Which Comes First, Overeating or Obesity?

Reframing obesity as a metabolic disorder

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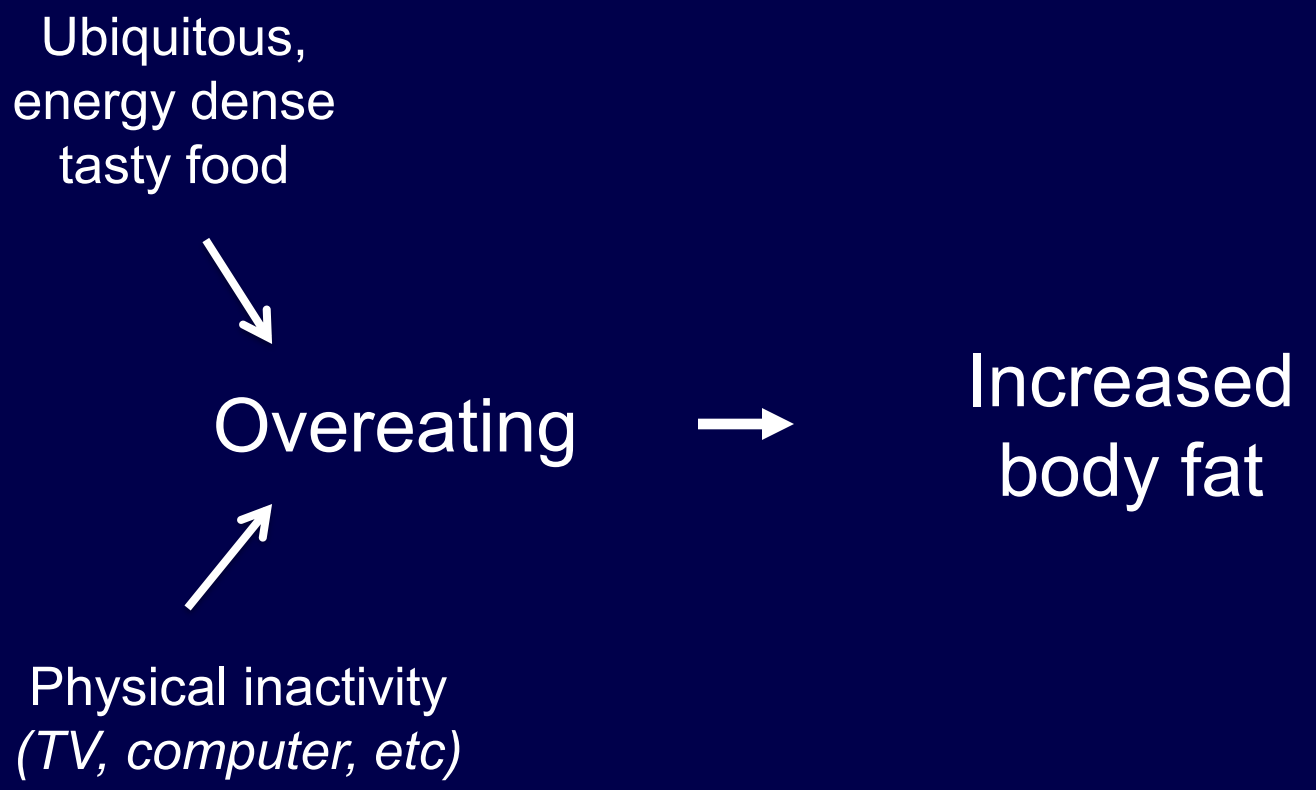
Law of Physics

Energy can neither be created nor destroyed

Calorie intake - Calorie expenditure = Calories stored (body fat)

Calories In, Calories Out View

Overeating CAUSES Obesity



Calories In, Calories Out

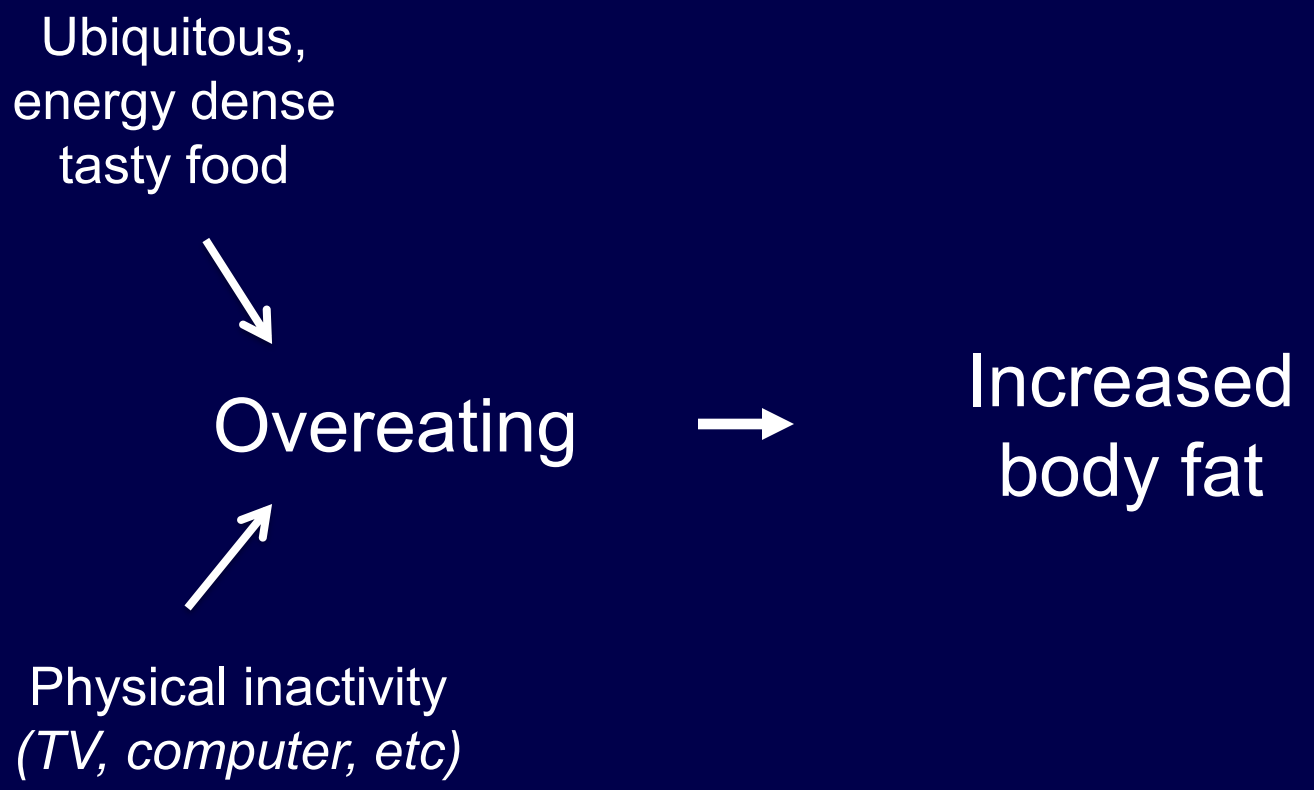
Central precept: All calories are alike to the body

Schwartz et al. Endocr Rev 2017, 38:267–96 (Endoc Society))

"The impact of diet on obesity risk is explained largely by its effect on calorie intake, rather than by changes of either energy expenditure or the internal metabolic environment. Stated differently, 'a calorie is a calorie.' "

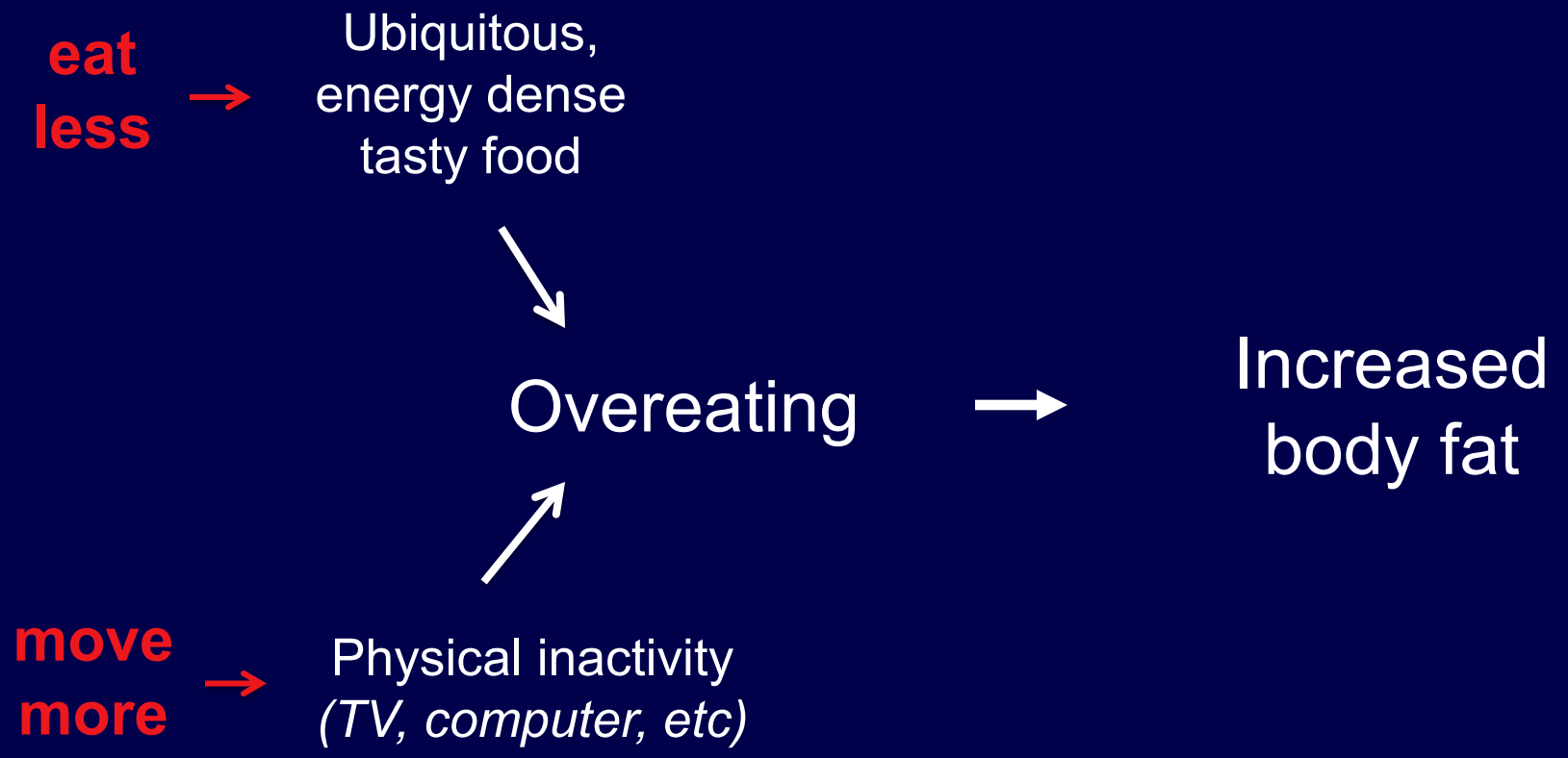
Calories In, Calories Out

Overeating CAUSES Obesity



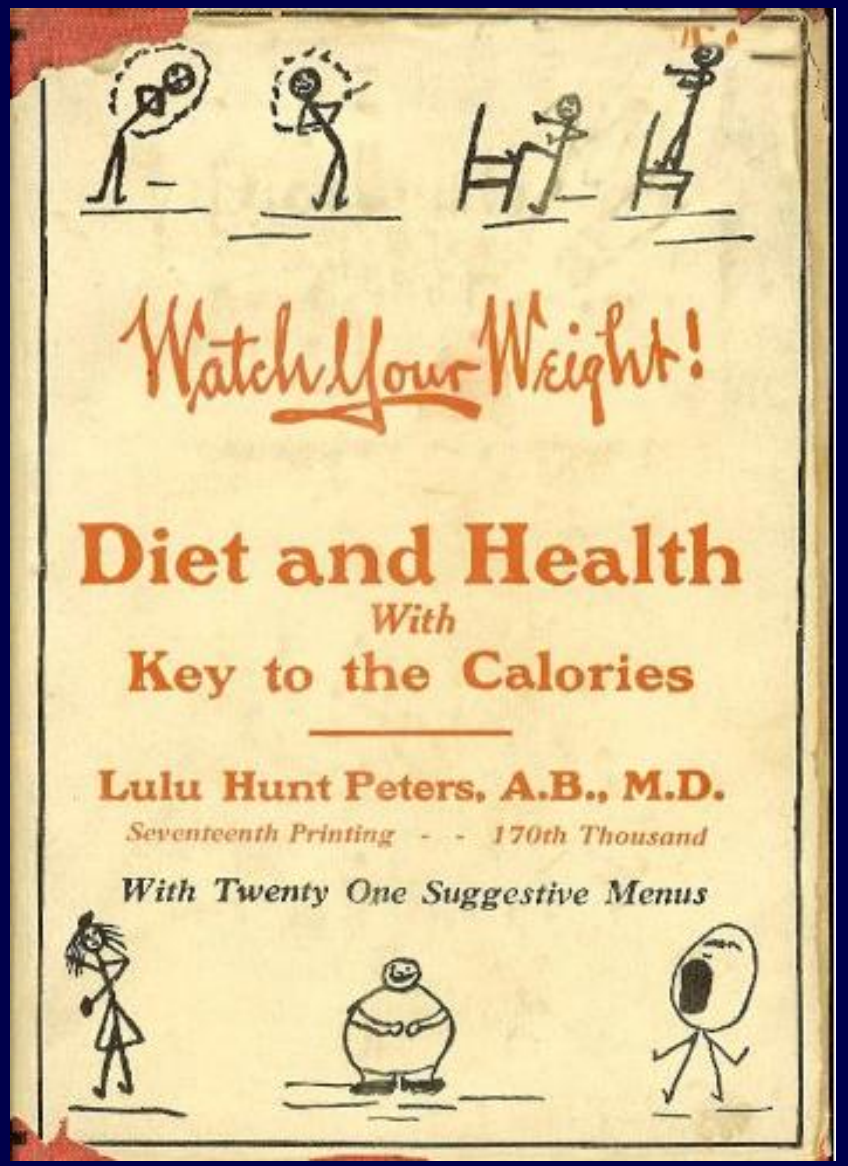
Calories In, Calories Out

Overeating CAUSES Obesity



Calories In, Calories Out

Early 20th Century

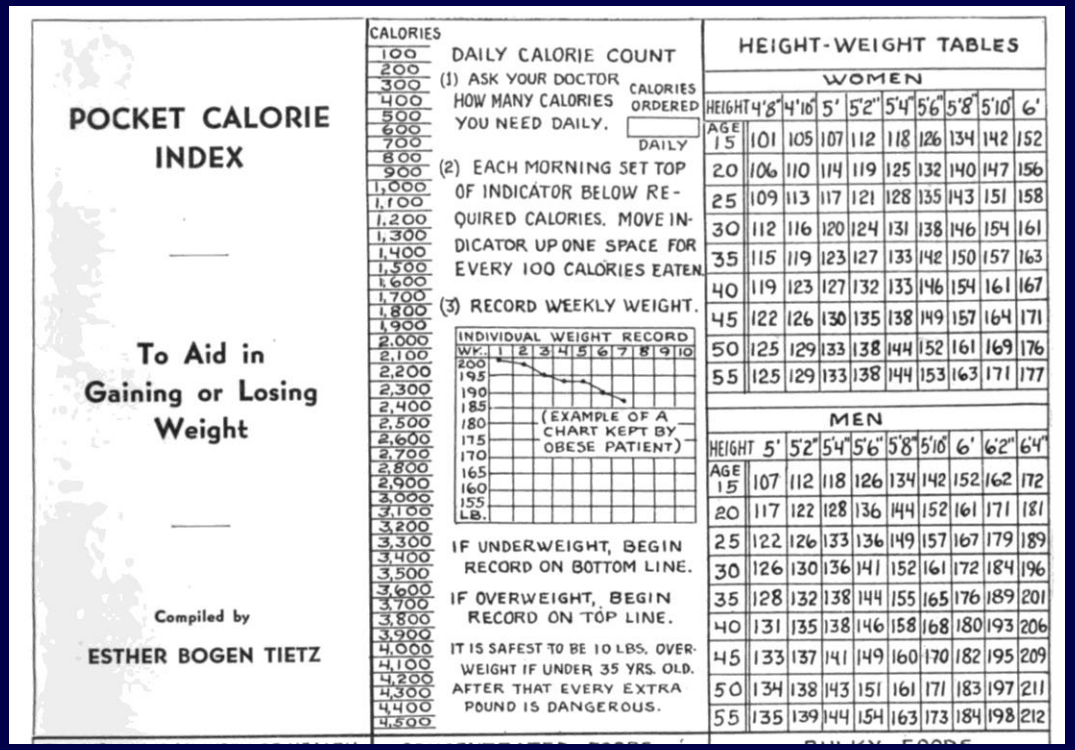


Published 1918

Calories In, Calories Out

Early 20th Century

"each block equals 100 calories"



POCKET CALORIE INDEX

To Aid in Gaining or Losing Weight

Compiled by

ESTHER BOGEN TIETZ

CALORIES

100 200 300 400 500 600 700 800 900 1,000 1,100 1,200 1,300 1,400 1,500 1,600 1,700 1,800 1,900 2,000 2,100 2,200 2,300 2,400 2,500 2,600 2,700 2,800 2,900 3,000 3,100 3,200 3,300 3,400 3,500 3,600 3,700 3,800 3,900 4,000 4,100 4,200 4,300 4,400 4,500

DAILY CALORIE COUNT

(1) ASK YOUR DOCTOR HOW MANY CALORIES YOU NEED DAILY. CALORIES ORDERED DAILY

(2) EACH MORNING SET TOP OF INDICATOR BELOW REQUIRED CALORIES. MOVE INDICATOR UP ONE SPACE FOR EVERY 100 CALORIES EATEN.

(3) RECORD WEEKLY WEIGHT.

INDIVIDUAL WEIGHT RECORD

WK. 1 2 3 4 5 6 7 8 9 10

200 195 190 185 180 175 170 165 160 155 LB.

(EXAMPLE OF A CHART KEPT BY OBESE PATIENT)

IF UNDERWEIGHT, BEGIN RECORD ON BOTTOM LINE.

IF OVERWEIGHT, BEGIN RECORD ON TOP LINE.

IT IS SAFEST TO BE 10 LBS. OVERWEIGHT IF UNDER 35 YRS. OLD. AFTER THAT EVERY EXTRA POUND IS DANGEROUS.

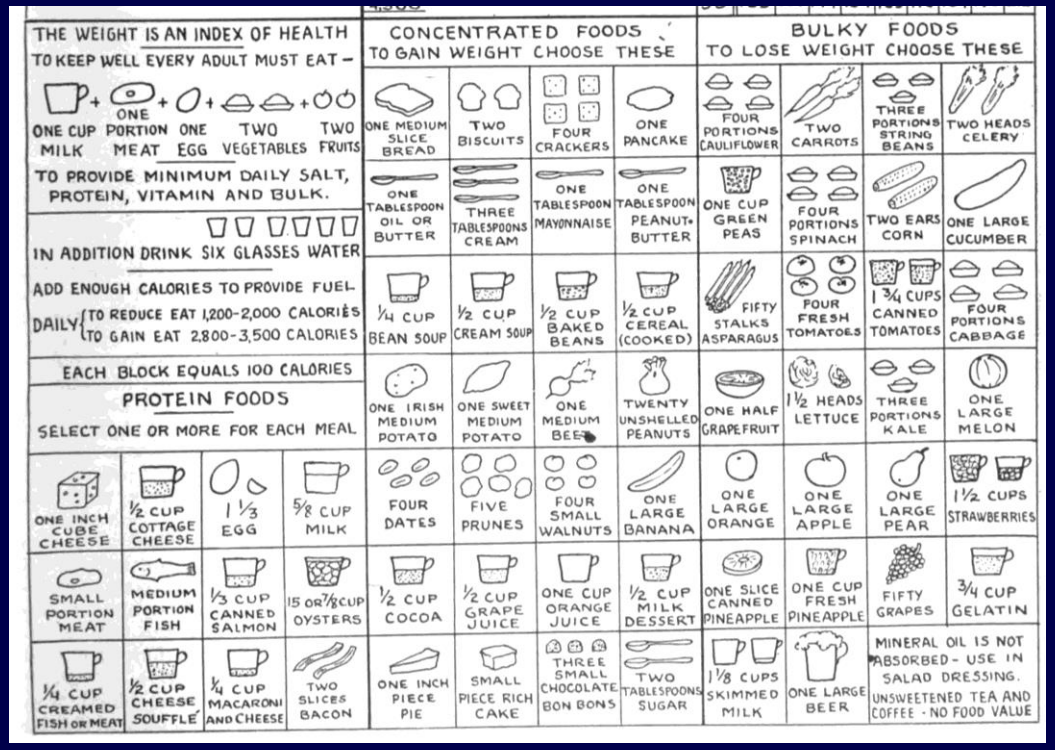
HEIGHT-WEIGHT TABLES

WOMEN

HEIGHT	4'8"	4'10"	5'	5'2"	5'4"	5'6"	5'8"	5'10"	6'
AGE 15	101	105	107	112	118	126	134	142	152
20	106	110	114	119	125	132	140	147	156
25	109	113	117	121	128	135	143	151	158
30	112	116	120	124	131	138	146	154	161
35	115	119	123	127	133	142	150	157	163
40	119	123	127	132	133	146	154	161	167
45	122	126	130	135	138	149	157	164	171
50	125	129	133	138	144	152	161	169	176
55	125	129	133	138	144	153	163	171	177

MEN

HEIGHT	5'	5'2"	5'4"	5'6"	5'8"	5'10"	6'	6'2"	6'4"
AGE 15	107	112	118	126	134	142	152	162	172
20	117	122	128	136	144	152	161	171	181
25	122	126	133	136	149	157	167	179	189
30	126	130	136	141	152	161	172	184	196
35	128	132	138	144	155	165	176	189	201
40	131	135	138	146	158	168	180	193	206
45	133	137	141	149	160	170	182	195	209
50	134	138	143	151	161	171	183	197	211
55	135	139	144	154	163	173	184	198	212



THE WEIGHT IS AN INDEX OF HEALTH

TO KEEP WELL EVERY ADULT MUST EAT –

ONE CUP MILK + ONE PORTION MEAT + ONE EGG + TWO VEGETABLES + TWO FRUITS

TO PROVIDE MINIMUM DAILY SALT, PROTEIN, VITAMIN AND BULK.

IN ADDITION DRINK SIX GLASSES WATER

ADD ENOUGH CALORIES TO PROVIDE FUEL DAILY { TO REDUCE EAT 1,200-2,000 CALORIES / TO GAIN EAT 2,800-3,500 CALORIES

EACH BLOCK EQUALS 100 CALORIES

PROTEIN FOODS

SELECT ONE OR MORE FOR EACH MEAL

ONE INCH CUBE CHEESE · ½ CUP COTTAGE CHEESE · 1 ⅓ EGG · ⅝ CUP MILK

SMALL PORTION MEAT · MEDIUM PORTION FISH · ⅓ CUP CANNED SALMON · 15 OR 7/8 CUP OYSTERS

¼ CUP CREAMED FISH OR MEAT · ½ CUP CHEESE SOUFFLÉ · ¼ CUP MACARONI AND CHEESE · TWO SLICES BACON

CONCENTRATED FOODS TO GAIN WEIGHT CHOOSE THESE

ONE MEDIUM SLICE BREAD · TWO BISCUITS · FOUR CRACKERS · ONE PANCAKE

ONE TABLESPOON OIL OR BUTTER · THREE TABLESPOONS CREAM · ONE TABLESPOON MAYONNAISE · ONE TABLESPOON PEANUT BUTTER

¼ CUP BEAN SOUP · ½ CUP CREAM SOUP · ½ CUP BAKED BEANS · ½ CUP CEREAL (COOKED)

ONE IRISH MEDIUM POTATO · ONE SWEET MEDIUM POTATO · ONE MEDIUM BEET · TWENTY UNSHELLED PEANUTS

FOUR DATES · FIVE PRUNES · FOUR SMALL WALNUTS · ONE LARGE BANANA

½ CUP COCOA · ½ CUP GRAPE JUICE · ONE CUP ORANGE JUICE · ½ CUP MILK DESSERT

ONE INCH PIECE PIE · SMALL PIECE RICH CAKE · THREE SMALL CHOCOLATE BON BONS · TWO TABLESPOONS SUGAR

BULKY FOODS TO LOSE WEIGHT CHOOSE THESE

FOUR PORTIONS CAULIFLOWER · TWO CARROTS · THREE PORTIONS STRING BEANS · TWO HEADS CELERY

ONE CUP GREEN PEAS · FOUR PORTIONS SPINACH · TWO EARS CORN · ONE LARGE CUCUMBER

FIFTY STALKS ASPARAGUS · FOUR FRESH TOMATOES · 1 ¾ CUPS CANNED TOMATOES · FOUR PORTIONS CABBAGE

ONE HALF GRAPEFRUIT · 1 ½ HEADS LETTUCE · THREE PORTIONS KALE · ONE LARGE MELON

ONE LARGE ORANGE · ONE LARGE APPLE · ONE LARGE PEAR · 1 ½ CUPS STRAWBERRIES

ONE SLICE CANNED PINEAPPLE · ONE CUP FRESH PINEAPPLE · FIFTY GRAPES · ¾ CUP GELATIN

1 ⅛ CUPS SKIMMED MILK · ONE LARGE BEER

MINERAL OIL IS NOT ABSORBED – USE IN SALAD DRESSING.

UNSWEETENED TEA AND COFFEE – NO FOOD VALUE

"To reduce, eat 1200 to 2000 calories"

Hygeia 1936,14(1):15

Calories In, Calories Out

It didn't work!

January 1959

The Results of Treatment for Obesity

A Review of the Literature and Report of a Series

ALBERT STUNKARD, M.D.; MAVIS McLAREN-HUME, M.S.

» Author Affiliations

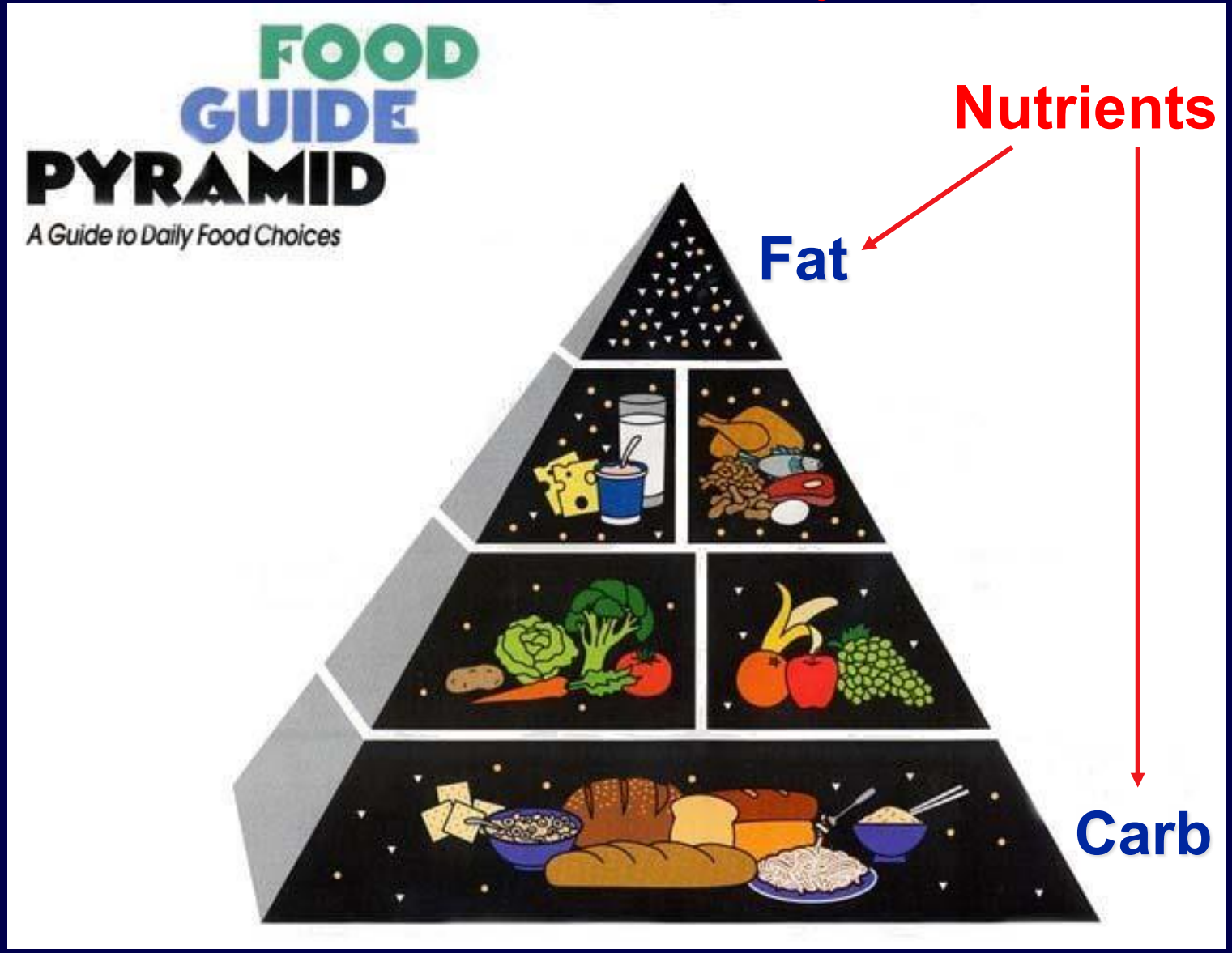
AMA Arch Intern Med. 1959;103(1):79-85. doi:10.1001/archinte.1959.00270010085011

30-yr literature review of calorie-restricted diets:

- "The results [among these programs] ... are remarkably similar and remarkably poor"
- "such programs may be far from harmless" and result in "emotional disturbances"

Calories In, Calories Out

Late 20th Century



Calories In, Calories Out

Late 20th Century

"When people are allowed to eat from ranges of high-fat or high-sucrose foods, passive overconsumption only occurs with fat. It follows that fat promotes overconsumption while sucrose probably prevents it" — J Am Diet Assoc 1997; 97:S63-9

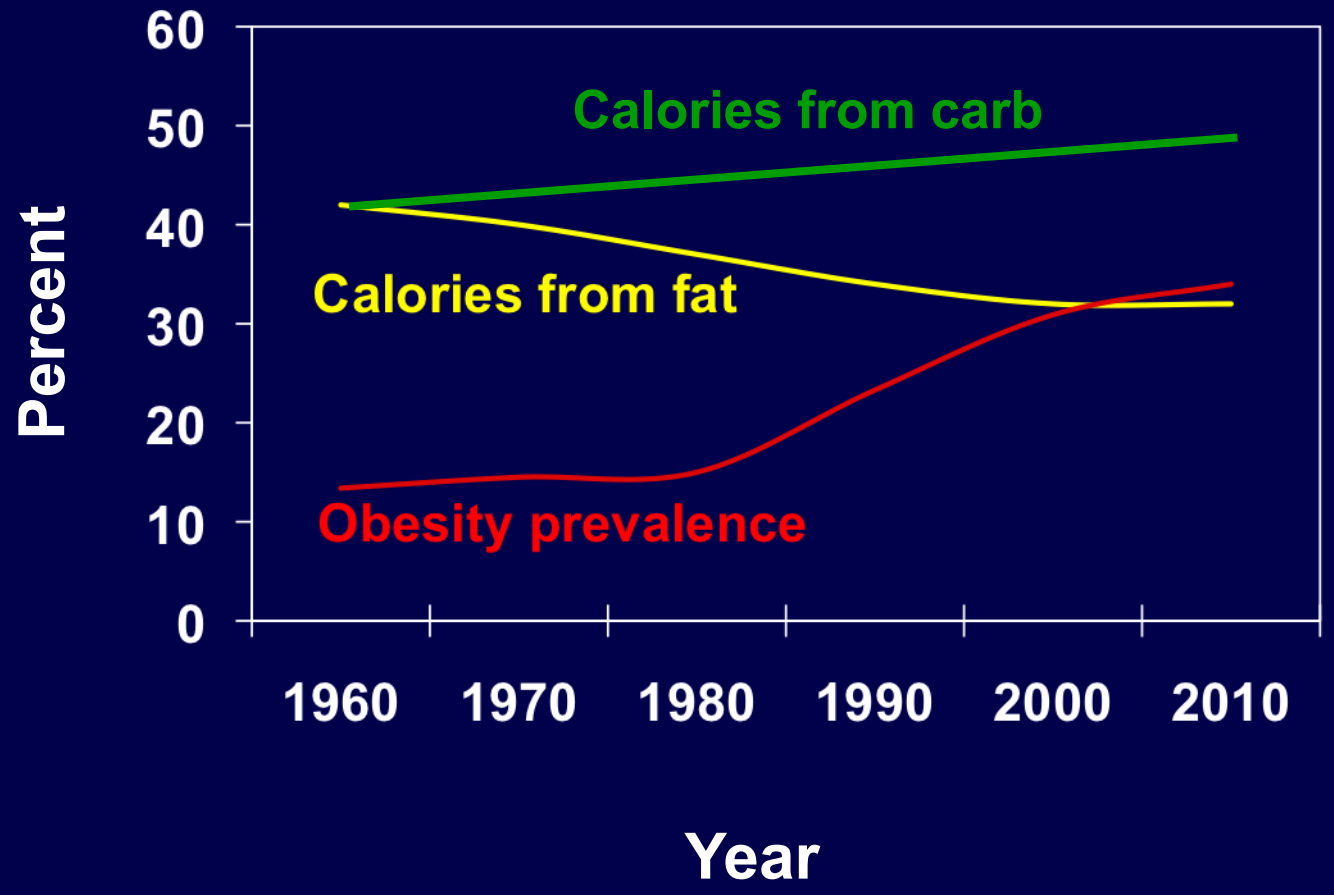
"The evidence intriguingly suggests that it is specifically an increased intake of sugars . . . rather than of complex carbohydrates that tends to dilute fat energy" — AJCN 1995; 62:264S-273S

Calories In, Calories Out

Late 20th century

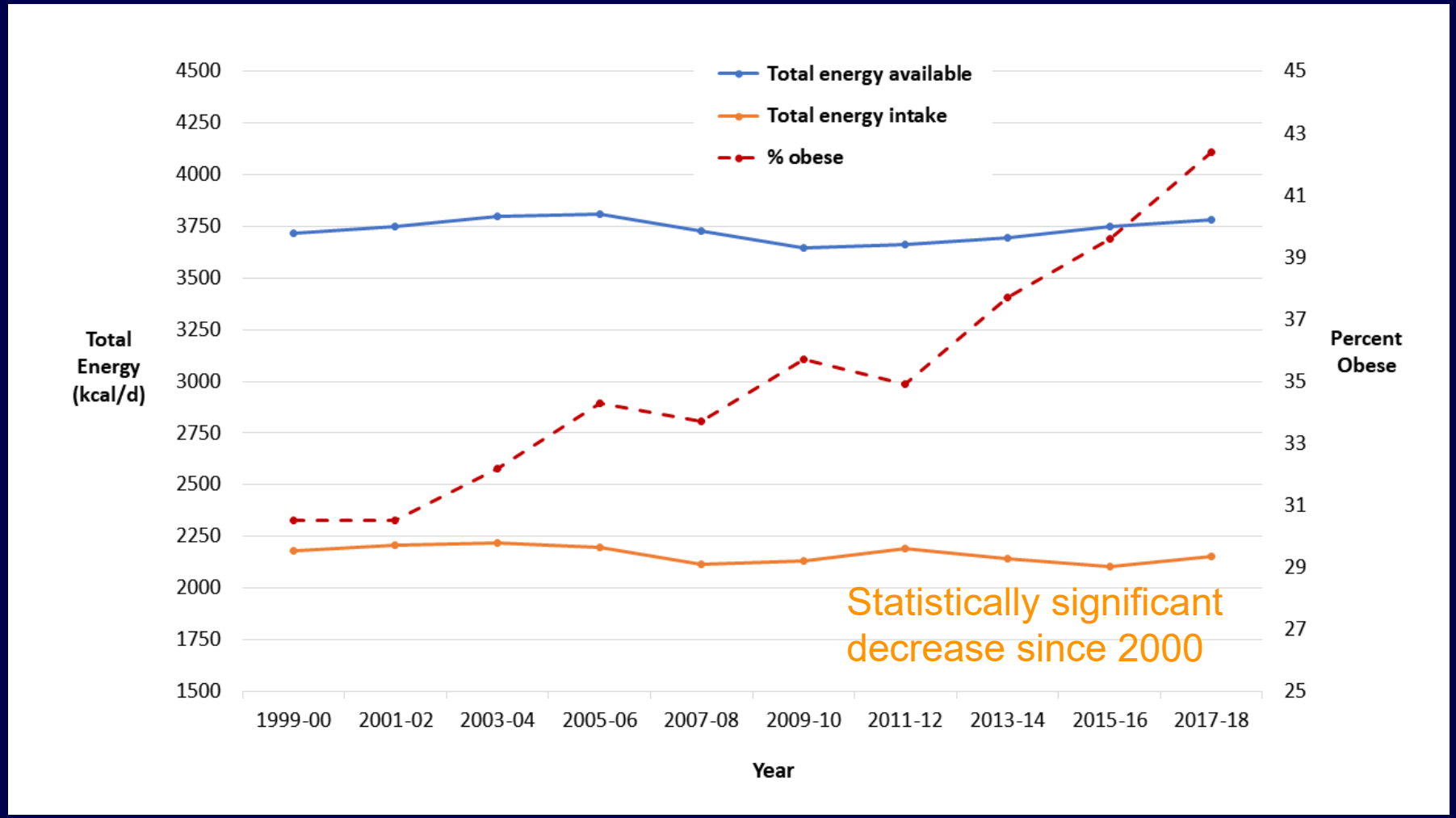
Trends in Dietary Fat

It's still not working!



Trends in Calorie Consumption

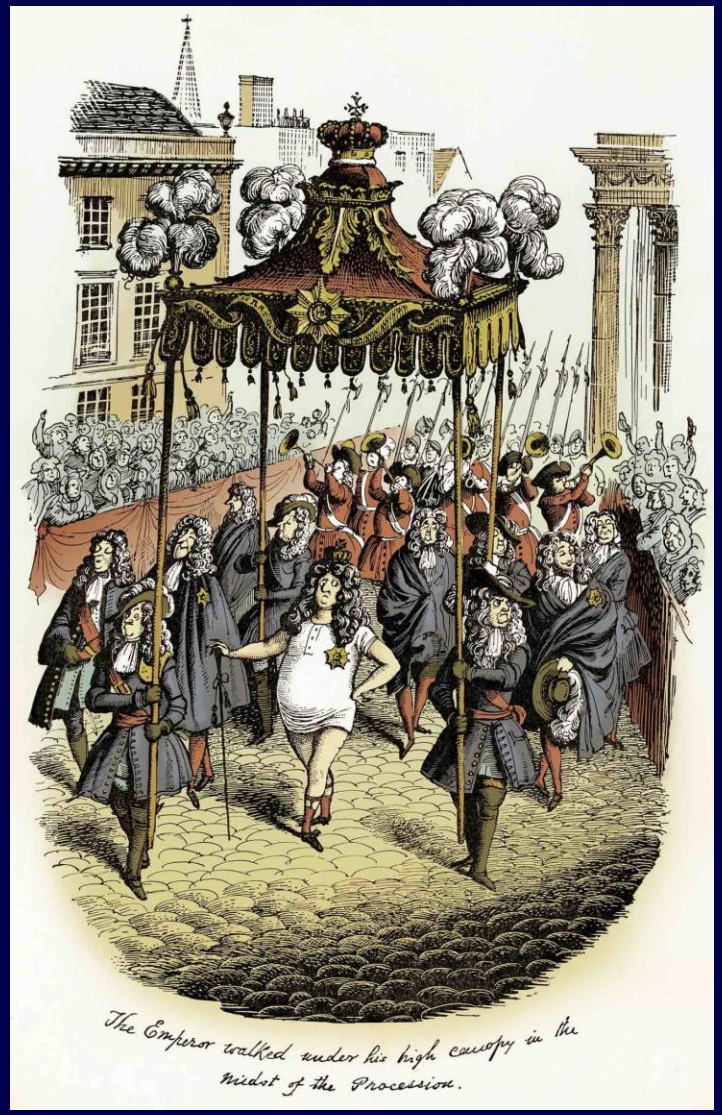
It's still not working …even through we are eating less!!!



Mozaffarian. AJCN 2022 Apr 23:nqac075

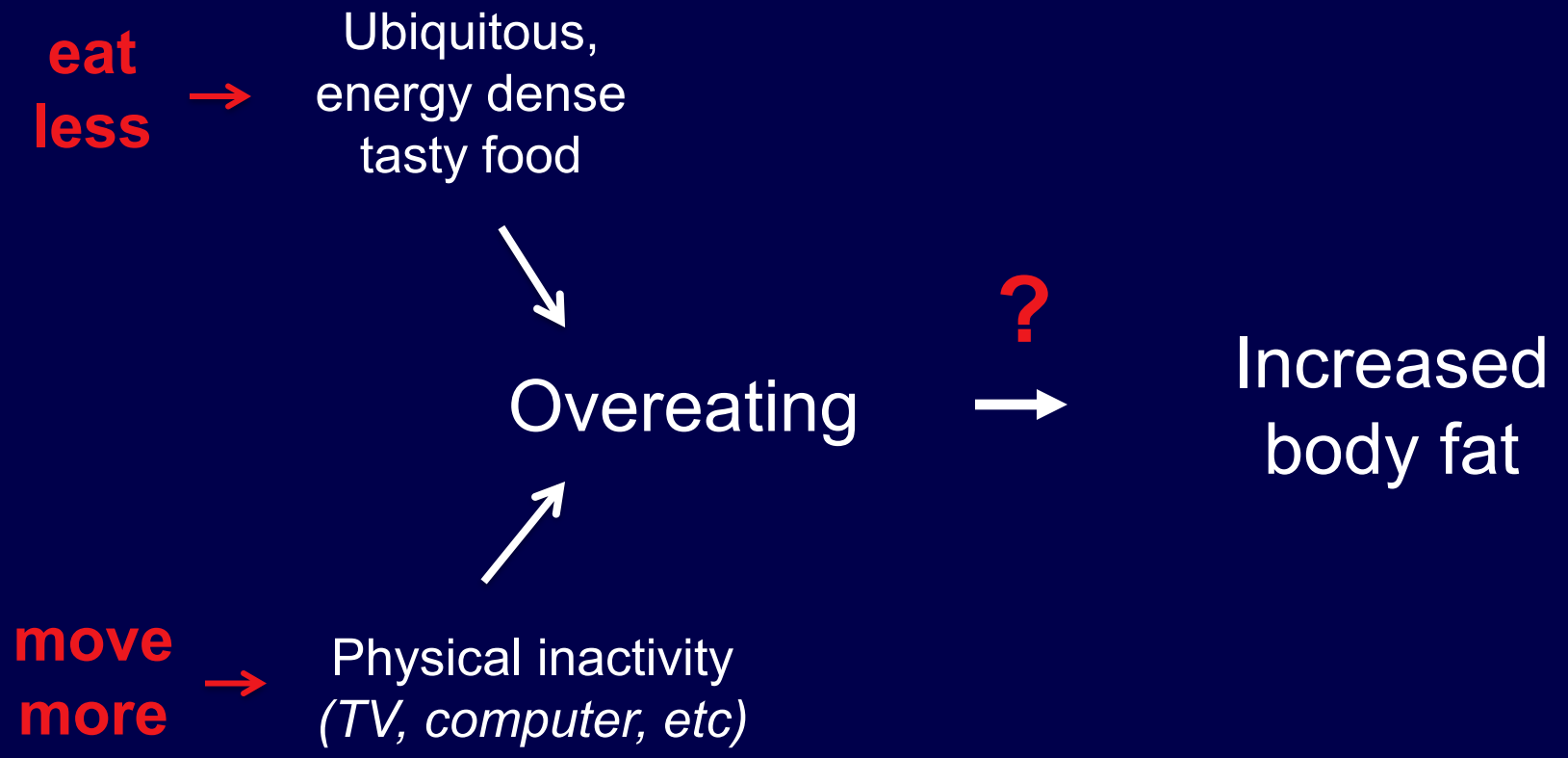
Calories In, Calories Out

Emperor's new clothes?



Calories In, Calories Out

Overeating CAUSES Obesity



Carbohydrate-Insulin Model

The process of getting fat DRIVES overeating

Overeating ← Increased body fat

Cause Versus Effect

Adolescent growth spurt

Overeating ← Increased ~~body fat~~ Growth

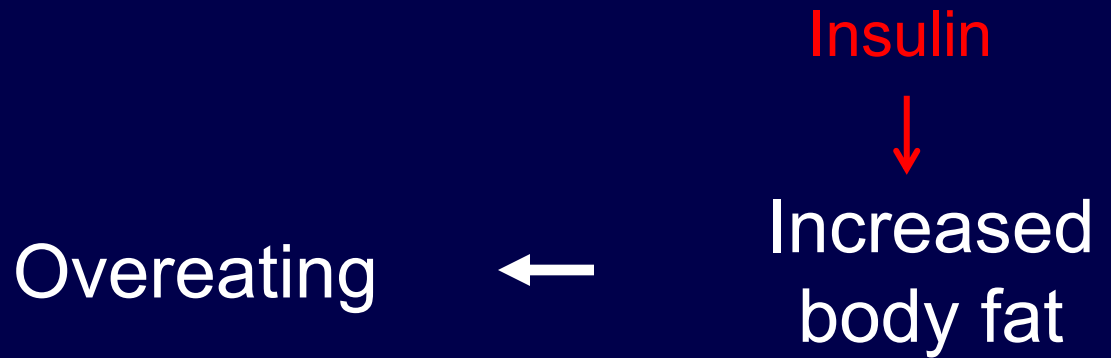
Carbohydrate-Insulin Model

The process of getting fat DRIVES overeating

Overeating ← Increased body fat

Carbohydrate-Insulin Model

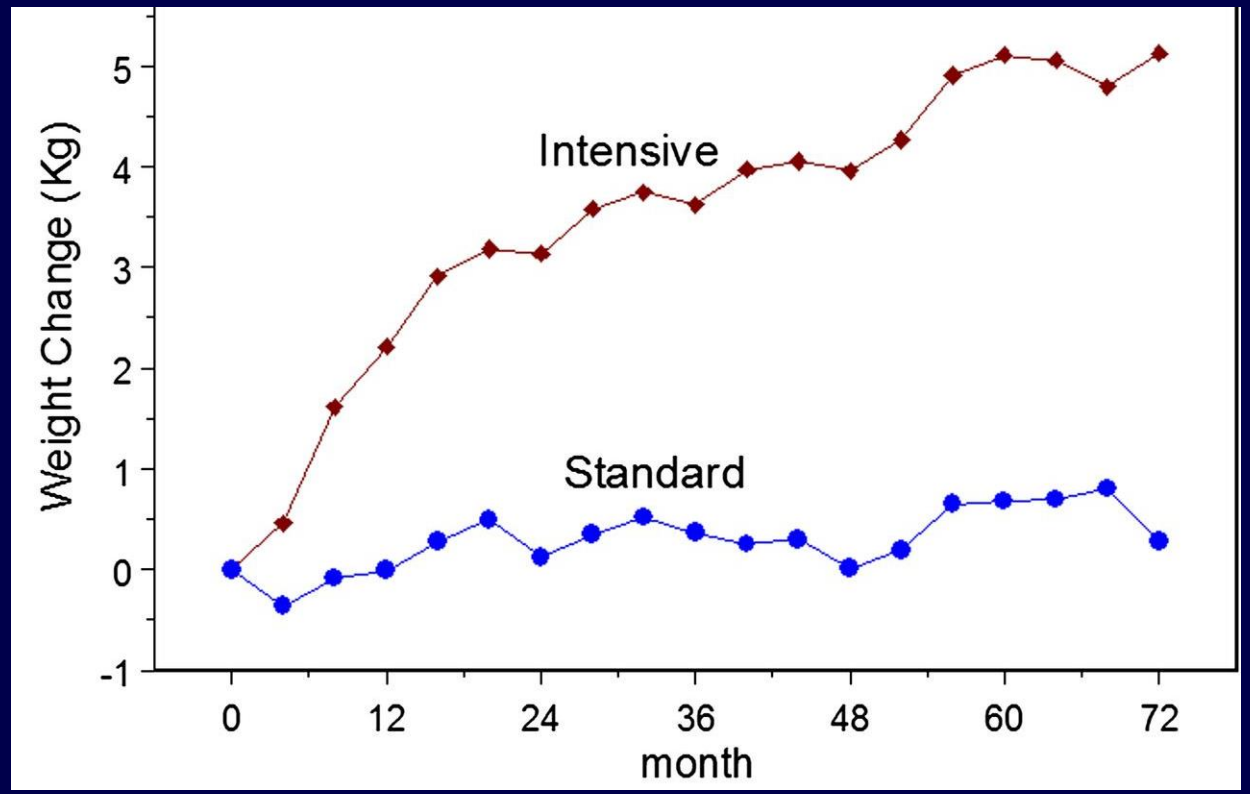
The process of getting fat DRIVES overeating



Insulin & Body Weight

ACCORD Trial

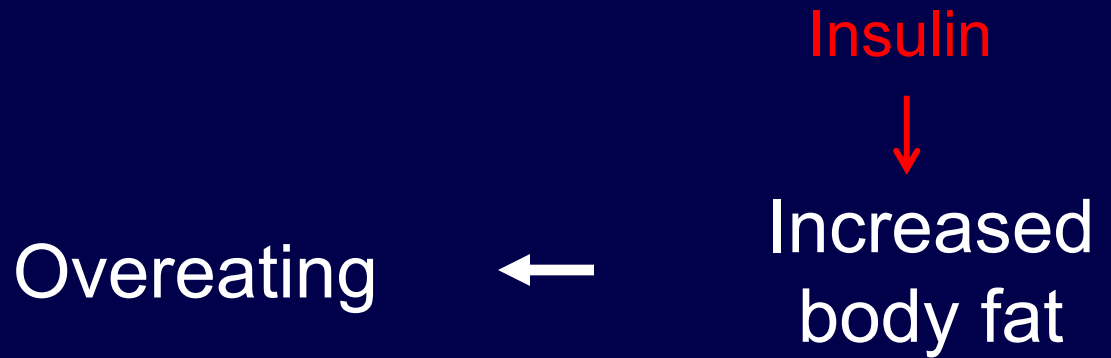
- 8,929 participants with T2DM
- Intensive treatment (with more insulin) versus standard treatment



Diabetes Care 36:2162-68

Carbohydrate-Insulin Model

The process of getting fat DRIVES overeating



Carbohydrate-Insulin Model

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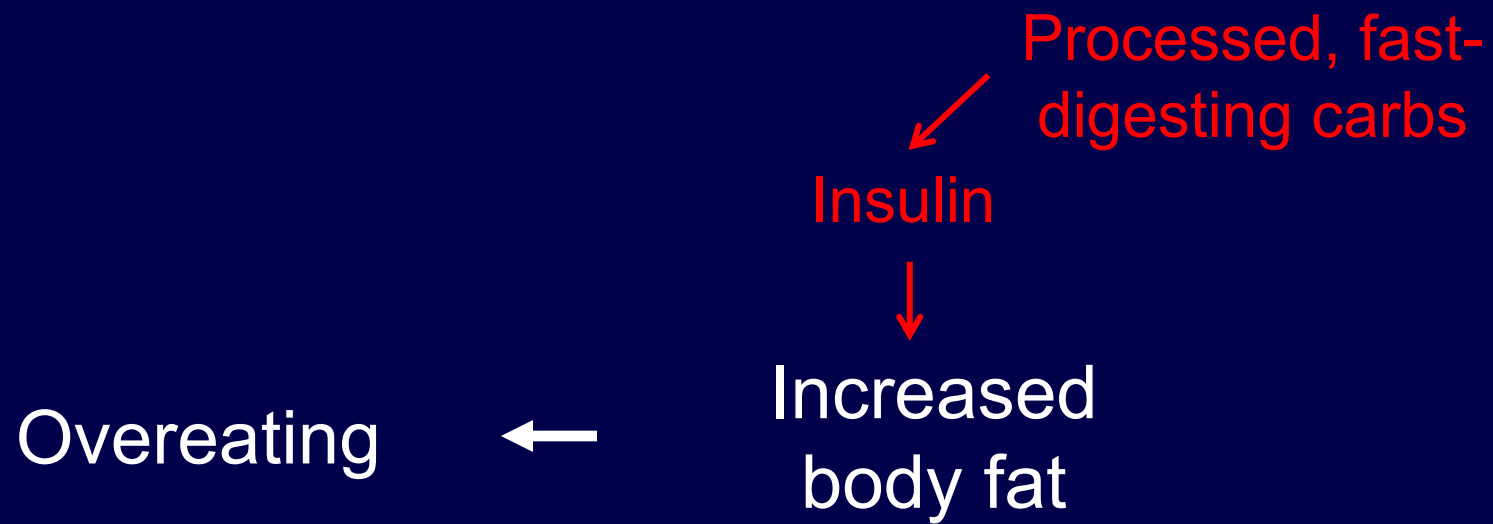


Two proof-of-concept studies

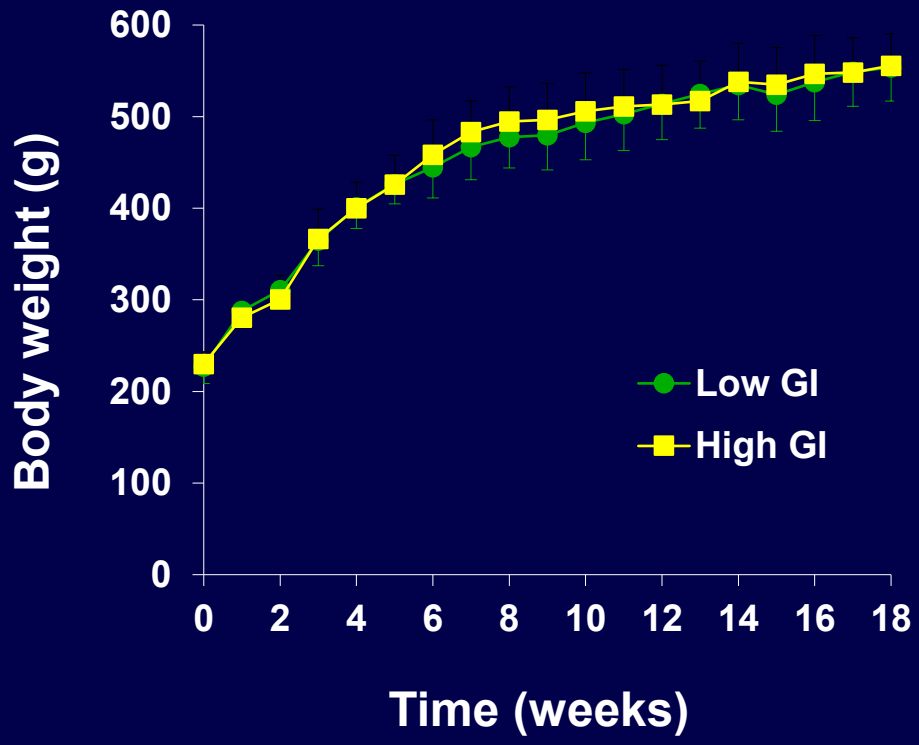
Effects of Fast-Digesting Carbs in Rodents

Study Design

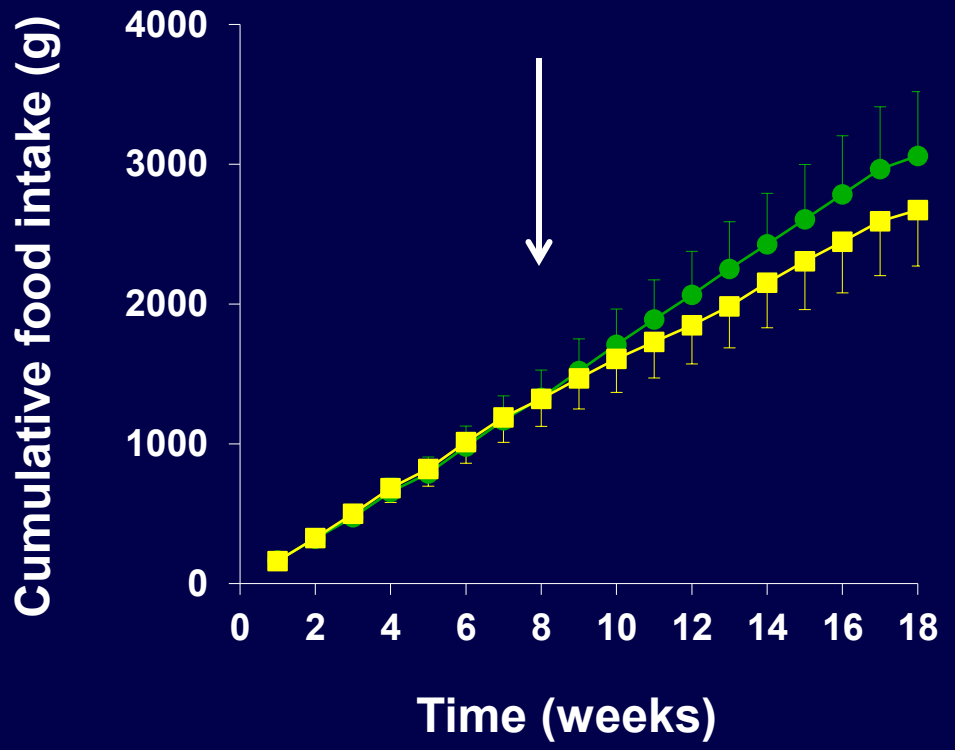
- Inbred rats given diets with same amounts of carb / protein / fat
  1. Fasting digesting starch (high “glycemic index” (GI) → high insulin)
  2. Slow digesting starch (low “glycemic index” (GI) → low insulin)
- Food intake controlled to maintain same weight between groups

Effects of Fast-Digesting Carbs in Rodents

Food intake and body weight



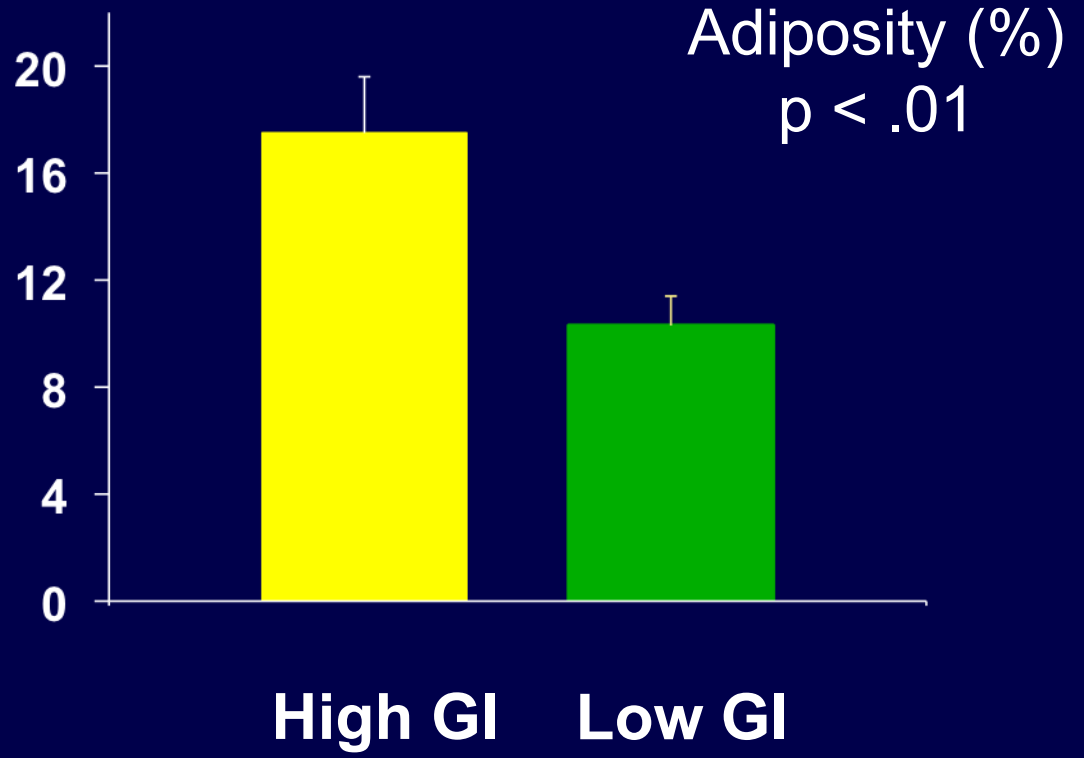
Energy restriction required, metabolism slowing down



Pawlak. Lancet 2004, 364:778-85

Effects of Fast-Digesting Carbs in Rodents

Differences in body composition

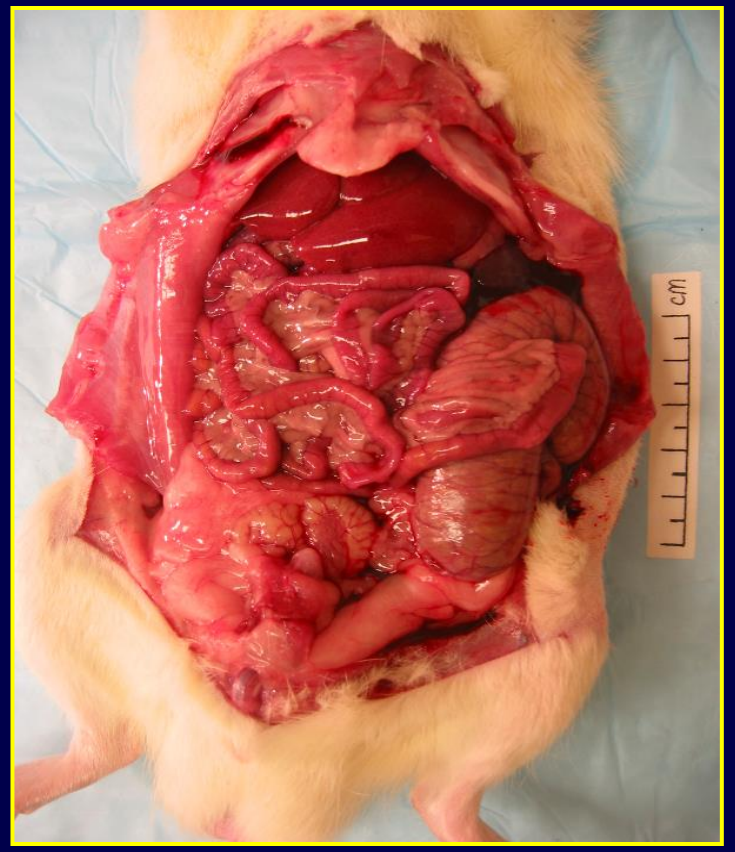


Pawlak. Lancet 2004, 364:778-85

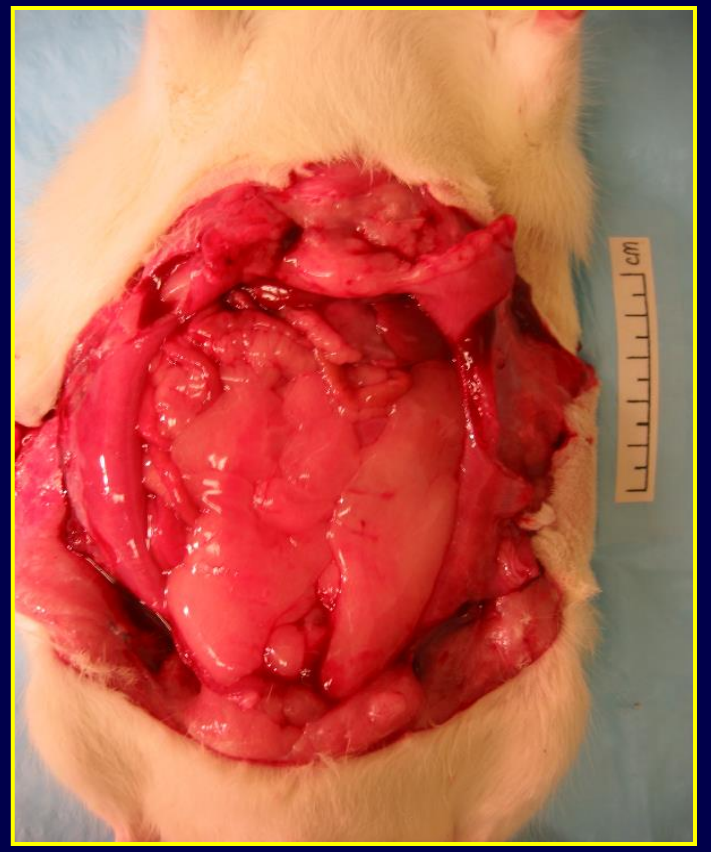
Effects of Fast-Digesting Carbs in Rodents

Differences in body composition

CANNOT be explained by calories in, calories out:



Low GI



High GI

- ⬇ Energy intake
- ⬇ Lean mass
- ⬆ Fat mass

Pawlak. Lancet 2004, 364:778-85

Do these effects occur in humans?

Carbs and Metabolism

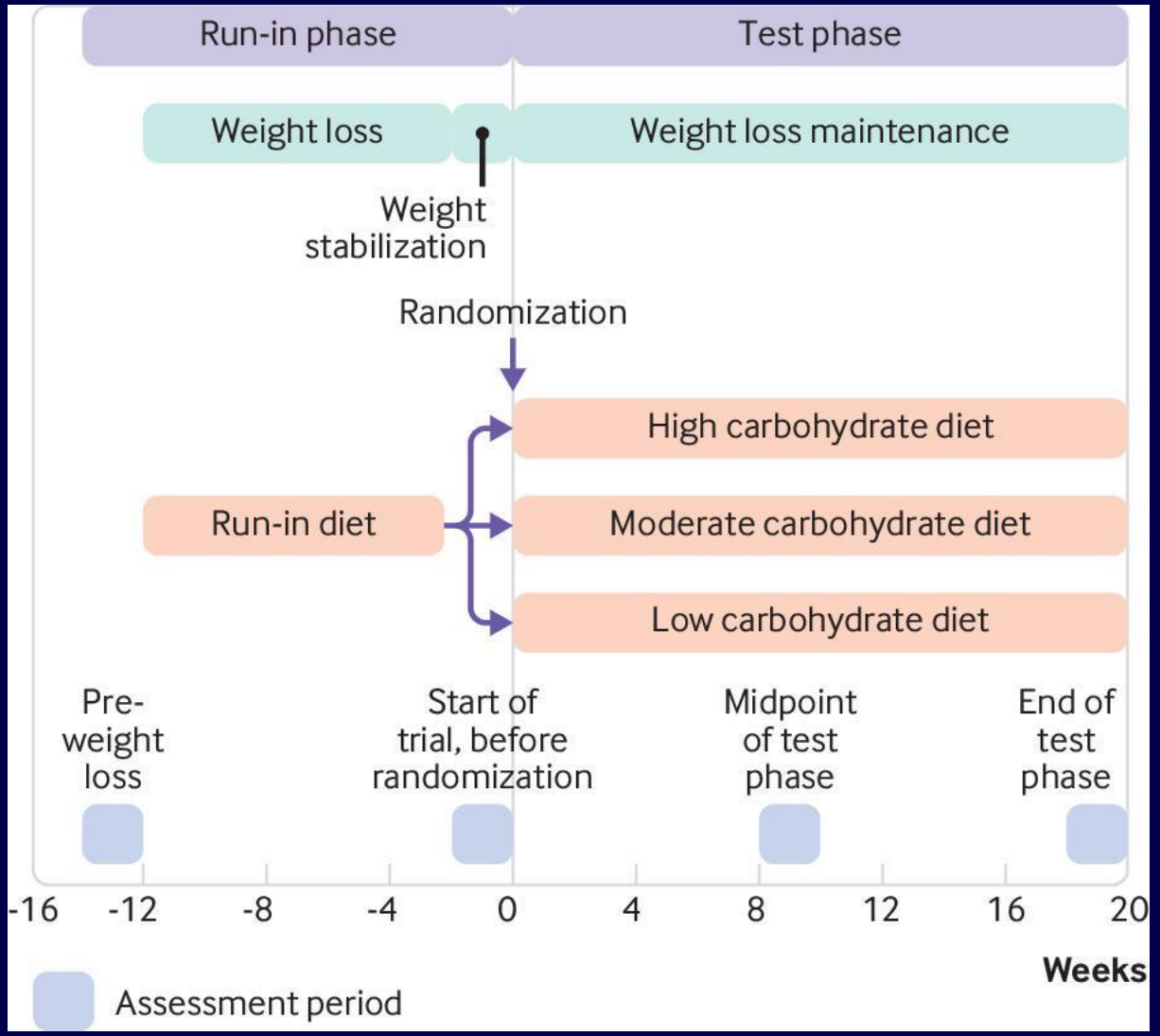
Framingham State Food Study (FS2)

Specific Aim

To evaluate the effect of three diets varying in carbohydrate on metabolism (calorie burn) over 5 months

Carbs and Metabolism

164 young adults with high body weight



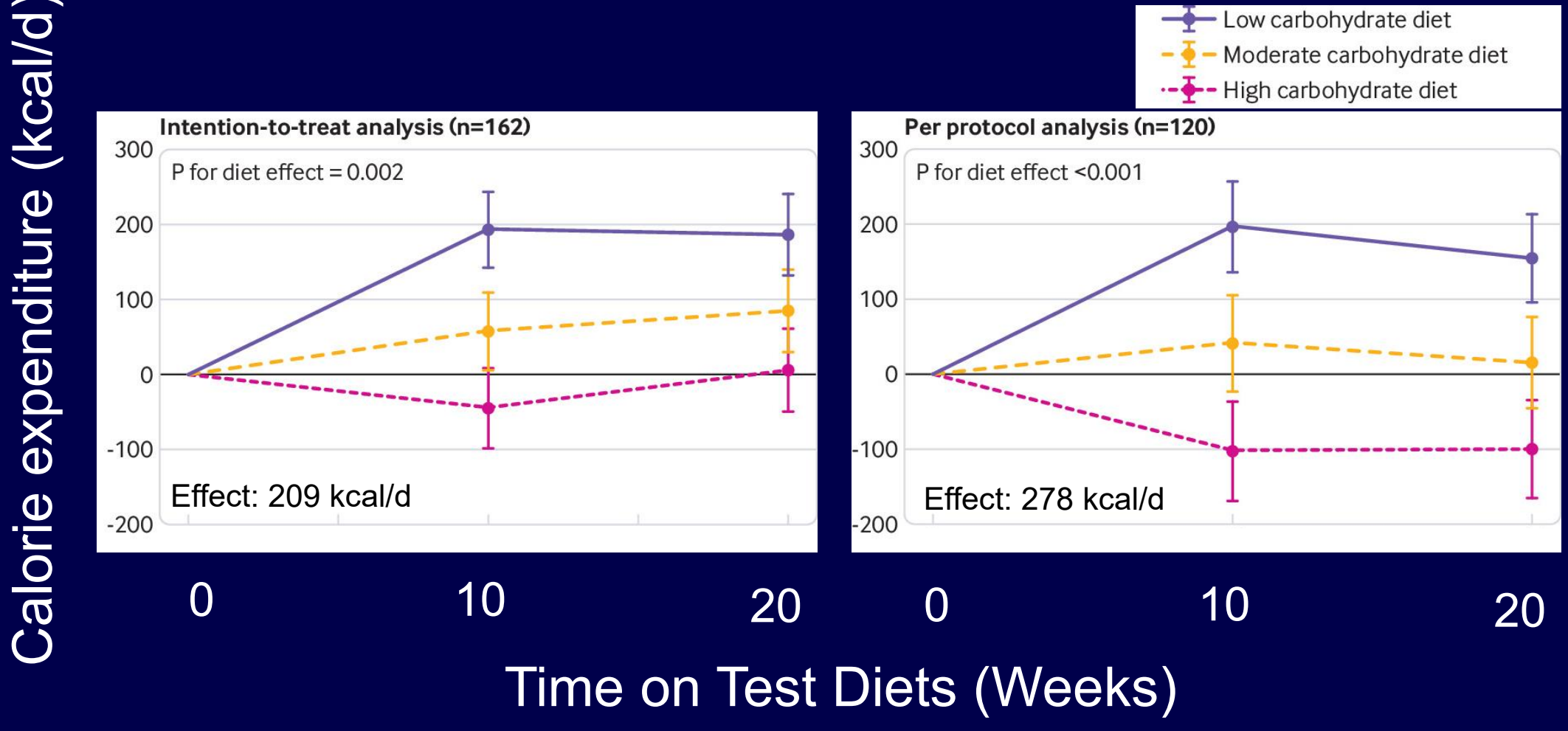
Carbs and Metabolism

Diet composition

	HI Carb	MOD Carb	LO Carb
Targets			
Carbohydrate (% energy)	**60**	**40**	**20**
Fat (% energy)	**20**	**40**	**60**
Protein (% energy)	20	20	20

Carbs and Metabolism

Energy expenditure (calorie burn)



Ebbeling. BMJ, 2018; 363:k4583

What about over the long term?

Meta-analyses of Low-Fat Diets

INFERIOR to all other comparison diets

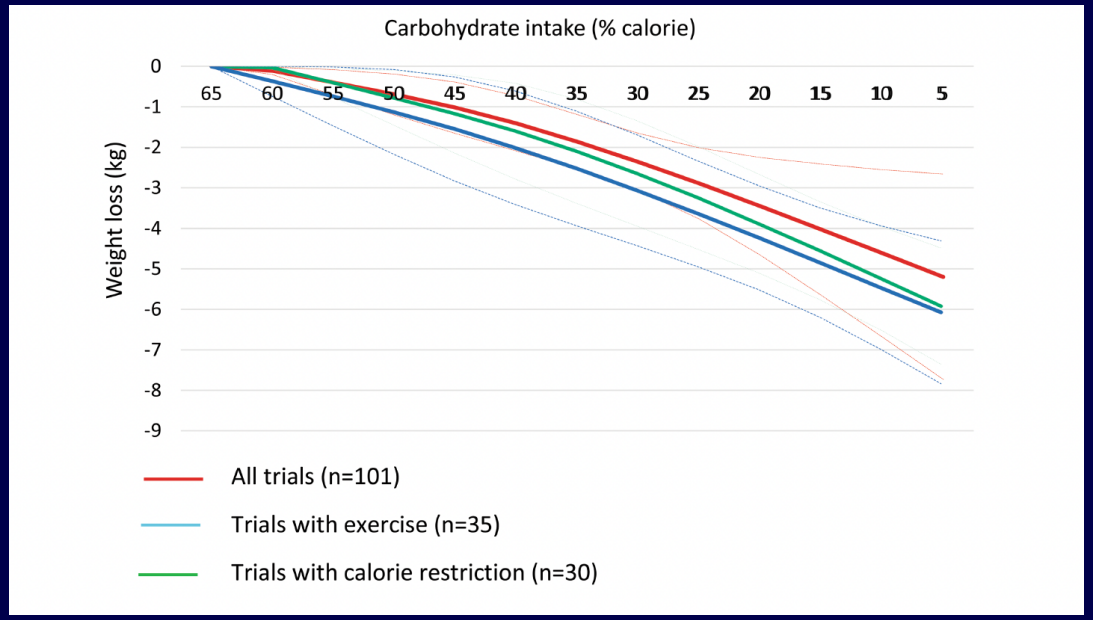
- Medium-fat Mediterranean diets
  Nordmann AJ. Am J Med 2011, 124:841-51
- Low-Carbohydrate diets
  Sackner-Bernstein J. PLoS One, 2015 20;10:e0139817
- Very low-carbohydrate diets.
  Bueno NB. Br J Nutr 2016, 115:466-79
- Ketogenic (ultra-low carbohydrate) diets
  Mansoor N. Br J Nutr 2013, 110:1178-87
- All higher-fat diets
  Tobias DK. Lancet Diabetes Endocrinology 2015, 3:968-79

Meta-analysis of Low-Carb Diets

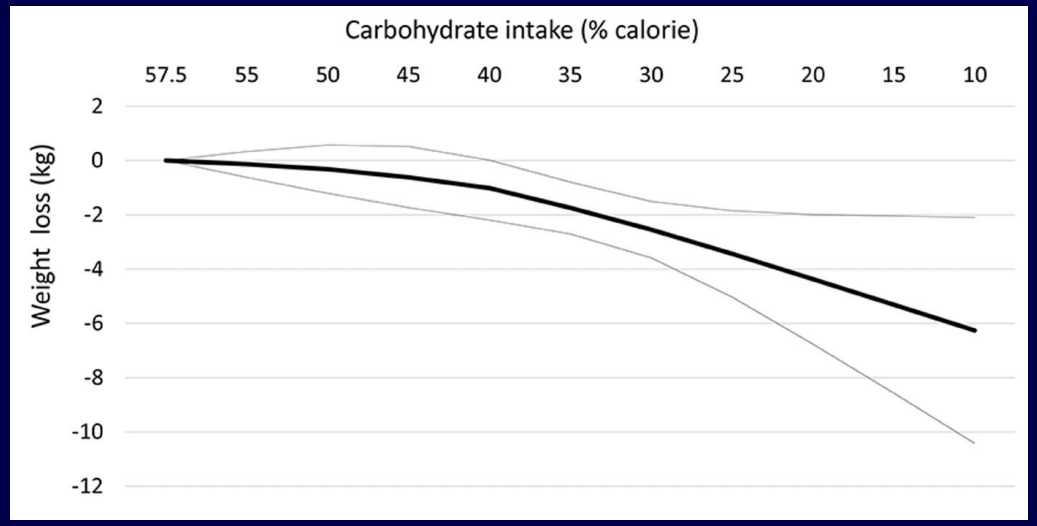
Advantage low-carb

- Dose response meta-analysis of 110 trials
- Carb-restricted (≤ 45%) versus control (> 45% CHO) diets
- **Conclusion**: "Carbohydrate restriction is an effective dietary strategy"

6-month data



12-month data



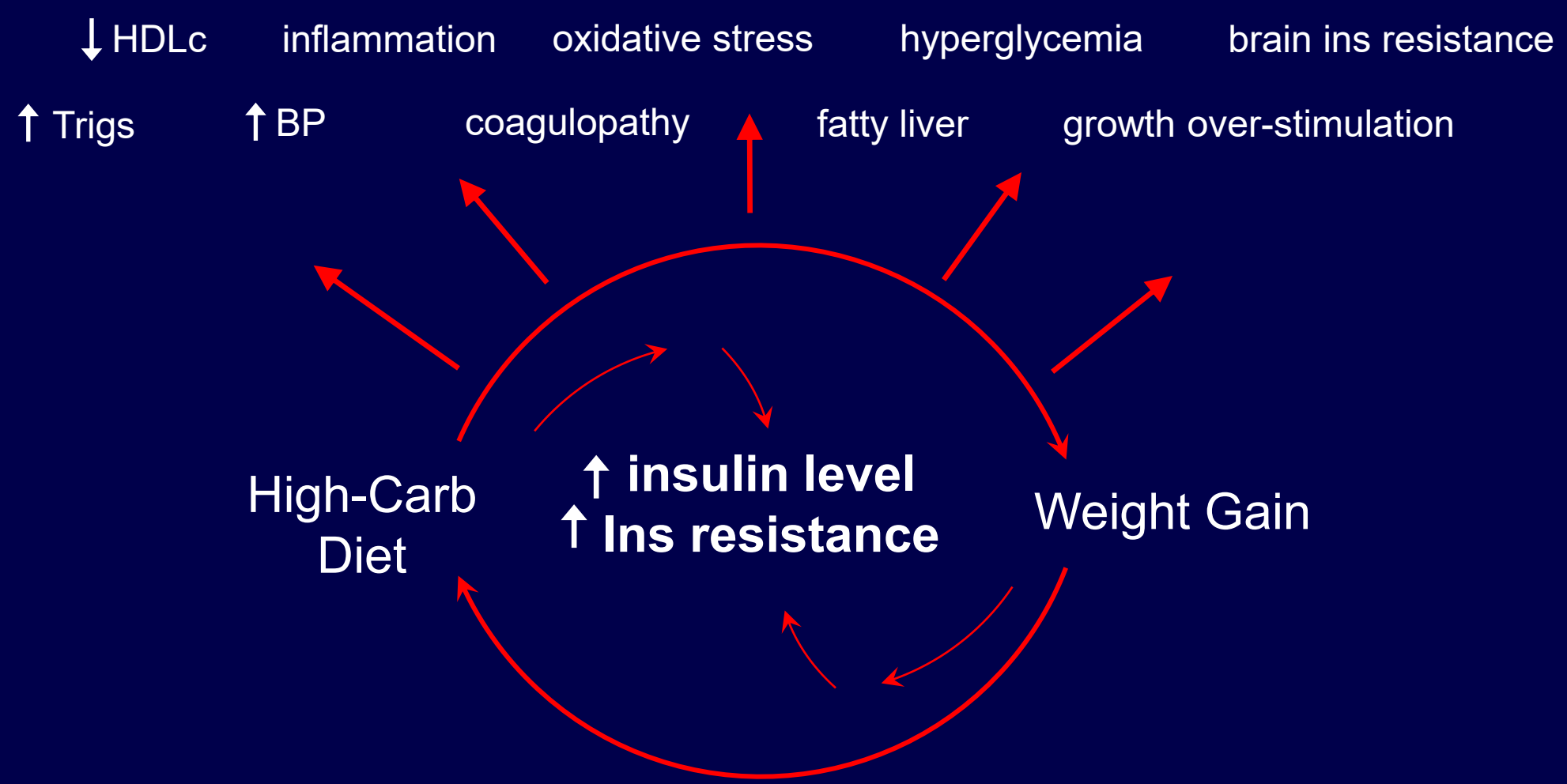
Soltani. Front Nutr 2023, 10:1287987

Processed Carbs & Healthy Life Span

Chronic diseases related to metabolic syndrome

Processed Carbs & Healthy Life Span

Chronic diseases related to metabolic syndrome



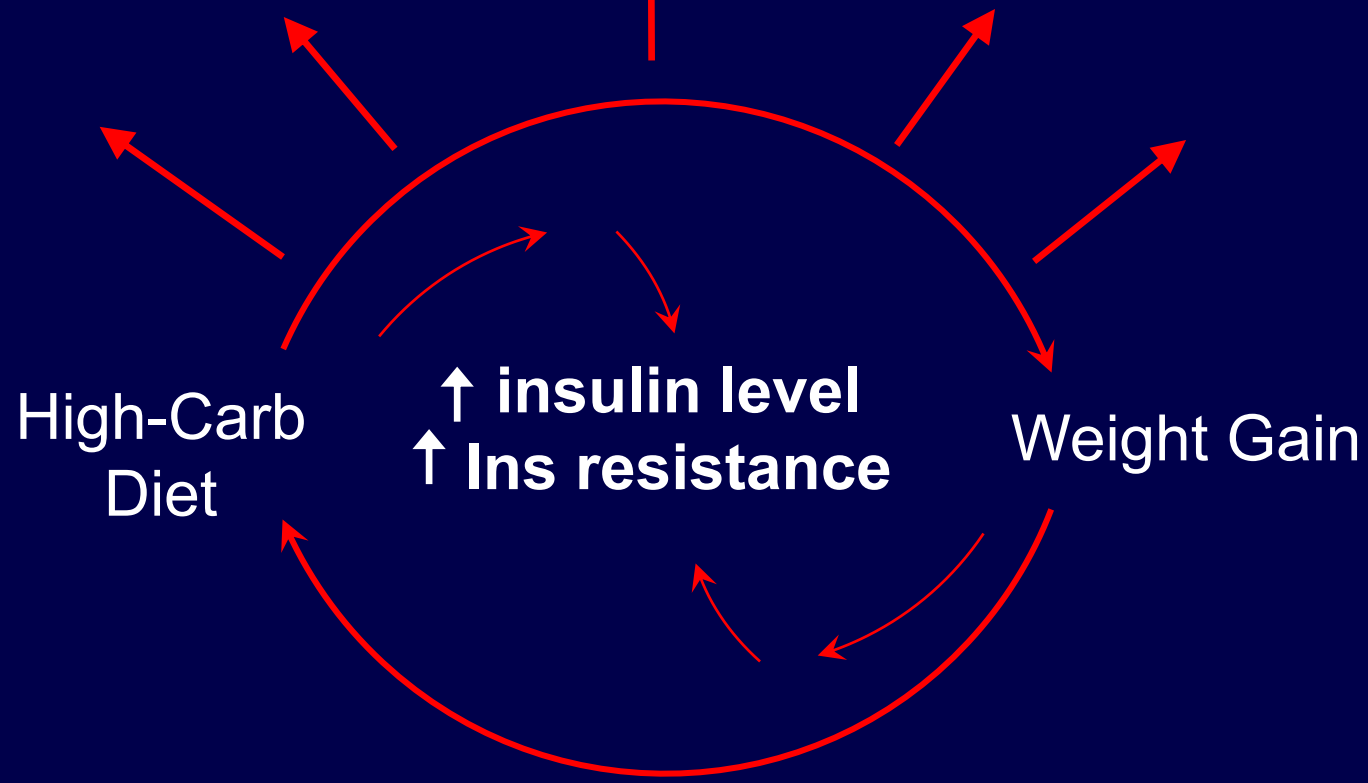
Processed Carbs & Healthy Life Span

Chronic diseases related to metabolic syndrome

Cardiovascular disease **Diabetes** **Cancer** **Alzheimer's**

↓ HDLc inflammation oxidative stress hyperglycemia brain ins resistance

↑ Trigs ↑ BP coagulopathy fatty liver growth over-stimulation



What about the new weight loss drugs
(Ozempic, Wegovy, Zepbound) ?

GLP-1 Receptor Agonists

Similarities to a low-carb diet

- Metabolic actions:
  - Slow gastric emptying
  - Delay nutrient absorption
  - Lower insulin
  - Lower ghrelin
  - Raise adiponectin
  - Improve measures of leptin sensitivity

GLP-1 Receptor Agonists

Potential synergies?

Viewpoint

May 1, 2023

Childhood Obesity at the Crossroads of Science and Social Justice

David S. Ludwig, MD, PhD[1,2]; Jens J. Holst, MD, DMSc[3]

» Author Affiliations | Article Information

JAMA. 2023;329(22):1909-1910. doi:10.1001/jama.2023.7592

Thus, combining a low-carb diet with GLP-1, we could:

- Increase drug efficacy
- At a lower drug dose
- With fewer side effects
- Have a way to transition patients off drug without weight regain

Low-Carb Diet: Win-Win-Win for Industry

Benefits to the life and health insurance companies

Major improvement of metabolic health throughout population:

Win Win Win

Low-Carb Diet: Win-Win-Win for Industry

Benefits to the life and health insurance companies

Major improvement of metabolic health throughout population:

Reduced cost for GLP-1 and other drugs to **prevent** chronic diseases

Win

Win

Low-Carb Diet: Win-Win-Win for Industry

Benefits to the life and health insurance companies

Major improvement of metabolic health throughout population:

Reduced cost for GLP-1 and other drugs to **prevent** chronic diseases

Reduced cost to **treat** diet-related disease (diabetes, CVD, etc.)

Win

Low-Carb Diet: Win-Win-Win for Industry

Benefits to the life and health insurance companies

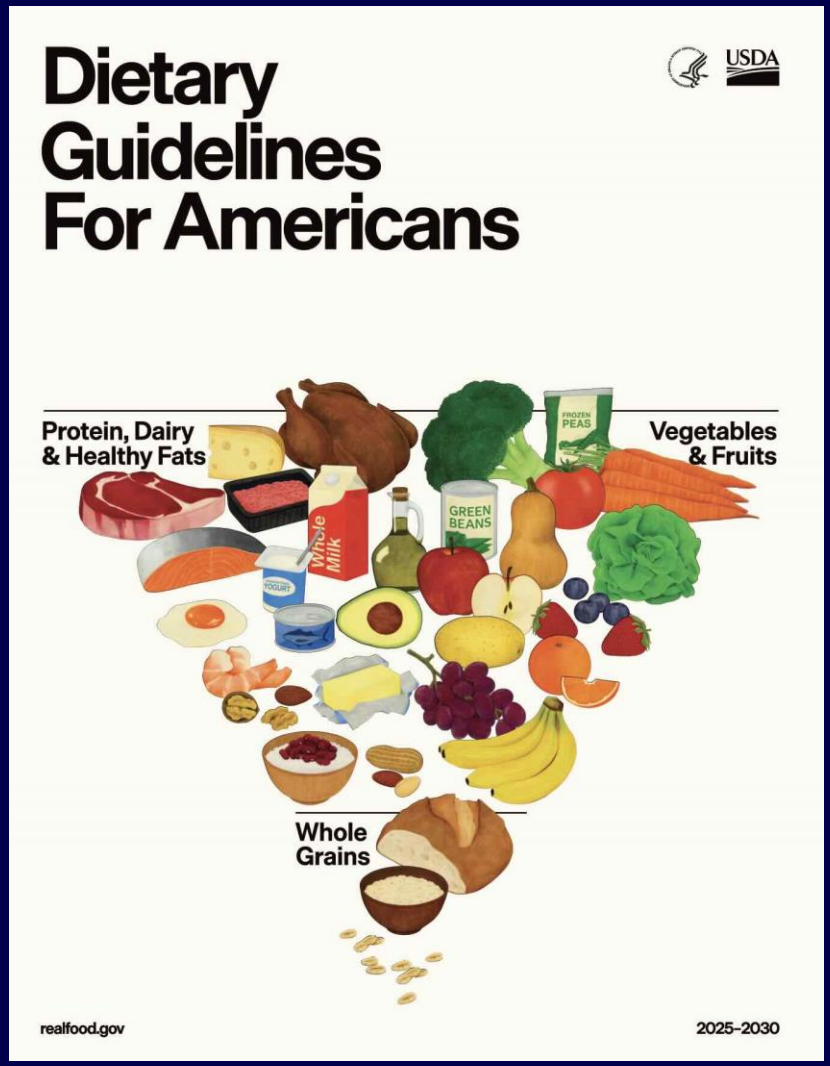
Major improvement of metabolic health throughout population:

Reduced cost for GLP-1 and other drugs to **prevent** chronic diseases

Reduced cost to **treat** diet-related disease (diabetes, CVD, etc.)

Improved claims ratios from **lower** mortality and morbidity rates

Moving Forward …



Limit Highly Processed Foods, Added Sugars, & Refined Carbohydrates