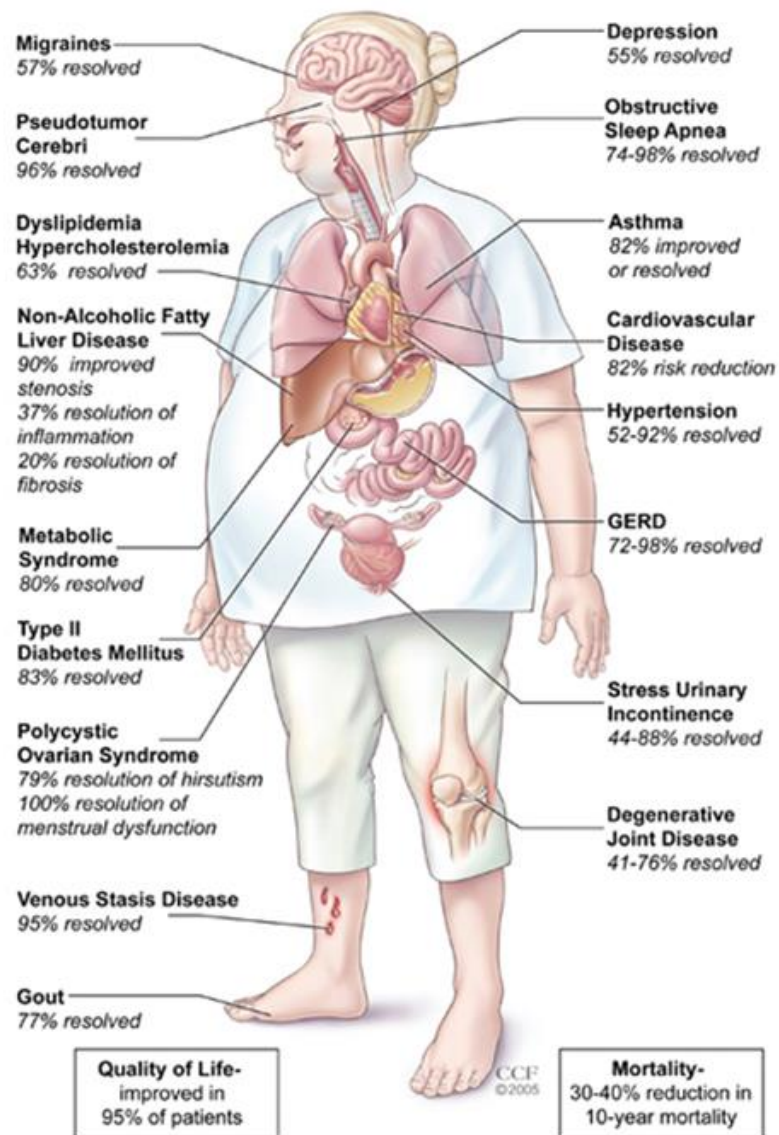
[2]Dolan JP, Diggs BS, Sheppard BC et al. The National Mortality Burden and Significant Factors Associated with Open and Laparoscopic Cholecystectomy: 1997–2006. J Gastrointest Surg. 2009; 13:2292-2301

[3]Lie SA, Engesaeter LB, Havelin LI et al. Early postoperative mortality after 67,548 total hip replacements. Acta Orthopaedica 2002; 73(4):392-399

[4]Ricciardi R; Virnig BA, Ogilvie Jr. JW. Volume-Outcome Relationship for Coronary Artery Bypass Grafting in an Era of Decreasing Volume. Arch Surg. 2008;143[4]:338-344

Medical Problems Resolved After Bariatric Surgery

Reprinted with permisson, Cleveland Clinic Center for Medical Art & Photography (c) 2007-2010. All Rights Reserved.
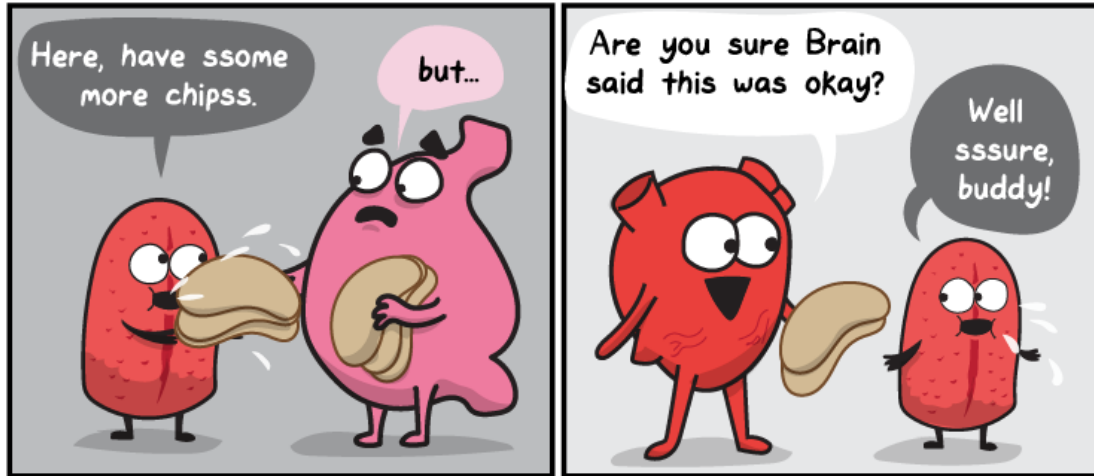
Migraines
57% resolved

Pseudotumor Cerebri
96% resolved

Dyslipidemia Hypercholesterolemia
63% resolved

Non-Alcoholic Fatty Liver Disease
90% improved stenosis
37% resolution of inflammation
20% resolution of fibrosis

Metabolic Syndrome
80% resolved

Type II Diabetes Mellitus
83% resolved

Polycystic Ovarian Syndrome
79% resolution of hirsutism
100% resolution of menstrual dysfunction

Venous Stasis Disease
95% resolved

Gout
77% resolved

Depression
55% resolved

Obstructive Sleep Apnea
74-98% resolved

Asthma
82% improved or resolved

Cardiovascular Disease
82% risk reduction

Hypertension
52-92% resolved

GERD
72-98% resolved

Stress Urinary Incontinence
44-88% resolved

Degenerative Joint Disease
41-76% resolved

Quality of Life-
improved in 95% of patients

Mortality-
30-40% reduction in 10-year mortality

CCF ©2005

Brethauer SA, Chand B, Shauer PR. Risks and benefits of bariatric surgery: Current evidence. Cleveland Clinic Journal of Medicine 2006; 73:1-15.
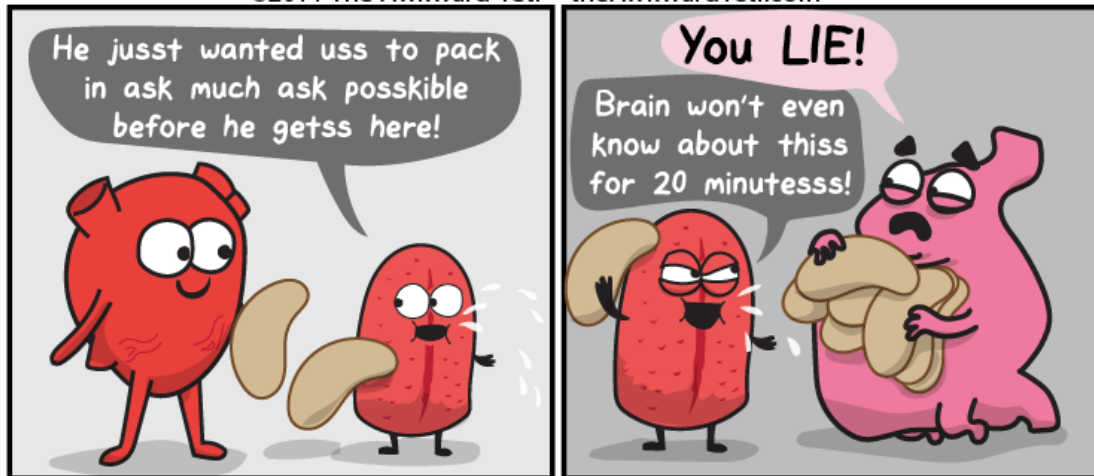
NOW WHAT?!?!

- Eat more protein (especially at breakfast): about ½ g per body weight in pounds
  - 200 lb person would need 100 grams of protein
    - At LEAST 20 grams per meal
- Snack less
  - Or at least plan a healthy snack
- Eat REAL food at every chance
- Cook dinner as often as you can
- Avoid liquid calories
  - Grande Pumpkin Spice Latte: 380 calories, 49g sugar, 13g fat
  - Krispy Kreme Chocolate Iced Custard Filled Doughnut: 300 calories, 16g sugar, 15g fat

Questions?