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Obesity facts, Diets for Health and Weight loss

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Disclosures

- Nothing to disclose

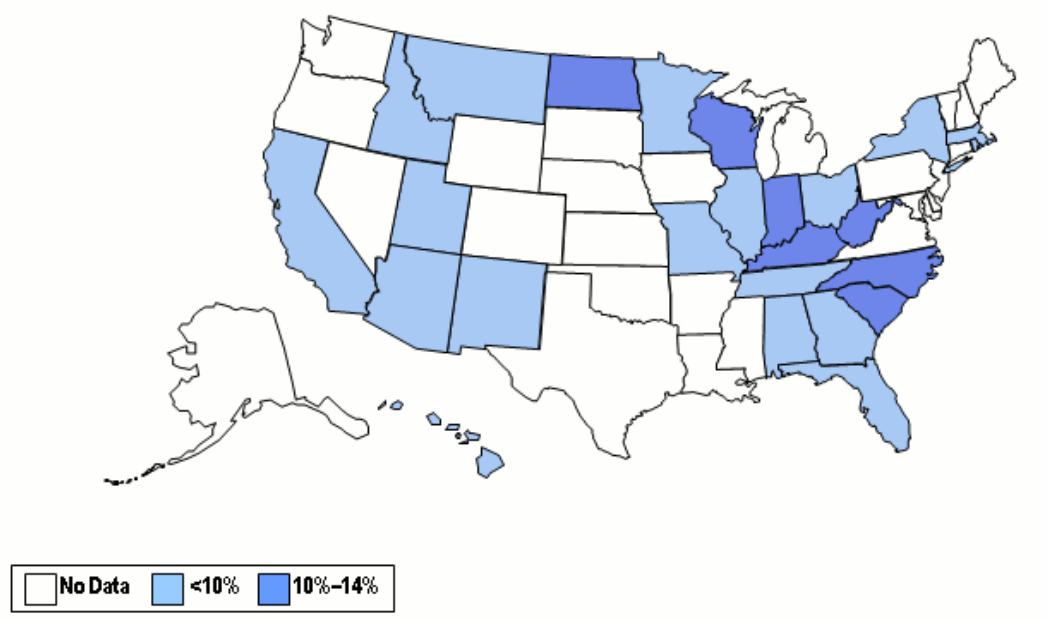
Objectives

- Review data on obesity, BMI, CV risk and Diabetes risk
- Review data on different types of diets and chronic diseases
- Review recent data on time restrictive eating on health and aging process

Obesity is counterintuitive

- Hides in plain sight: not recognized by physicians
- Not a problem of recent excess of food availability
- NOT a single disorder
- Not slowing down, in any country

Obesity in 1986



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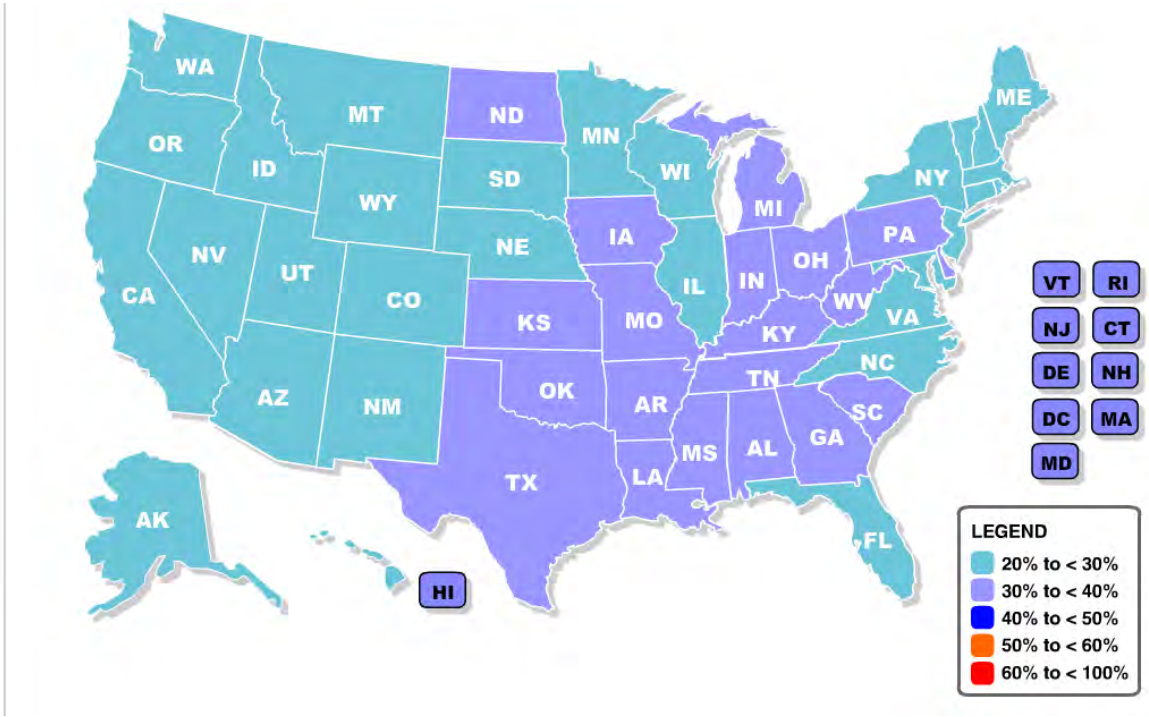
Obesity in 2013



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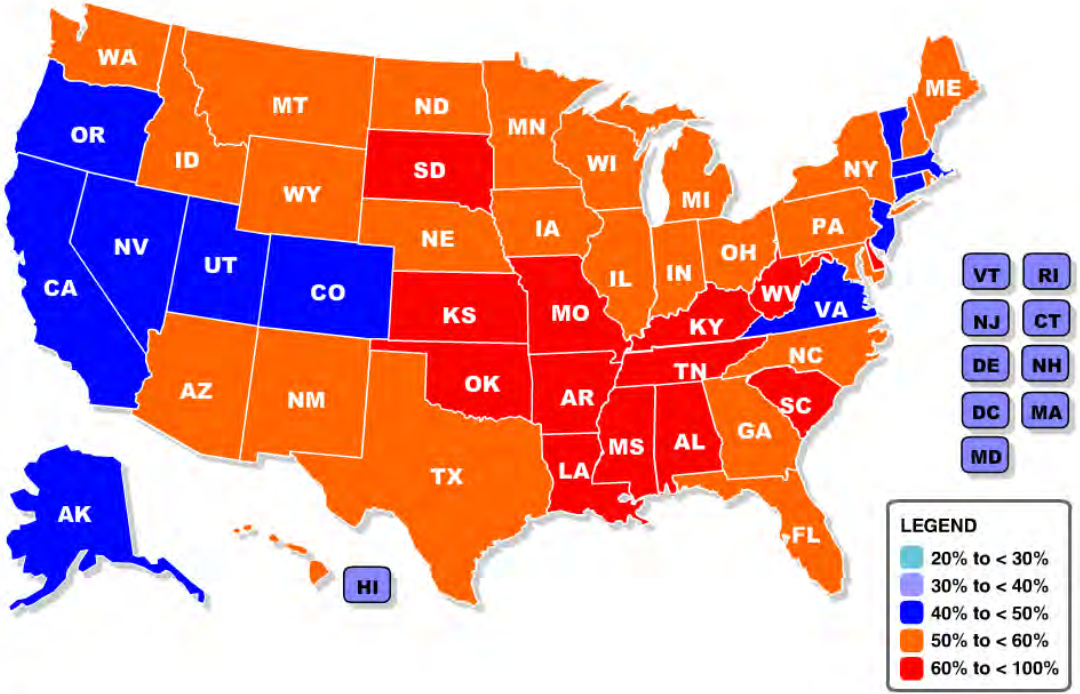
Obesity in 2030 (projected)



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How to Evaluate?

- BMI：weight in kilograms divided by the square of the height in meters
- Waist circumference
- Ideal weight （BMI of 20)

For women over 5 feet (152 cm):

– 100 lb (45 kg) plus 5 lb (2.3 kg) for each additional inch (2.5 cm)

For women under 5 feet (152 cm):

– 100 lb (45 kg) minus 5 lb (2.3 kg) for each additional inch (2.5 cm) under 5 feet

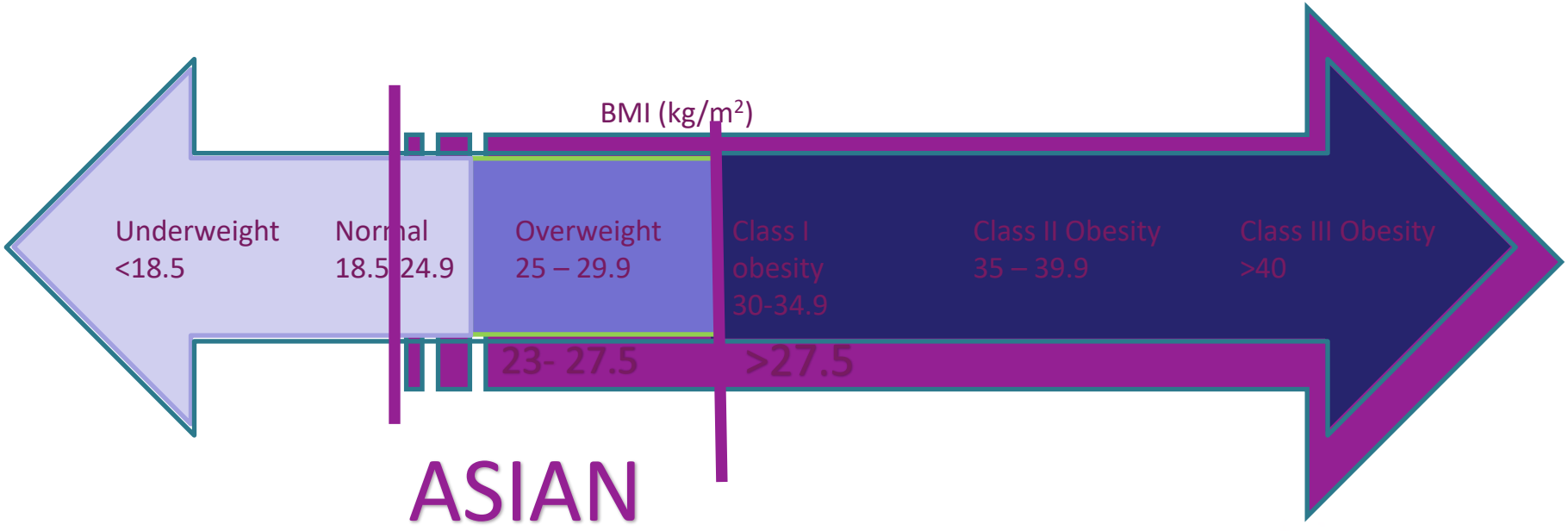
For men over 5 feet (152 cm):

– 106 lb (48 kg) plus 6 lb (2.7 kg) for each additional inch (2.5 cm)

Height†	Weight‡
	pounds
4′10″	91–119
4′11″	94–124
5′0″	97–128
5′1″	101–132
5′2″	104–137
5′3″	107–141
5′4″	111–146
5′5″	114–150
5′6″	118–155
5′7″	121–160
5′8″	125–164
5′9″	129–169
5′10″	132–174
5′11″	136–179
6′0″	140–184
6′1″	144–189
6′2″	148–195
6′3″	152–200
6′4″	156–205
6′5″	160–211
6′6″	164–216

Willett W et ***al***. NEJM 1999;341(6):427-433

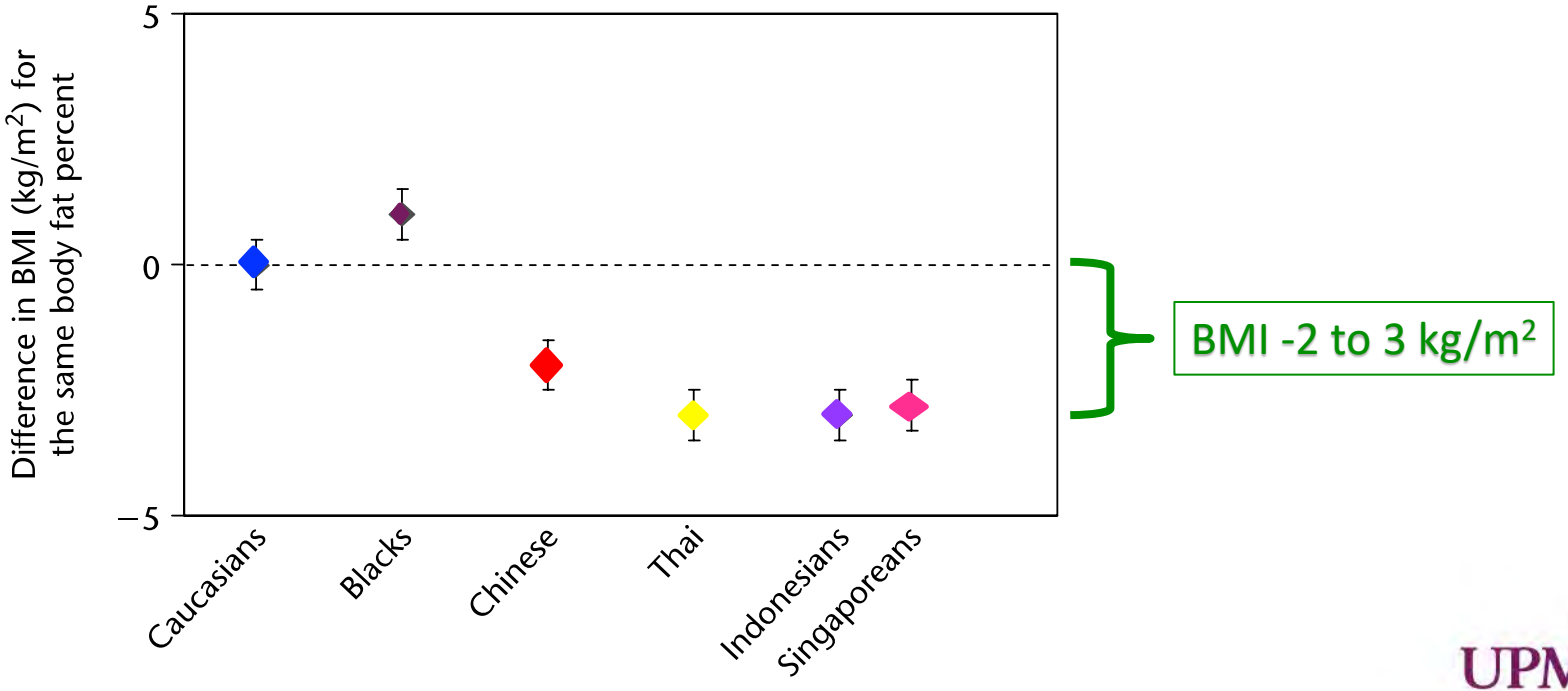
Weight categories based on BMI



Adapted from Obesity Algorithm Obesity Medicine Association 2019

BMI and Ethnicity

Adjustments to be made in BMI to reflect
Equal levels of % body fat compared with
That in Caucasians of the same age and sex



Hu. Obesity Epidemiology. Handbook of Obesity 1998:81-92

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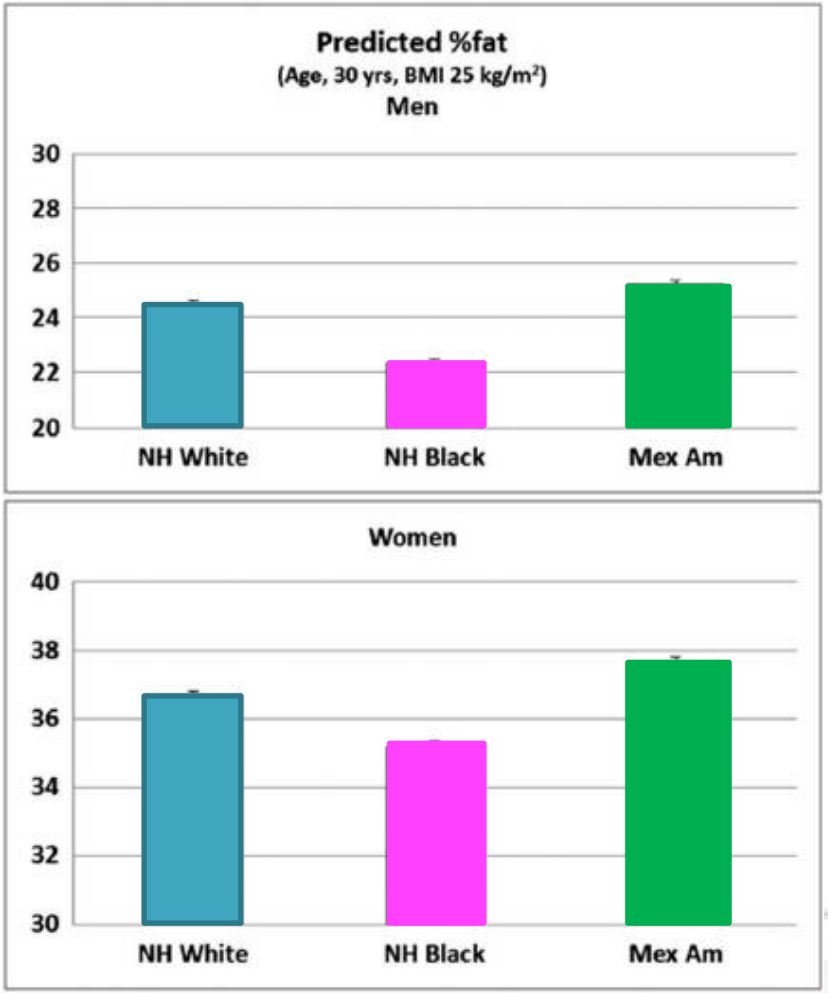
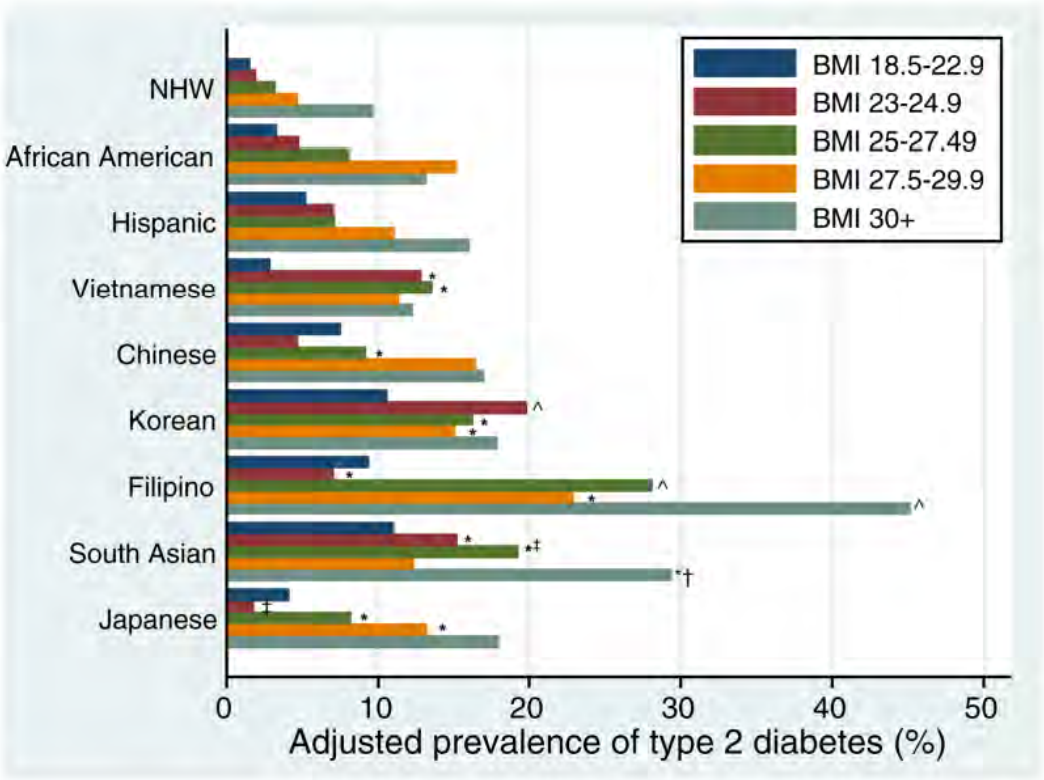
BMI and Ethnicity

- BMI-adiposity relations appear to vary significantly across race/ethnic groups



Heysmsfield S et al . Obes Rev. 2016 March; 17(3):262-275

BMI and ethnicity



the prevalence of self-reported type 2 diabetes within 5 BMI categories for NHW, African American, Hispanic and Asian subgroups

Jih J et al. Prev Med. 2014 Aug; 65: 1–6.

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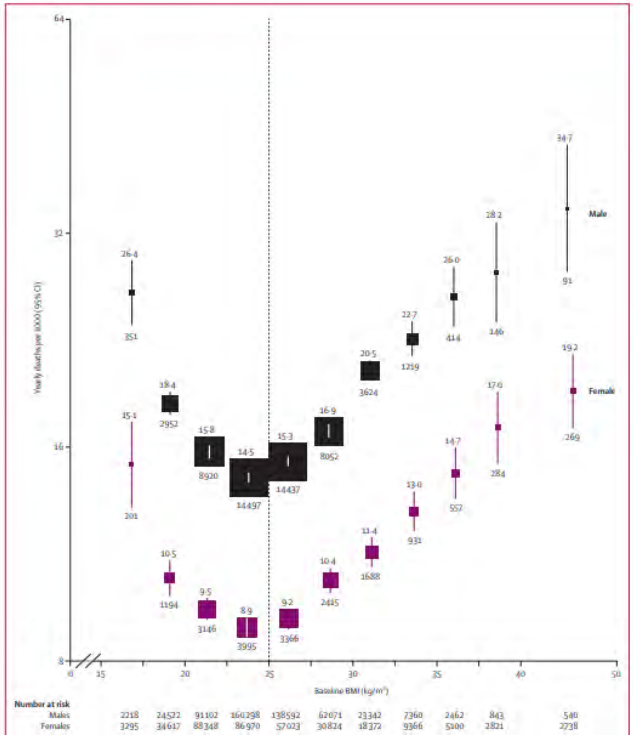
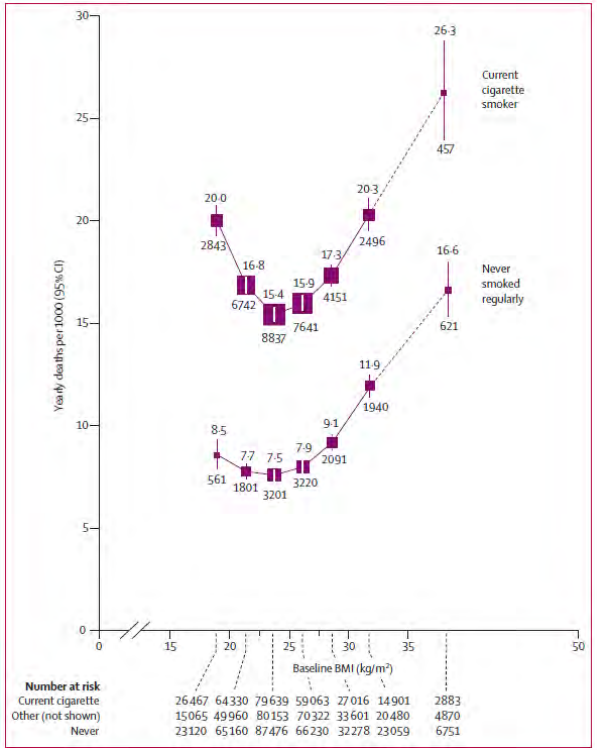
BMI and mortality/ morbidity





Prospective Studies Collaboration Lancet 2009; 373: 1083–96

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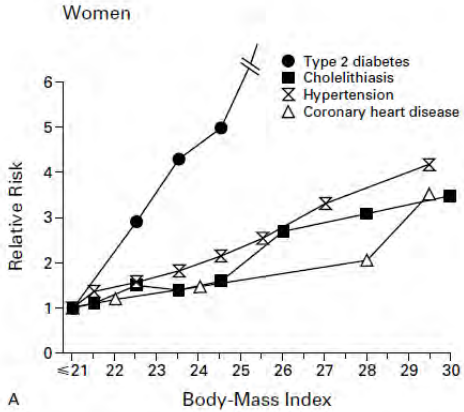
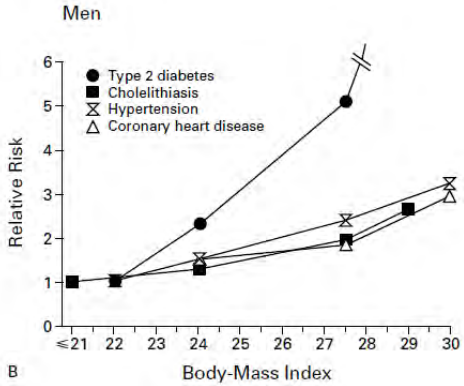
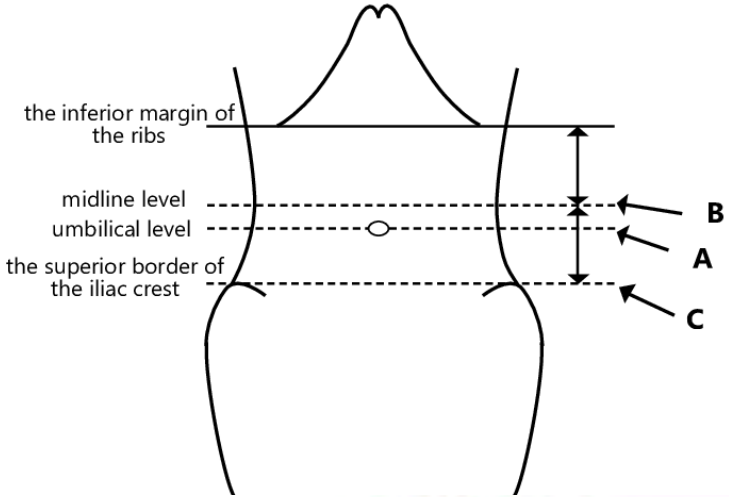




Willet W et al. NEJM 1999;341(6):427-433

Waist circumference

- >102 (40inches) for men, or >88 (35 inches) for women
- measured at the midpoint between the lower border of the rib cage and the iliac crest



Hu F. Obesity Epidemiology. New York City: Oxford University Press, 2008; 53–83

International Diabetes Federation Criteria for Ethnic or country-specific values for Waist Circumference

Country or Ethnic Group	Sex	Waist Circumference (cm)
Europid	Men Women	>94 >80
South Asian	Men Women	>90 >80
Chinese	Men Women	>90 >80
Japanese	Men Women	>90 >80

WHO (2011) Waist Circumference and Waist-Hip Raito.

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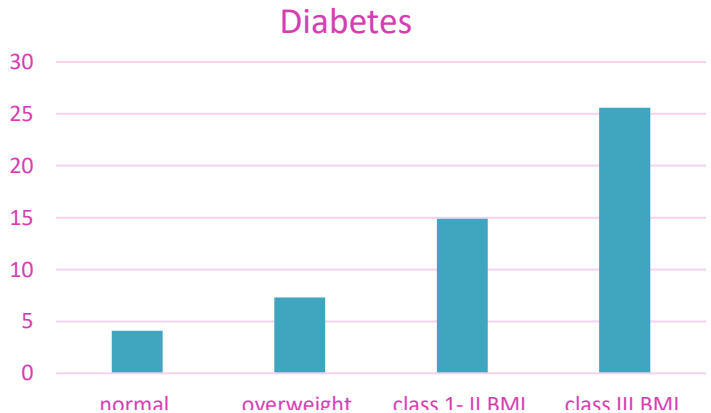
Obesity and T2DM risk

- Diet affect directly obesity
- Risk of IFG and diabetes increase with BMI



Mokdad A et al JAMA. 2003; 289: 76-79

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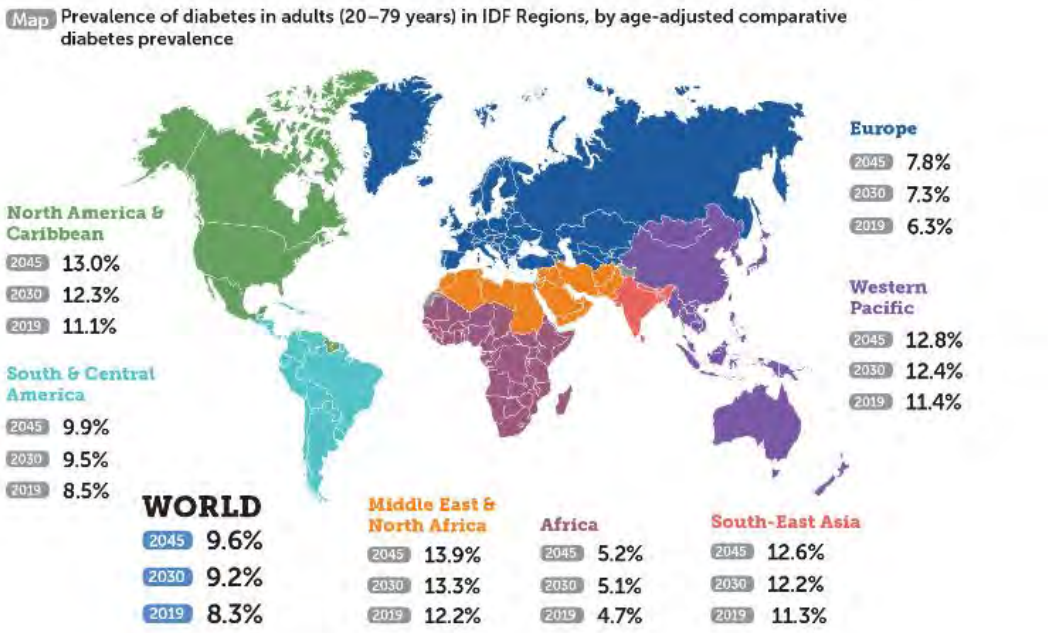
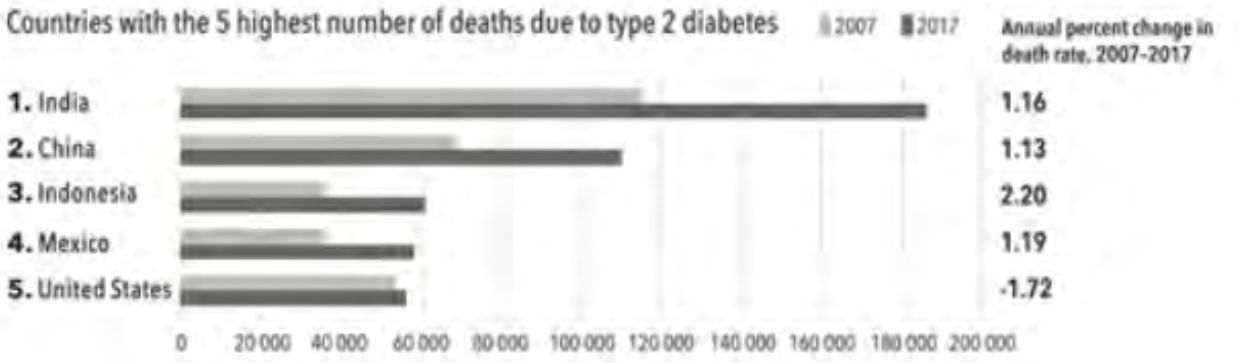
Diabetes prevalence in the world



151 mill 2000 (4.6%)
463 mill 2019 (9.3%)
700 mill 2045 (10.9)



GBD 2017 JAMA. 2019;322(16):1542.

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- Diabetes→ second leading cause of BMI-related deaths in 2015 and contributed to 0.6 million deaths
- Diabetes leading cause of years lived with disability related to BMI

The GBD 2015 Obesity Collaborators. N Engl J Med 2017; 377:13-27

HOW TO attempt to FIX THIS?

Challenges of weight reduction

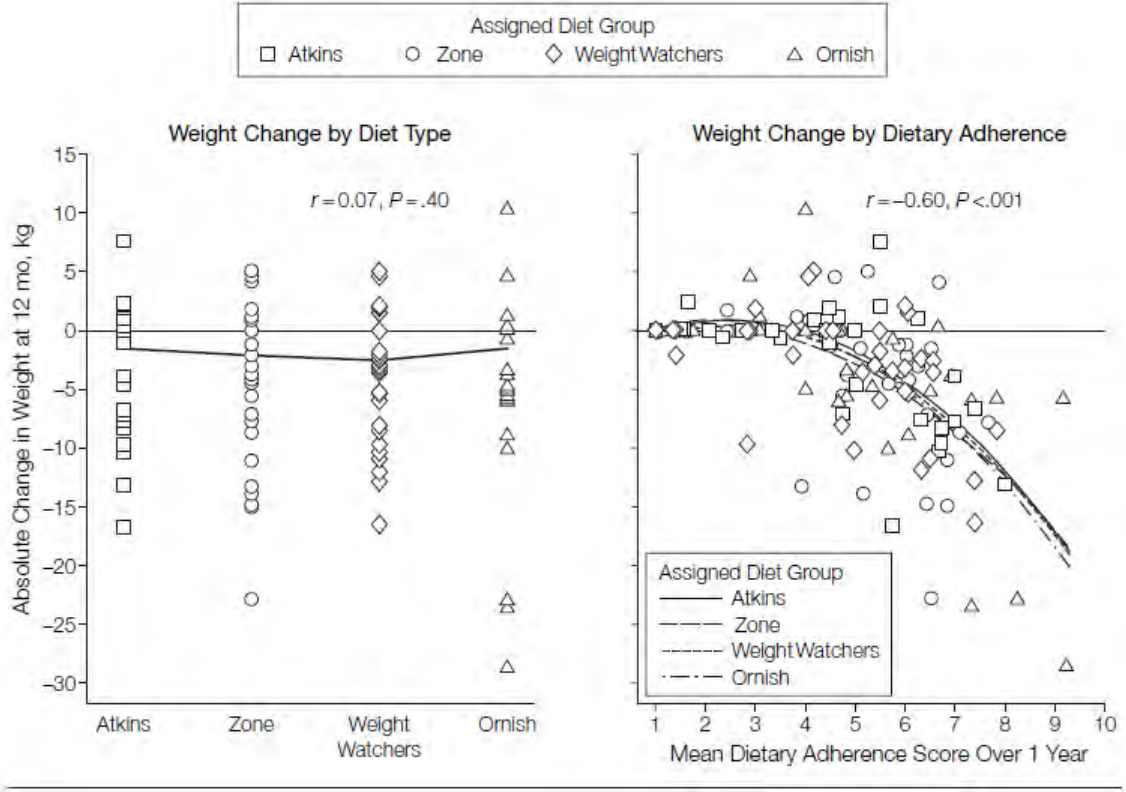
- Adaptive biological responses to weight loss

- Increase in appetite observed after weight loss associated with changes in hormones

Weight loss plans

- Lifestyle changes, no quick diet solutions,
- Realistic goals
- Not every “ diet” is successful for everyone
- Trial and error

Adherence is the most important part for weight loss



Dansinger et Al. JAMA, 2005 (93) 43-53

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Caloric balance

- Caloric needs calculation
- Macros
  - Carbs45-65% emphasis on high quality, non processed foods
  - Protein 10-35%
  - Fat 20-35%
  - Fiber 14g per 1000 calories

Caloric needs

Measured and estimated resting metabolic rates of the body mass index (BMI) groups.

Variable	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
	BMI <20.0 kg/m^2	BMI 20.0–25.0 kg/m^2	BMI 25.1–29.9 kg/m^2	BMI 30.0–39.9 kg/m^2	BMI 40.0–49.9 kg/m^2	BMI >50.0 kg/m^2
Measured RMR (kcal/day)	1197 ± 115	1420 ± 223	1508 ± 241	1689 ± 311	1944 ± 280	2575 ± 656
Mifflin St. Jeor (kcal/day)	1216 ± 116	1409 ± 221	1515 ± 240	1680 ± 249	1939 ± 257	2502 ± 630
Livingston (kcal/day)	1216 ± 111	1404 ± 201	1522 ± 225	1662 ± 230	1859 ± 208	2283 ± 457
Muller (kcal/day)	1220 ± 82	1415 ± 193	1558 ± 211	1744 ± 228	2028 ± 234	2646 ± 655
WHO (wt only) (kcal/day)	1244 ± 57	1460 ± 202	1597 ± 229	1756 ± 268	2002 ± 317	2666 ± 932
WHO (wt and ht) (kcal/day)	1265 ± 70	1467 ± 201	1600 ± 231	1755 ± 269	1991 ± 311	2656 ± 933
Oxford (wt only) (kcal/day)	1204 ± 61	1411 ± 191	1563 ± 223	1755 ± 275	2034 ± 316	2792 ± 998
Oxford (wt and ht) (kcal/day)	1245 ± 95	1435 ± 199	1561 ± 228	1720 ± 263	1948 ± 292	2583 ± 895
Harris Benedict (kcal/day)	1275 ± 95	1473 ± 209	1588 ± 232	1774 ± 284	2035 ± 302	2762 ± 905

D.C. Frankenfield. Clinical Nutrition 32 (2013) 976e982

Caloric needs

(resting metabolic rate)

- Man
  - 10 x weight (kg) + 6.25 x height (cm) - 5 x age (y) + 5
- Women
  - 10 x weight (kg) + 6.25 x height (cm) - 5 x age (y) - 161

Mifflin MD, St Jeor ST et al, Am J Clin nutr 1990 Feb;51(2):241-7.

Males

Age	Sedentary[a]	Moderately Active[b]	Active[c]
9	1,600	1,800	2,000
10	1,600	1,800	2,200
11	1,800	2,000	2,200
12	1,800	2,200	2,400
13	2,000	2,200	2,600
14	2,000	2,400	2,800
15	2,200	2,600	3,000
16	2,400	2,800	3,200
17	2,400	2,800	3,200
18	2,400	2,800	3,200
19-20	2,600	2,800	3,000
21-25	2,400	2,800	3,000
26-30	2,400	2,600	3,000
31-35	2,400	2,600	3,000
36-40	2,400	2,600	2,800
41-45	2,200	2,600	2,800
46-50	2,200	2,400	2,800
51-55	2,200	2,400	2,800
56-60	2,200	2,400	2,600
61-65	2,000	2,400	2,600
66-70	2,000	2,200	2,600
71-75	2,000	2,200	2,600
76 & Up	2,000	2,200	2,400

Females[d]

Age	Sedentary[a]	Moderately Active[b]	Active[c]
9	1,400	1,600	1,800
10	1,400	1,800	2,000
11	1,600	1,800	2,000
12	1,600	2,000	2,200
13	1,600	2,000	2,200
14	1,800	2,000	2,400
15	1,800	2,000	2,400
16	1,800	2,000	2,400
17	1,800	2,000	2,400
18	1,800	2,000	2,400
19-20	2,000	2,200	2,400
21-25	2,000	2,200	2,400
26-30	1,800	2,000	2,400
31-35	1,800	2,000	2,200
36-40	1,800	2,000	2,200
41-45	1,800	2,000	2,200
46-50	1,800	2,000	2,200
51-55	1,600	1,800	2,200
56-60	1,600	1,800	2,200
61-65	1,600	1,800	2,000
66-70	1,600	1,800	2,000
71-75	1,600	1,800	2,000
76 & Up	1,600	1,800	2,000

Sedentary lifestyle→ physical activity of independent living.
Moderately active→ physical = walking about 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the activities of independent living.
Active→physical activity = walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the activities of independent living.

U.S. Department of Health and Human Services and U.S. Department of Agriculture. *2015–2020 Dietary Guidelines for Americans*. 8th Edition. December 2015. Available at http://health.gov/dietaryguidelines/2015/guidelines/.

Resting metabolic rate machine

(falk and Mkeesport)

1.Don't eat or exercise 8 hours prior to your test.
2.Don't drink coffee 4-5 hours prior to your test.
3.Don't smoke or drink alcohol.
4.Don't participate in vigorous/high intensity weight training 12 hours prior.
5.Come rested and relaxed.

Table 1. **Global and regional per capita food consumption (kcal per capita per day)**

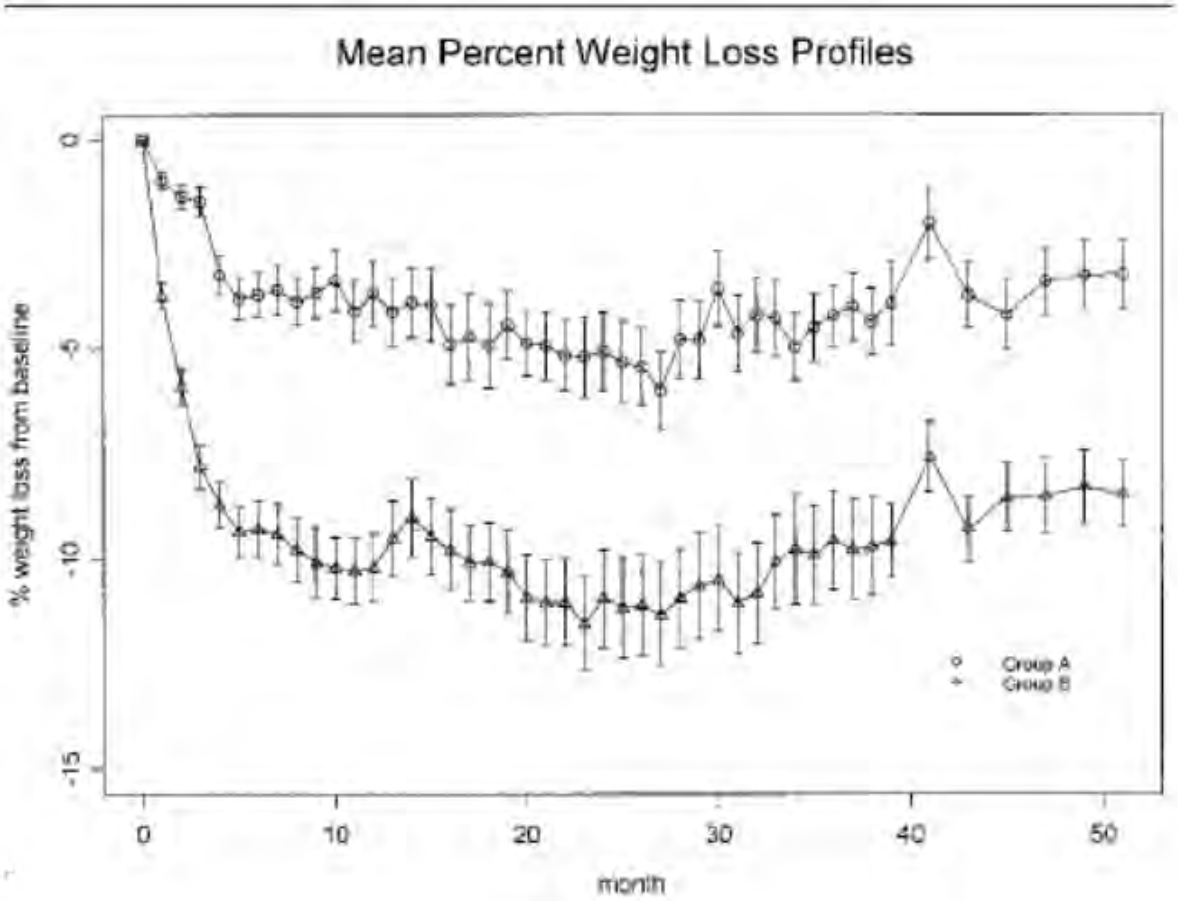
Region	1964 - 1966	1974 - 1976	1984 - 1986	1997 - 1999	2015	2030
World	2358	2435	2655	2803	2940	3050
Developing countries	2054	2152	2450	2681	2850	2980
Near East and North Africa	2290	2591	2953	3006	3090	3170
Sub-Saharan Africa[a]	2058	2079	2057	2195	2360	2540
Latin America and the Caribbean	2393	2546	2689	2824	2980	3140
East Asia	1957	2105	2559	2921	3060	3190
South Asia	2017	1986	2205	2403	2700	2900
Industrialized countries	2947	3065	3206	3380	3440	3500
Transition countries	3222	3385	3379	2906	3060	3180

[a] Excludes South Africa.

WHO based on FAO report 2002

Caloric Restriction

- 1200-1800 calories diet
- “easy” to prescribe, Not very easy in practice
- Undercalculation of calories by patients
- Easier way to replace with already made food options: soups, bars, frozen meals(200-300 cals)



Flechtner-Mors M et al. OBESITY RESEARCH Vol. 8 No. 5 Aug. 2000

- Lifelong caloric restriction (CR) may extend life by up to 50% in rodents, with progressively less impact the later in life it is started.
- Reduced risk of cancer, neurodegenerative disorders, autoimmune disease, cardiovascular disease and T2DM

Speakman et al molecular aspects of medicine (32) 3, 2011 159-221

- Two phases of CR in mammals→ an adaptive period immediately after the regimen is imposed, and a steady state period, which can last the lifetime of the animal.
- Adaptive phase, metabolism measured by oxygen consumption, declines.
- After adaptive period →steady state in which ketones help meet energy needs of the brain.

Speakman et al molecular aspects of medicine (32) 3, 2011 159-221

- the oxidative damage theory of aging and suggested that reactive oxygen species damage DNA, lipids, and proteins, all leading to accelerated biological aging.
- CR results in a decrease in metabolic rate that is greater than that expected on the basis of loss of tissue mass

Speakman et al molecular aspects of medicine (32) 3, 2011 159-221

FIGURE 1.—Inverse linear relationship between caloric intake and lifespan in mice. C3B10F$_1$ females were individually housed and placed on controlled diets (115 kcal/week, 85 kcal/week, 50 kcal/week, and 40 kcal/week) from weaning (n = 49, 57, 71, and 60, respectively). Animals with the highest caloric intake died earliest, and survival improved with increased caloric restriction.

Anderson et al *Toxicologic Pathology,* 37: 47-51, 2009

- Humans have problems sustaining CR for long periods of time
- Data on CR in humans in populations related to poverty and frequently deficient in essential nutrients.

Holloszy and Fontana. Exp Gerontol. 2007 August ; 42(8): 709–712

- CR of 25% for 2 years. Non obese patients.
- Most sustained 11% of CR.

Ravussin et al Gerontol A Biol Sci Med Sci, 2015, Vol. 70, No. 9, 1097–1104

- Okinawa population: 11 % less calories (1700)
  - Death rates from CV , cancer and CVA were 60-70% of japan average
  - Older Okinawans: gained an additional 6% survival time from age 65 (1.3 years) versus other Japanese and an additional 20% survival time (3.6 years) versus Americans

Willcox C. Biogerontology (2006) 7: 173–177

Plant based diets

Vegetarian/ Plant based and Vegan

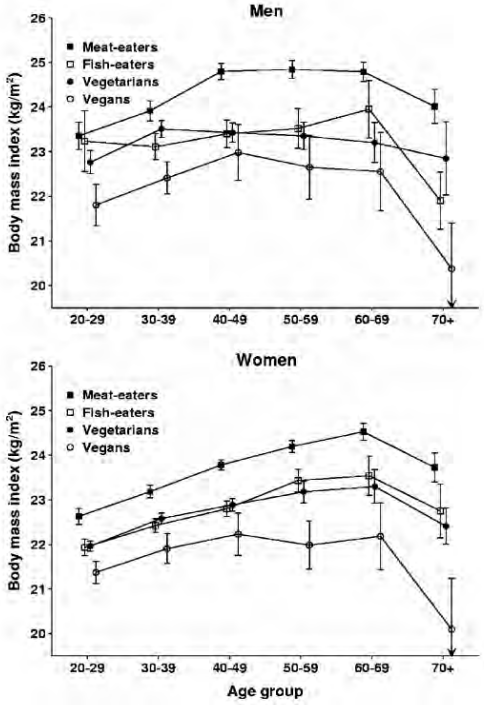


Figure 1 Mean BMI by age in four diet groups, showing 95% confidence intervals.

- Vegans: lower intake of protein and higher intake of fiber. Lowest BMI , meat eaters highest BMI.

Spencer. International Journal of Obesity (2003) 27, 728–734

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Vegetarian diet and Diabetes?

	Vegan	Lacto-ovo vegetarian	Pesco-vegetarian	Semi-vegetarian	Nonvegetarian	*P*
N	2,731	20,408	5,617	3,386	28,761	
Type 2 diabetes	2.9	3.2	4.8	6.1	7.6	<0.0001
Age in years	58.1 ± 13.3	58.1 ± 14.1	57.2 ± 13.8	57.7 ± 13.6	54.9 ± 13.2	<0.0001
Female	60.1	62.3	65.9	65.7	63.2	<0.0001
Black	19.9	12.5	34.9	15.0	31.2	<0.0001
BMI (kg/m^2)	23.6 ± 4.4	25.7 ± 5.1	26.3 ± 5.2	27.3 ± 5.7	28.8 ± 6.3	<0.0001

Tonstad et al. Diabetes Care 2009 32(5) 791-796

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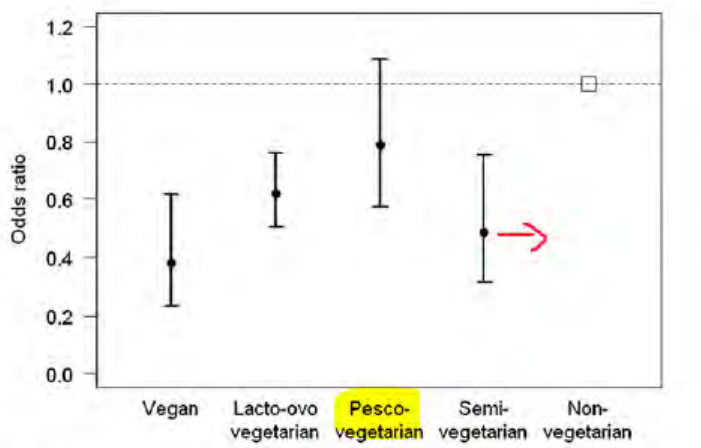


Figure 1 Odds ratios with 95% confidence intervals for incident diabetes by dietary group adjusted for age, BMI, ethnicity, gender, educational level, income, TV watching, sleep, alcohol, physical activity and cigarette smoking.

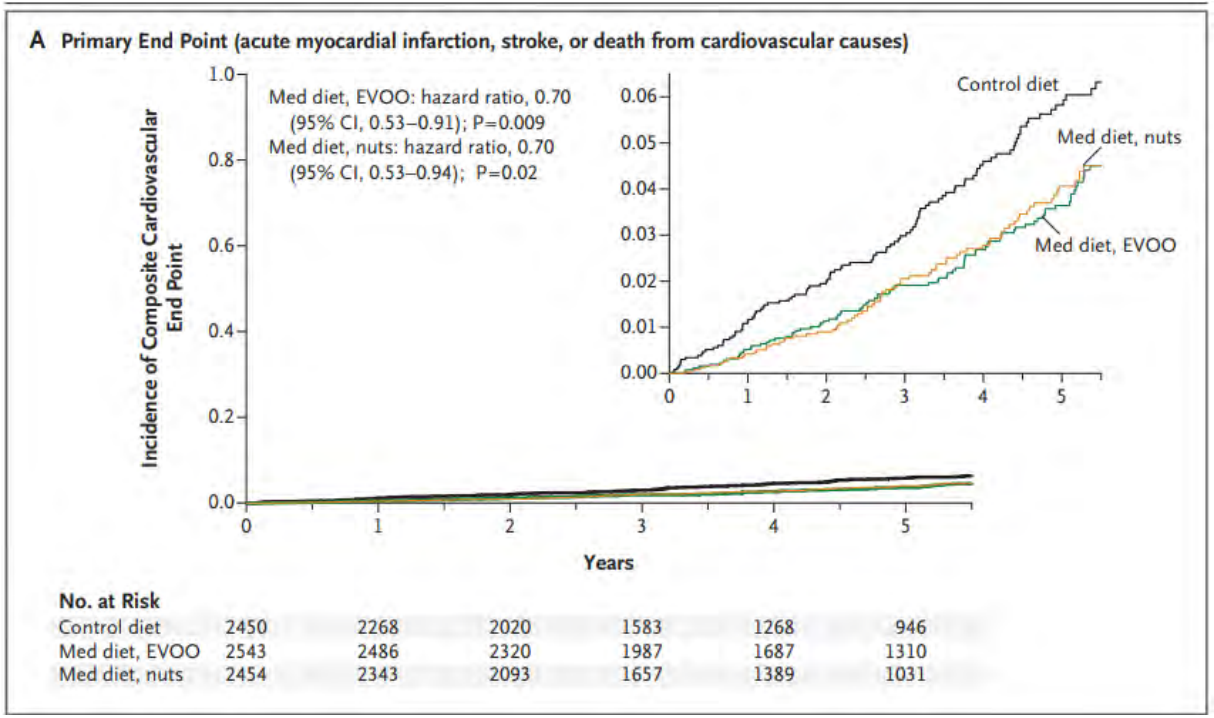
Tonstad et al . Nutrition, Metabolism & Cardiovascular Diseases (2013) 23, 292e299

- Vegetarian dietary patterns reduced CV mortality and risk of CAD by 40%
- Plant based diet and pro vegetarian diet associated with 16-24% lower risk of CVD and all cause mortality .

Kahleova et al Prog cardiovasc Dis may 29 2018
Kim H et al. (J Am Heart Assoc. 2019;8:e012865

Mediterranean Diet

- Not a “diet”, is a lifestyle.
- Mostly a plant based diet: fruits, vegetables, grains, beans, nuts and seeds
- Healthier fats
- Less red meat, More fish, less poultry, less dairy
- Wine with meals



Estruch R N Engl J Med. 2013;368(14):1279. Epub 2013 Feb 25.

Low carbohydrate diets

Ketogenic Diets

- True keto diet: high fat 70-80% of Total daily energy, adequate protein 0.8-1g/kg. Very low CHO<50g/day
- Ketones in urine
- Low CHO: >50g “no ketones in urine”

Paoli, et al European Journal of Clinical Nutrition (2013) 67, 789–796

- Most of the studies are not truly ketogenic diets
- Most of the studies were 6-24 months no longer follow ups
- They are LCHF diets with a median of 120g/day

- Noted high LDL
- Lower TG levels, and seems to have high HDL levels, however, not known yet what is the significance
- Not studied long enough in chronic conditions

Yancy et al . Ann Intern Med. 2004;140:769-777
Hu et al. Am J Epidemiol. 2012;176(Suppl):S44–S54

- In the nurse study, noted lower all cause mortality, hazard ratio [HR] 0.80, 95% CI 0.75-0.85) and cardiovascular mortality (HR 0.77, 95% CI 0.68-0.87), but when high protein and fat came from VEGETABLE sources.

Halton, T et al N Engl J Med 2006;355:1991-2002.

Intermittent fasting?

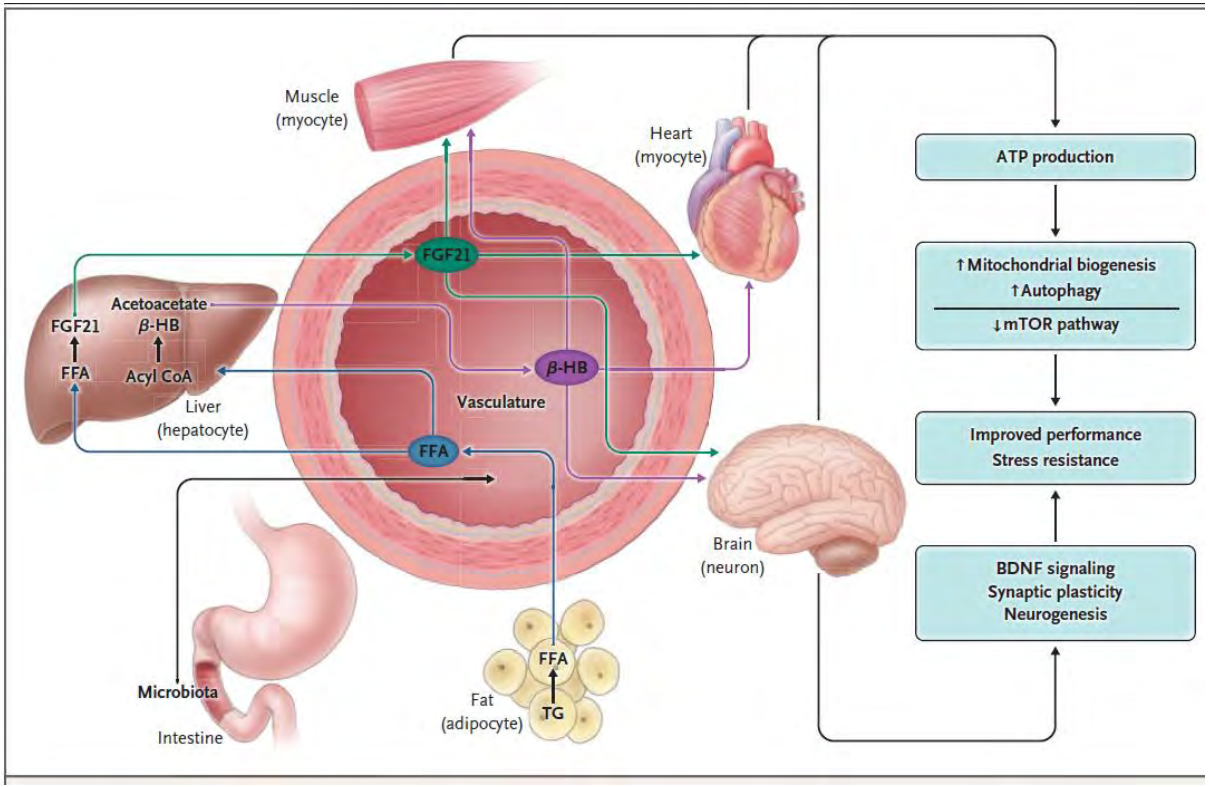
Some definitions

- Intermittent fasting: 12 hour or longer of fasting
- TRF: eating pattern at specific time periods of the day 8-12 hours. (eTRF)
- Alternate day fasting (ADF): no calories on fasting days, feast days
- 5:2 IF

Anton et al. obesity 2018 (26) , 2
Longo D. N Engl J Med 2019;381:2541-51

Time restricted feeding

- Cells respond to intermittent fasting by engaging in a coordinated adaptive stress response that leads to increased expression of antioxidant defenses, DNA repair, protein quality control, mitochondrial biogenesis and autophagy, and down-regulation of inflammation



Longo D. N Engl J Med 2019;381:2541-51

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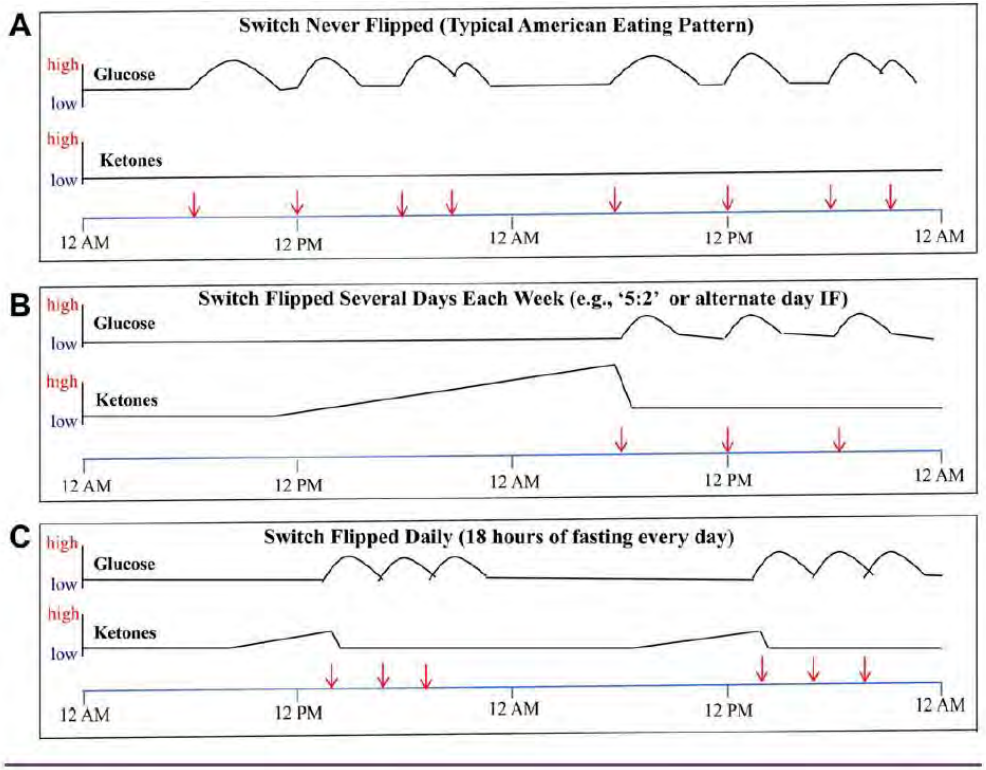
- Periods of dietary restriction cause depletion of glycogen: metabolic switch towards use of fatty acids and ketones
- On recovery from fasting: glucose increase, ketone decrease and cells increase protein synthesis: growth and repair

- In animals : reduced plasma glucose, insulin and leptin levels higher in fasting days (ADF)
- TRF : normalize expression of genes involved in fatty acid metabolism FASN, PPAR r and antioxidant defenses (SOD1) in the liver.
- Prevents accumulation of lipids even on high fat diet

Metabolic switch



Anton et al. obesity 2018 (26) , 2

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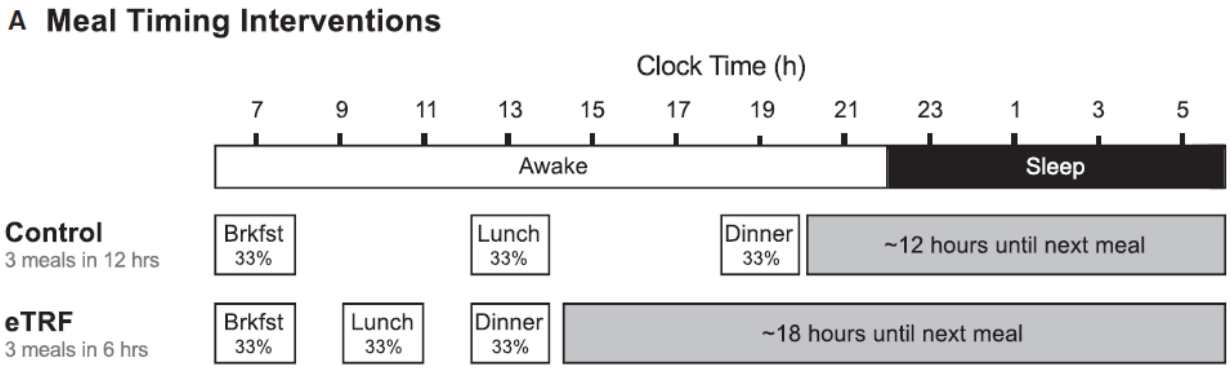
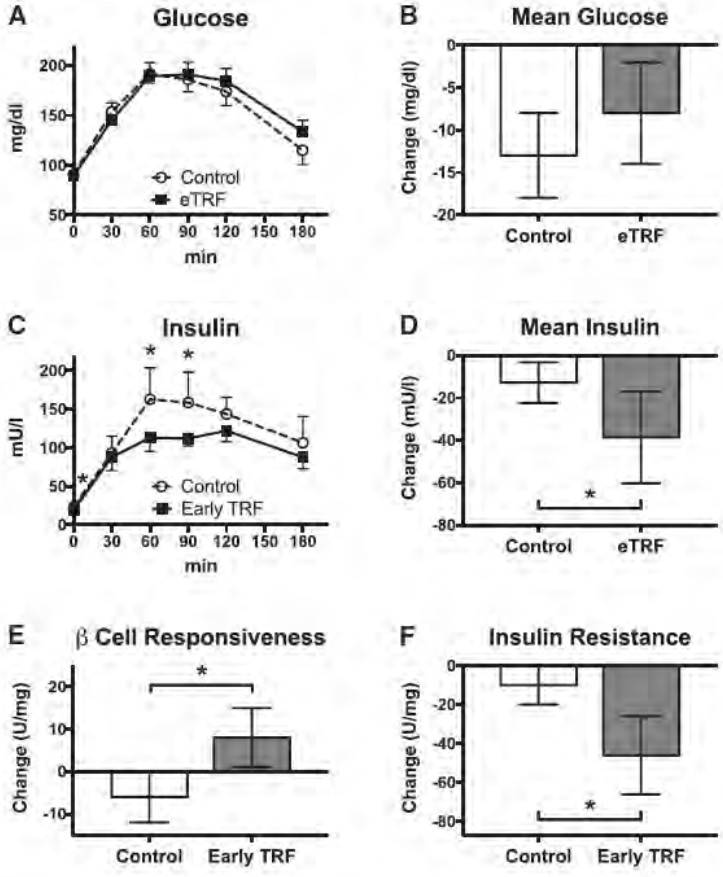
Early Time-Restricted Feeding Improves Insulin Sensitivity, Blood Pressure, and Oxidative Stress Even without Weight Loss in Men with Prediabetes



Sutton et al., 2018, Cell Metabolism 27, 1212–1221

UPMC LIFE CHANGING MEDICINE



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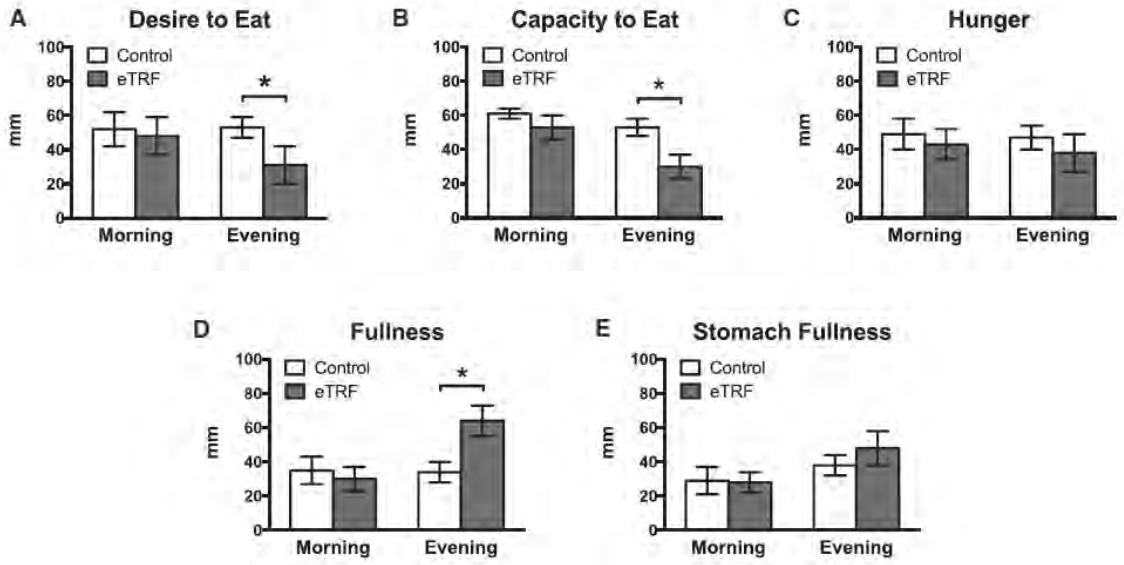
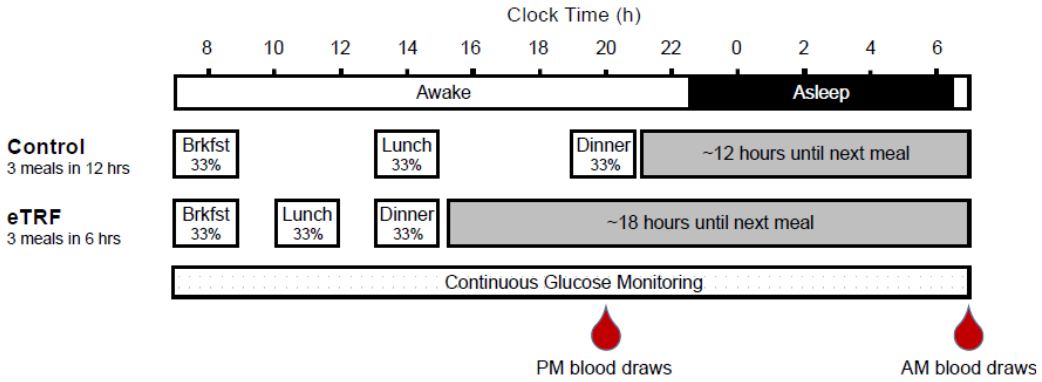
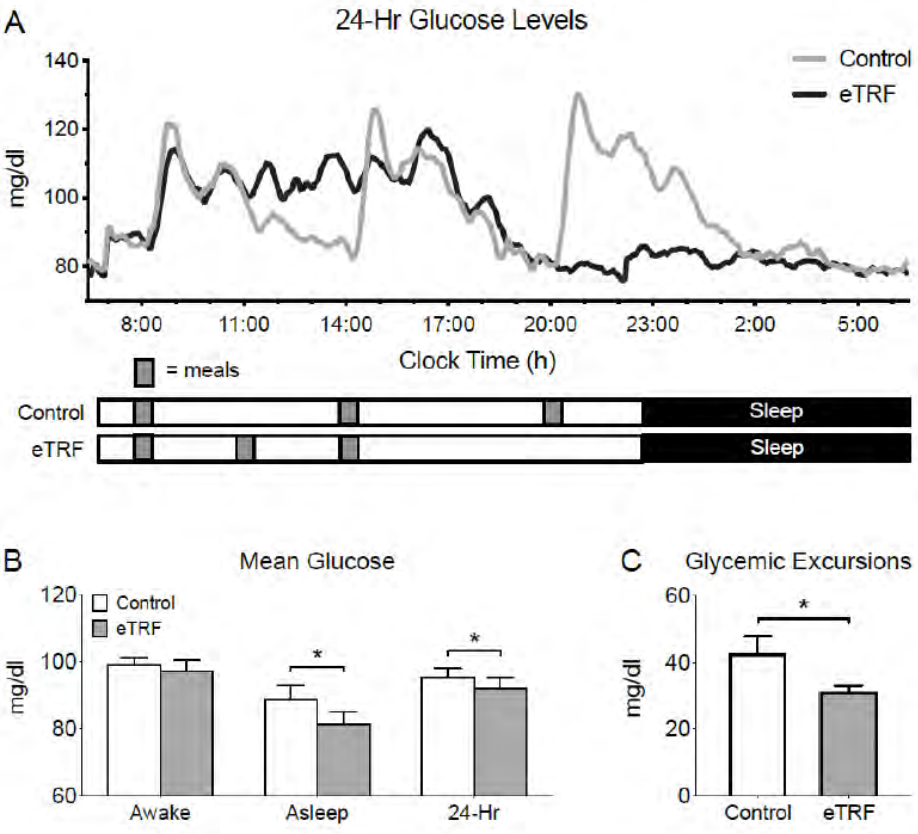


Early TRF

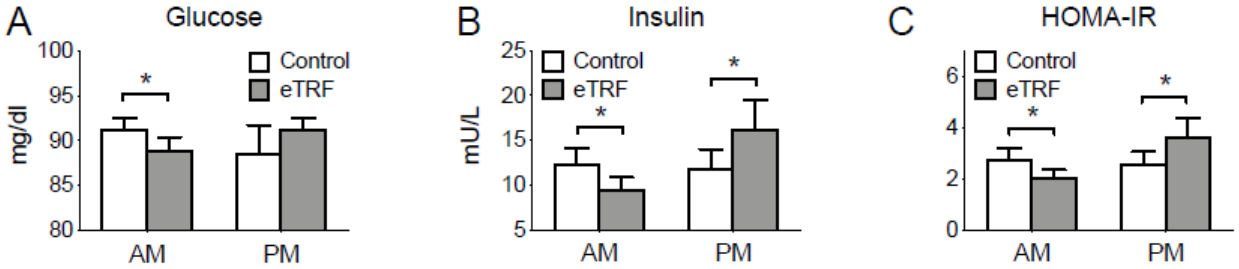
- Eating in sync with the circadian rhythm.
- Theory of decreasing hunger, other theory is increased energy expenditure
- Rodents: eating period 8h earlier: increase 24h energy expenditure
- TRF: eating within <10h period and fasting at least 14h
- Worsen metabolic patterns when eating later

Jamshed H, et al Nutrients 2019, 11, 1234





UPMC LIFE CHANGING MEDICINE



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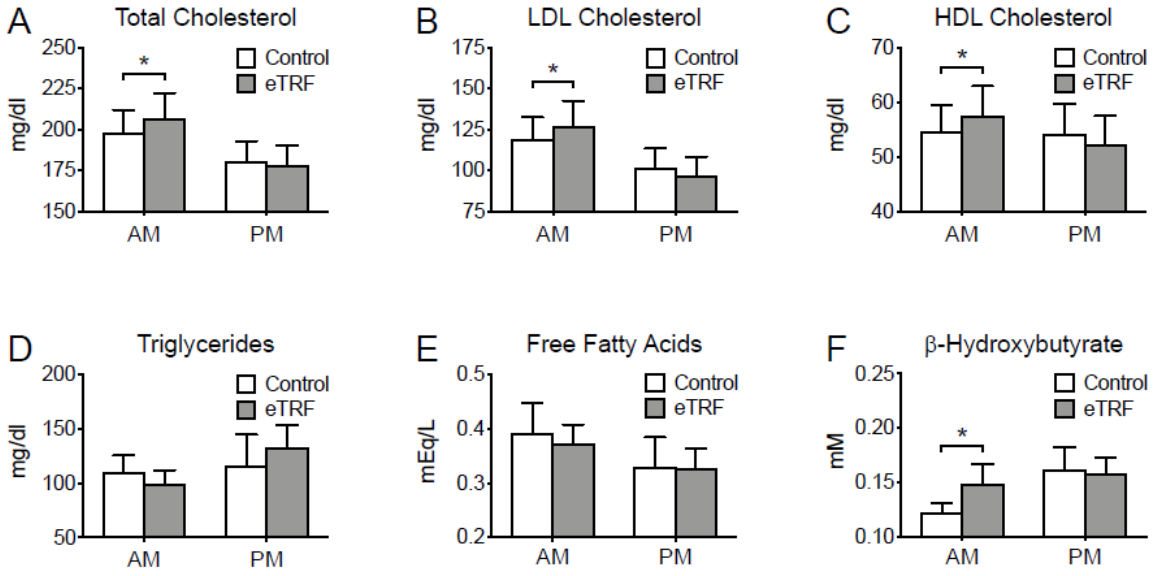
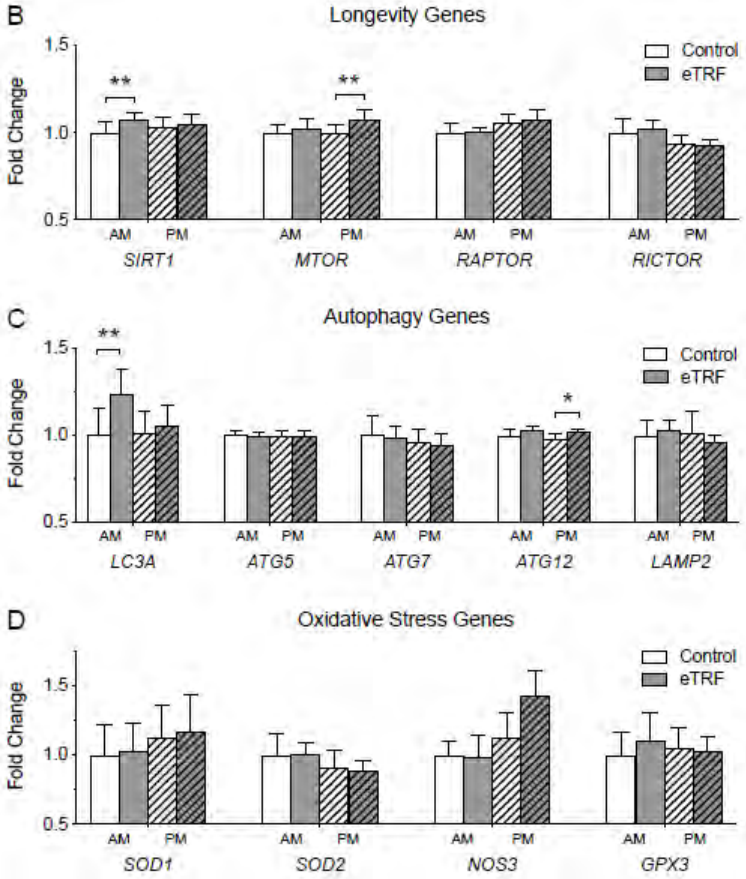


UPMC LIFE CHANGING MEDICINE



UPMC LIFE CHANGING MEDICINE

TRE in older adults

- Small pilot study
- 10 people, 77 yo, BMI 25-40
- 4 weeks
- 16 h of fasting in a ramp up to full 16h fasting period → Days 1–3 : 12–14 h/d, Days 4–6→ 14–16, Days 7–28: for 16 h/d
- No dietary restriction on amount of food, no time frame either

Anton S et al. Nutrients 2019 11, 1500

- AE: headaches, dizziness

Study Measures	Baseline *M (SD)*	Follow-Up *M (SD)*	Cohen's d (Effect Size)	*p*-Value
Antropometric and Metabolic Measures				
Body Weight	96.96 (16.2)	94.81 (16.9)	0.13	**0.009**
Body Mass Index (BMI)	34.1 (3.3)	33.2 (3.2)	0.29	**0.013**
Waist Circumference (cm)	109.43 (12.9)	109.23 (12.3)	0.02	0.602
Blood Glucose (mg/dL)	105.6 (28.2)	107.3 (29.4)	0.06	0.736
Systolic Blood Pressure (mmHg)	145.9 (15.6)	148.22 (24.2)	0.11	0.812
Diastolic Blood Pressure (mmHg)	78.1 (12.4)	78.89 (8.3)	0.07	0.877
Physical Function				
Six Min Walk (meters)	301.8 (91.0)	310.89 (111.2)	0.09	0.585
Six Min Walk (m/s)	0.88 (0.2)	0.92 (0.2)	0.21	0.877
Grip Strength (dominant hand)	22.3 (7.0)	24.0 (6.8)	0.13	0.270
Health Related Quality of Life				
SF-12 Physical Function (Summary Score)	13.6 (3.1)	14.9 (2.0)	0.52	0.185
SF-12 Mental Function (Summary Score)	22.0 (2.1)	22.8 (1.7)	0.41	0.285
SF-12 Total Score	35.6 (4.6)	37.7 (3.2)	0.54	0.170
Fatigability				
Pittsburgh Fatigue Scale (Mental)	13.8 (8.3)	14.7 (8.9)	0.10	0.787
Pittsburgh Fatigue Scale (Physical)	24.7 (6.8)	24.9 (8.2)	0.03	0.650
Cogntive Function				
MoCA	25.6 (3.4)	25.9 (3.1)	0.09	0.810

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Okinawa Grandomothers: Eat until you are 80% full (hara hachi-bu)

THANK YOU