“Attacking the Driver of Increased Stroke, Heart Disease, and Diabetes”

Invited Talk

Right Care Rotating University of Best Practices

UCSD

November 5, 2012

Dr. Larry Smarr

Director, California Institute for Telecommunications and Information Technology

Harry E. Gruber Professor,

Dept. of Computer Science and Engineering

Jacobs School of Engineering, UCSD

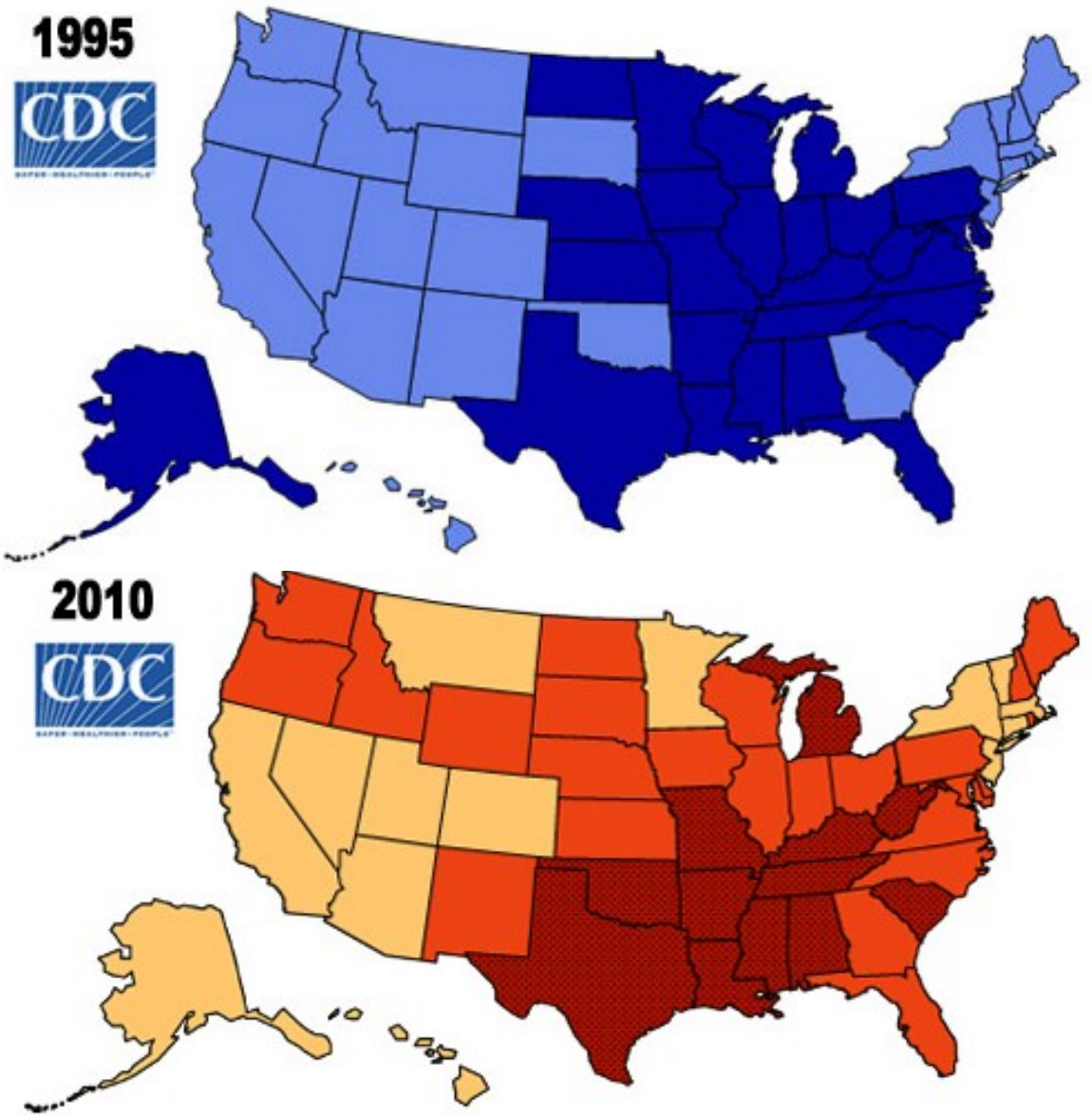
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During the Last 15 Years, the Fraction of the Population That is Obese Has Greatly Increased

Source: Behavioral Risk Factor Surveillance System, CDC

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



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Over 1/3 of American Adults are Obese: This is the Driver of Increased Disease

Obesity-related conditions include heart disease, stroke, type 2 diabetes and certain types of cancer, some of the leading causes of preventable death.
--CDC

I Arrived in La Jolla in 2000 After 20 Years in the Midwest and Decided to Move Against the Obesity Trend

Age 51



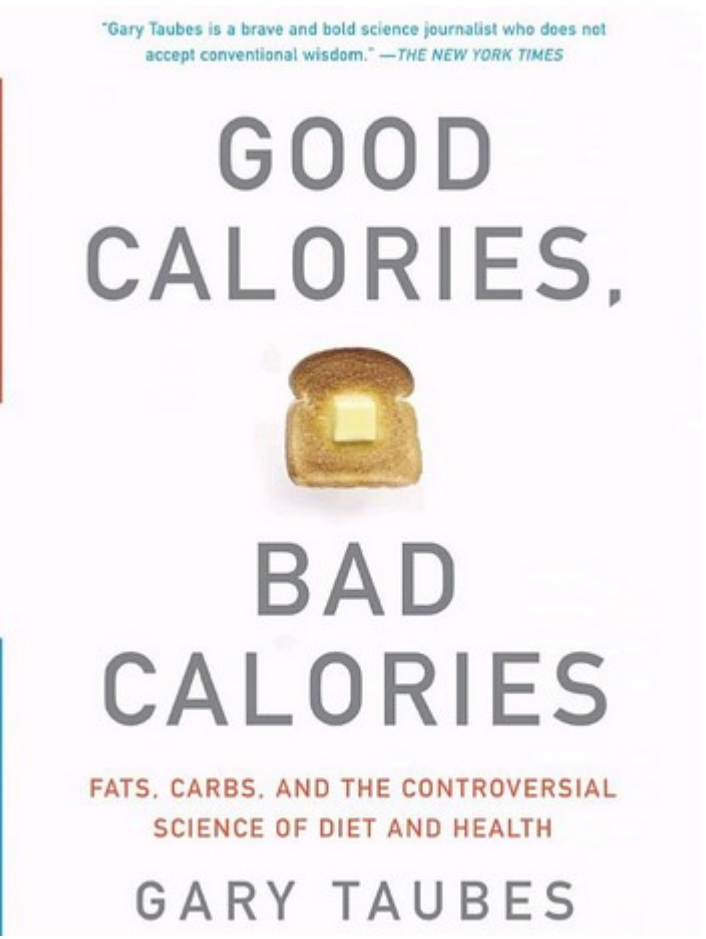


Age 61

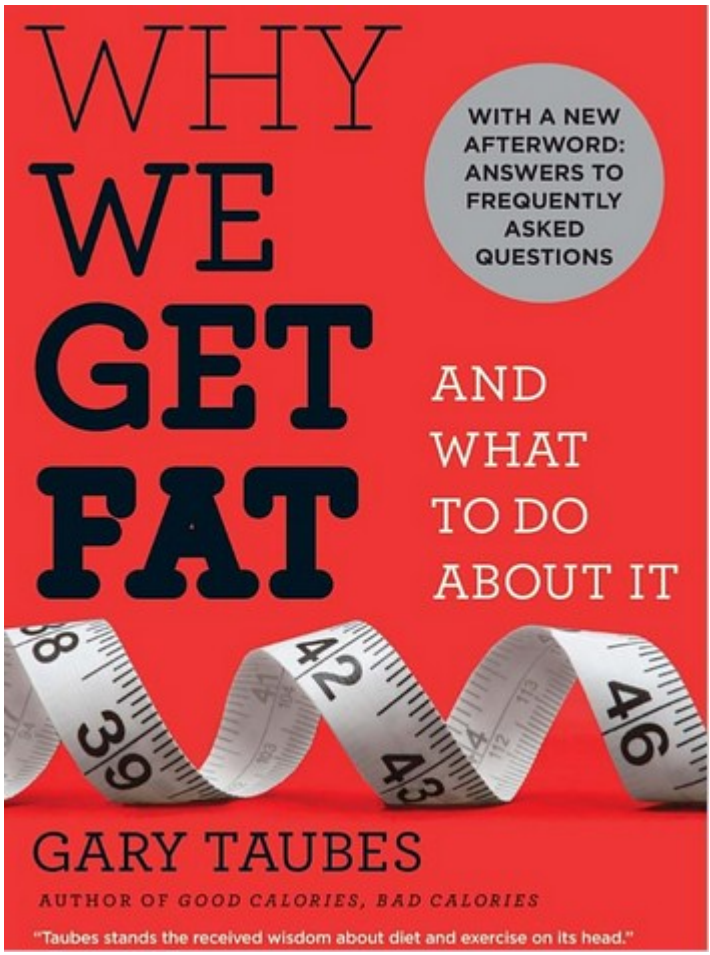
I Reversed My Body's Decline By Altering Nutrition and Exercise

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The Body's Glucose-Insulin Cycle Is at the Heart of Why We Get Fat



"Carbohydrate is driving insulin is driving fat," the late George Cahill, formerly at Harvard Medical School.

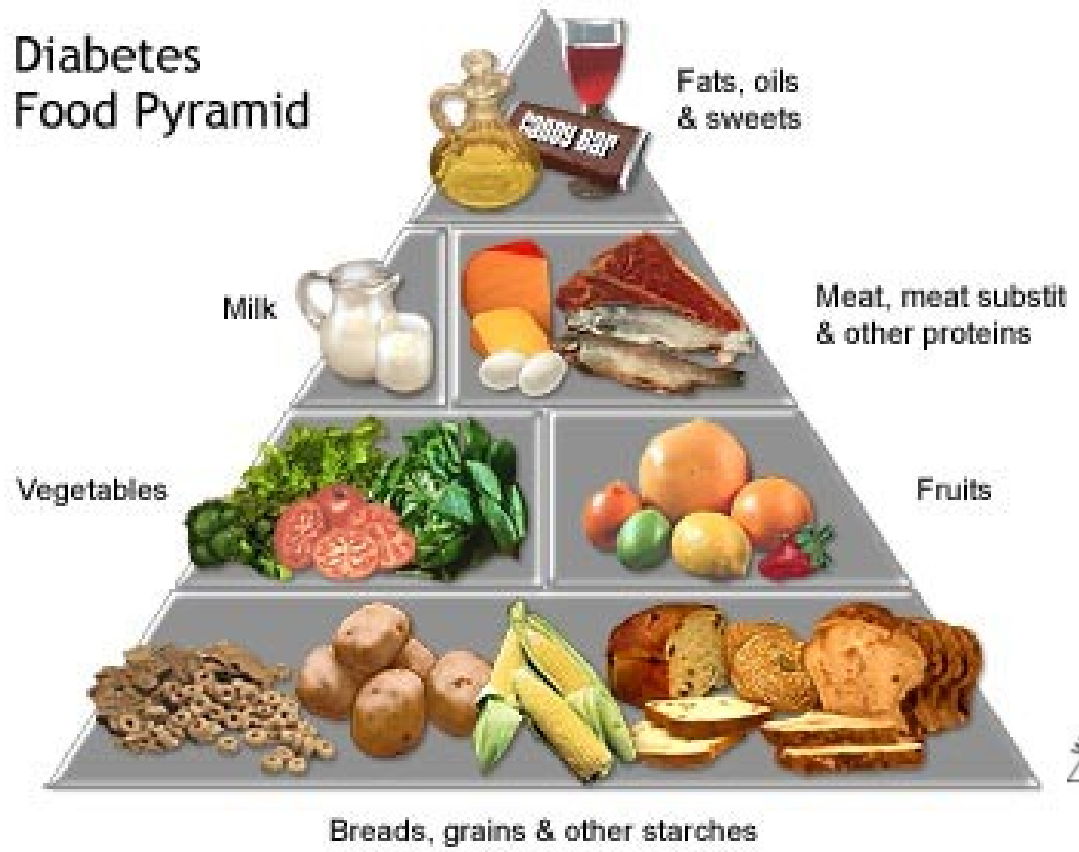


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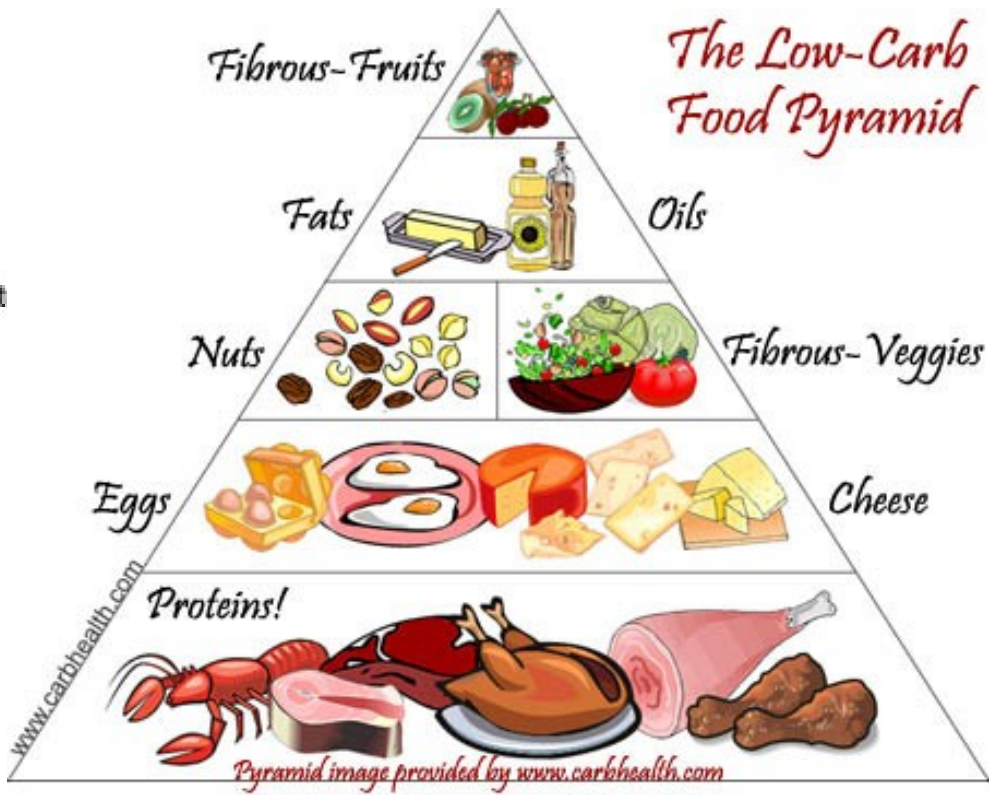
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Is Government and Medical Advice Driving the Obesity Epidemic?

RUSH UNIVERSITY MEDICAL CENTER



The Low-Carb Alternative



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Avoid High Glycemic Carbs Which Spike Your Glucose-Insulin Cycle

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Intermediate Moments On the Path to Public Health

2012



1982



Glycemic Index:

- **Potato 126**
- **Table Sugar 97**

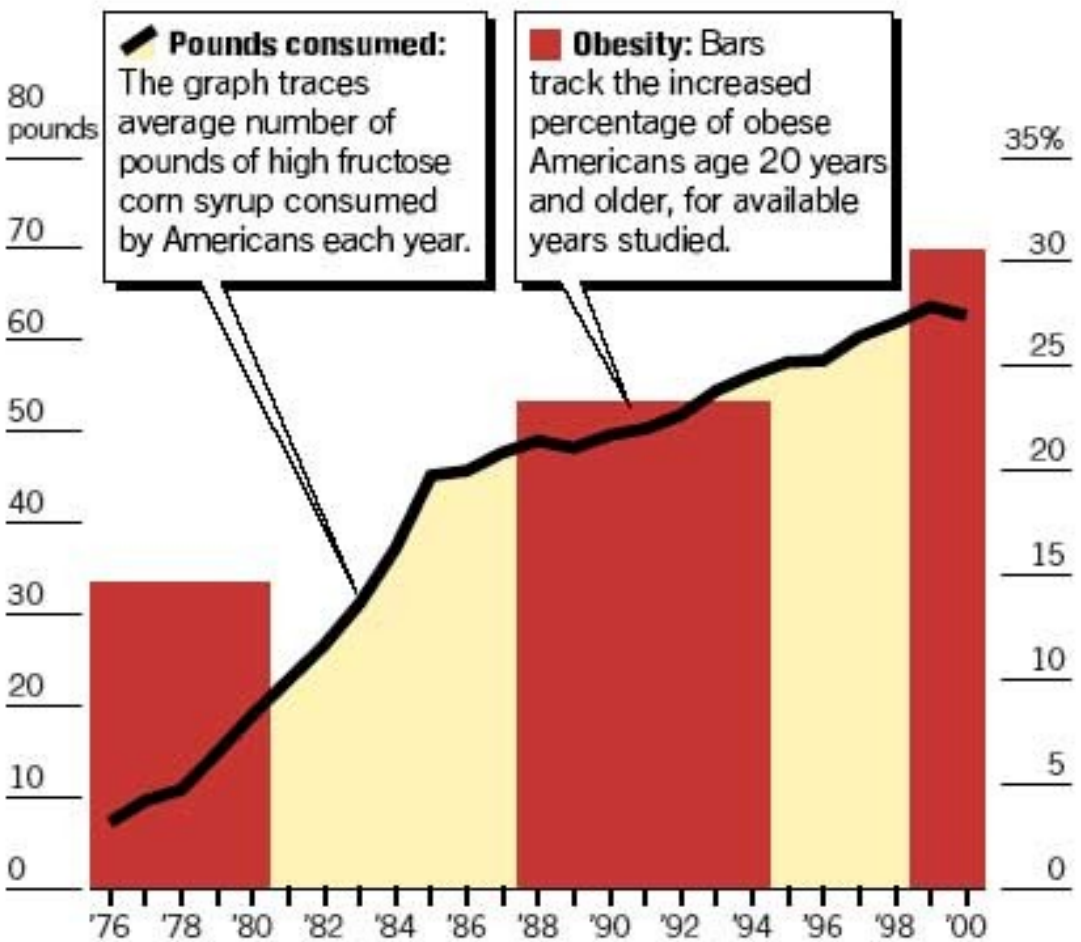
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Reversing the Consumption of High Glycemic Sweeteners is Key to Reducing Public Health Risks

Obesity and high fructose corn syrup

The number of Americans who are obese has quadrupled in recent years, a study shows. At the same time, high fructose corn syrup consumption has risen at parallel rates.

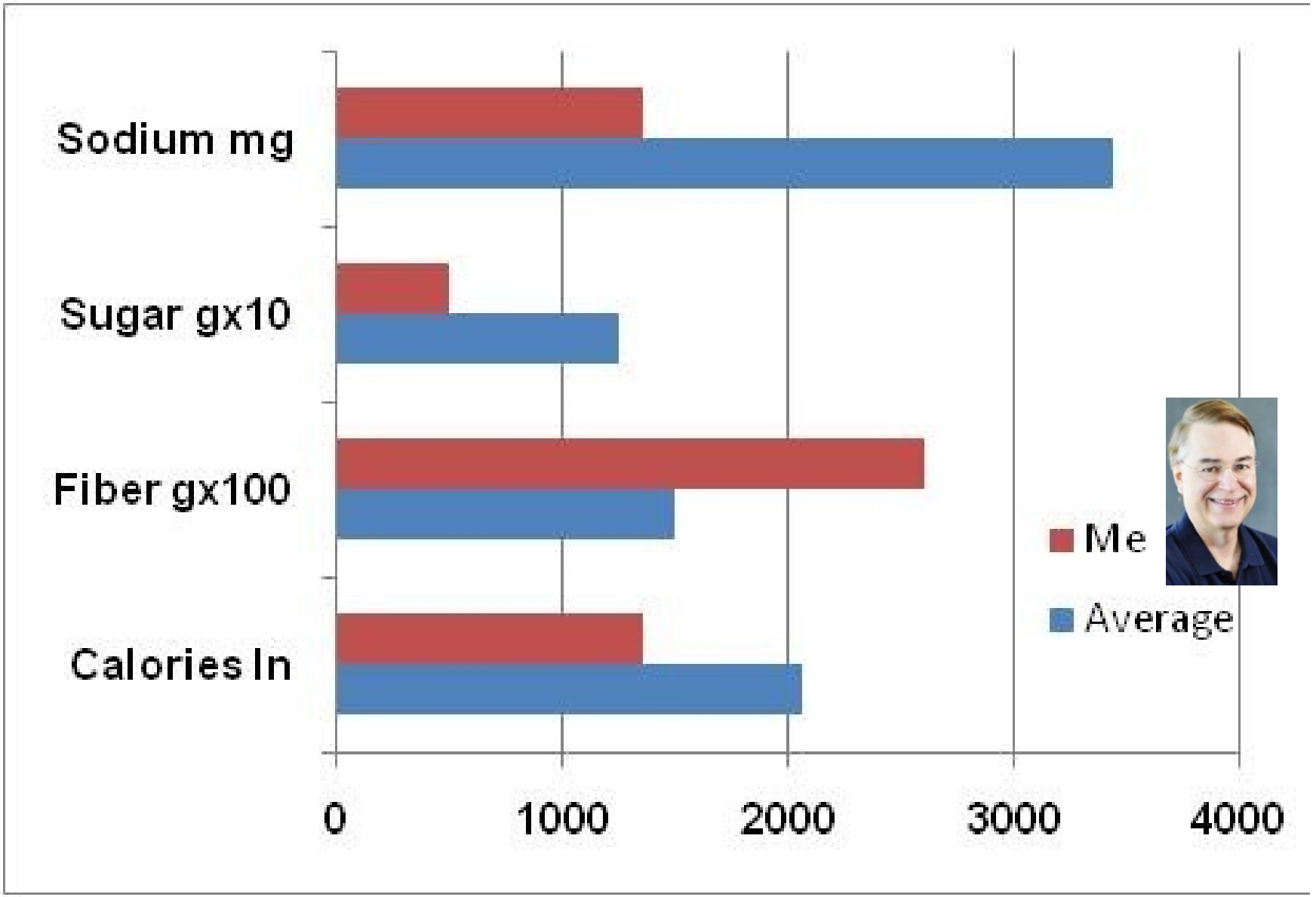


Source: Centers for Disease Control, American Obesity Association, Chronicle research

Chronicle Graphic

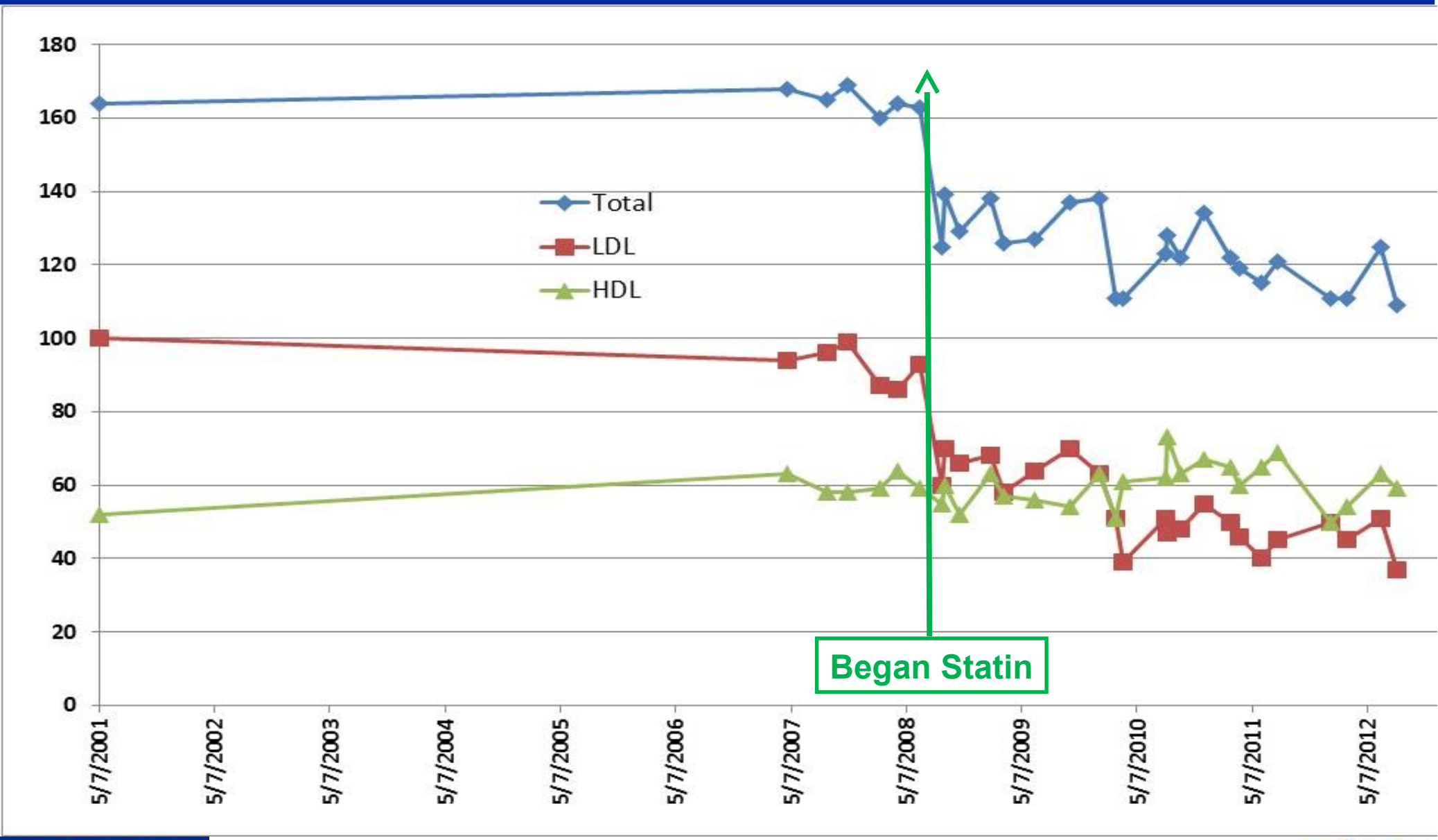
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I Modified My Diet to Reduce Calories, Sugar, and Sodium, While Increasing Fiber



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Statins Do Change Your Cholesterol Levels By Lowering LDL, Thus Lowering Total Cholesterol



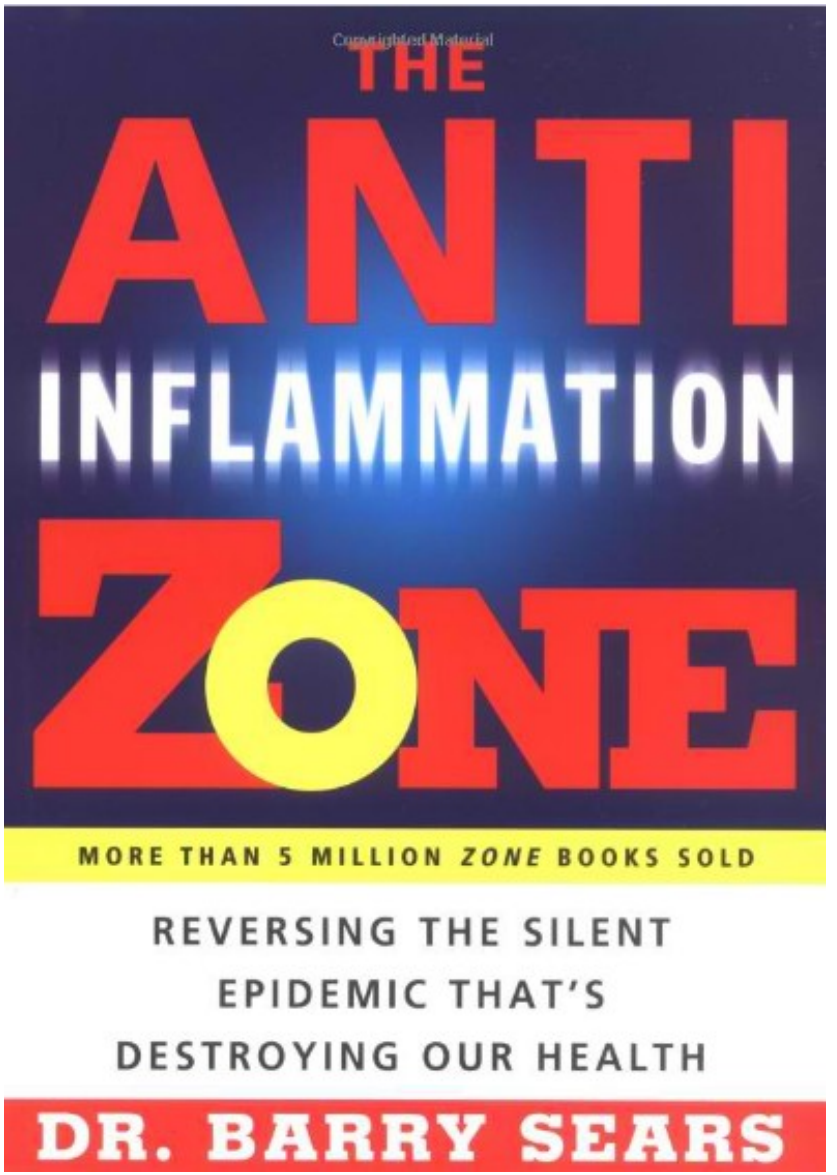
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I am Currently on 5mg Crestor Daily

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But What About Fat? Inflammation Is Driven By Consuming Excess Omega-6 Essential Fatty Acids



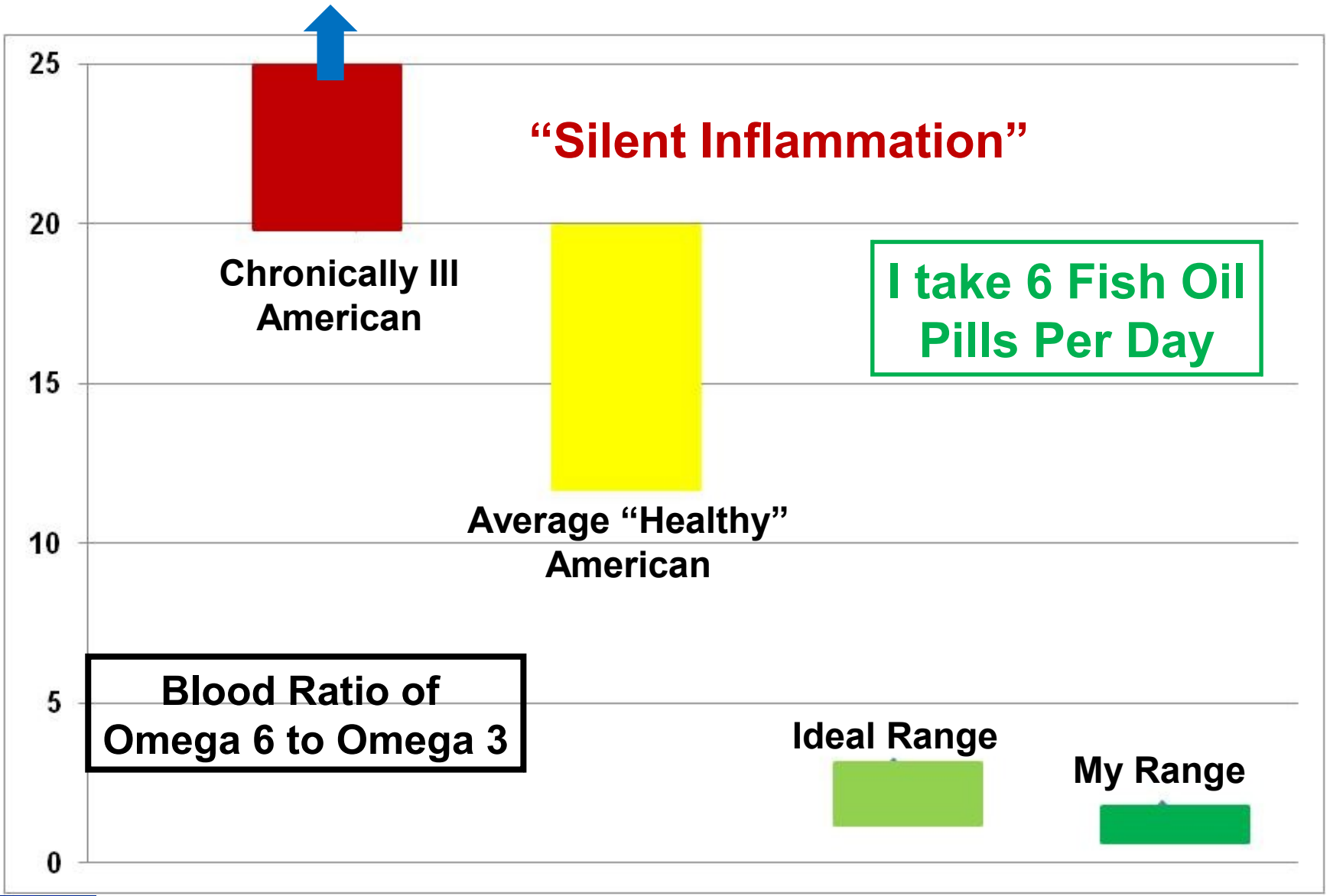


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I Lowered My Body's Inflammation Driven by Food By Increasing Omega-3s and Reducing Omega-6s



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Range Source: Barry Sears
My Tests by www.yourfuturehealth.com

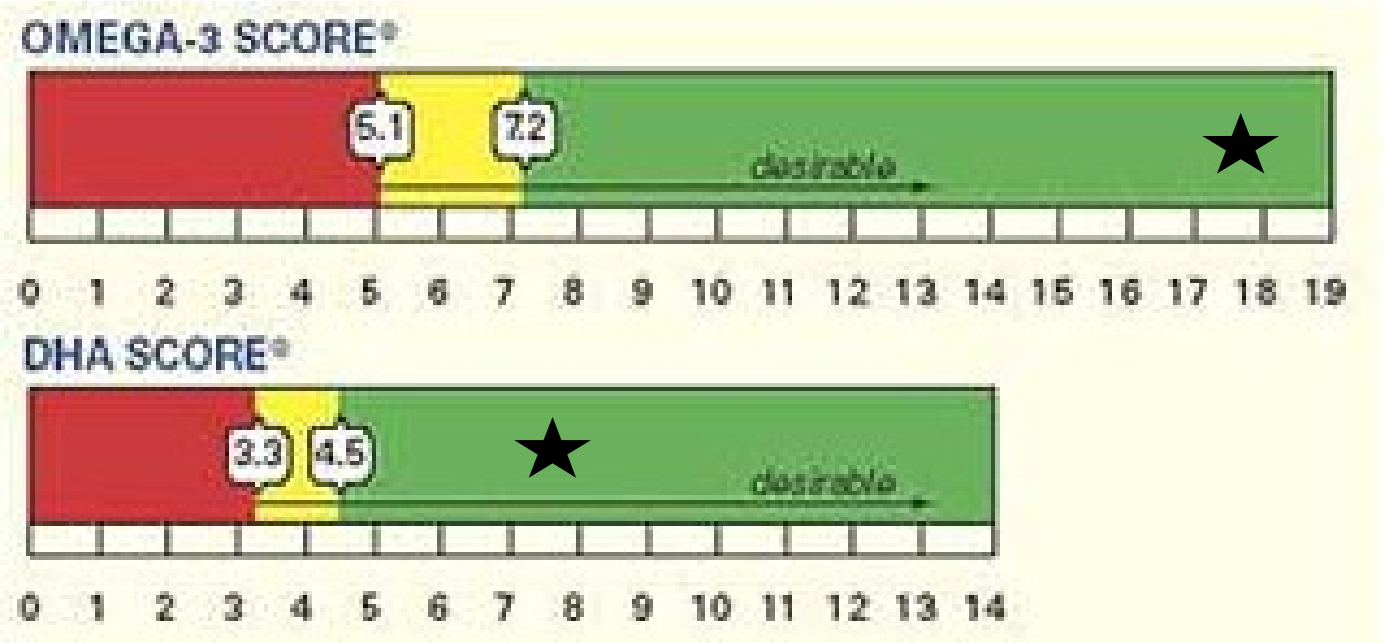
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Goal: Increase My Omega-3 Scores By Diet Changes To Protect Against Future Heart Disease

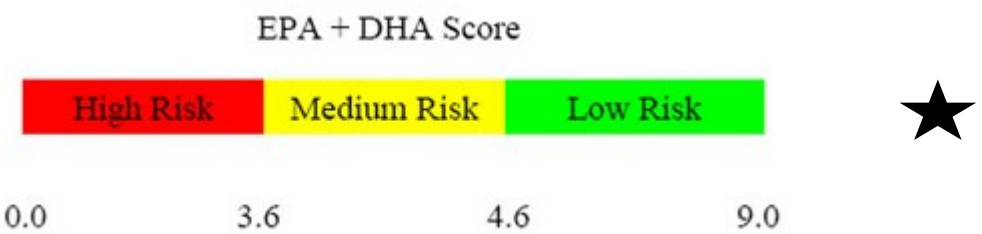
Graphics from www.anne-marie.ca/ratiokits/

If your Omega-3 Score

is at least 7.2 and your DHA Score is at least 4.5, you are 32% less likely to develop heart disease



If your EPA+DHA Score is at least 4.6, you are 70% less likely of dying from a heart attack.



★ = My Values Tested by yourfuturehealth.com

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Ref: Based on Lemaitre et al., n-3 Polyunsaturated fatty acids, fatal ischemic heart disease, and nonfatal myocardial infarction in older adults: the Cardiovascular Health Study. Am. J. Clin. Nutr. 77:319-325 (2003).

Lower Triglycerides by Increasing Omega-3 Intake and by Reducing Foods High in Refined Carbs

- **TG**
  - High Risk 200-500
  - Best <150
  - My TG Dropped from 62 (2001) to 37 (2012)
- **TG/HDL**
  - Ratio >4 Are Pre-Diabetic or Have Type 2 Diabetes
  - Average American Has a Ratio of ~3.3
  - My Ratio 0.6 Is Half What is Was in 2001

"The Ratio of Triglycerides to HDL Cholesterol (TG/HDL-C) is the Single Most Powerful Lipid Predictor of Extensive Coronary Disease."
[*Clinics* 63, 427-432 (2008)]

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New Meta-Analysis Shows Why Low-Carb Diets Lower Heart Disease Risk

Effects of Low-Carbohydrate Diets Versus Low-Fat Diets on Metabolic Risk Factors: A Meta-Analysis of Randomized Controlled Clinical Trials

Tian Hu, et al., Tulane University School of Public Health and Tropical Medicine
Am J Epidemiol. 2012;176(Suppl):S44–S54

"Compared with participants on low-fat diets, persons on low-carbohydrate diets experienced a slightly but statistically significantly lower reduction in total cholesterol, and LDL, but a greater increase in HDL and a greater decrease in triglycerides."

TG Down, HDL Up → TG/HDL Much Lower

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mobile → social

SMART Social Mobile Approach to Reduce Weight

CW PHS
CENTER FOR WIRELESS & POPULATION HEALTH SYSTEMS

Source: Kevin Patrick, UCSD SOM & Calit2

PURPOSE

To leverage social networks, social media, mobile phones, and the web for weight loss among 18-35 year old young adults.

Funded with a 5-year grant from NHLBI/NIH





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Exercise Lowers Risk of Heart Disease and Diabetes

"Weight training was associated with a significantly lower risk of Type 2 Diabetes, independent of aerobic exercise. Combined weight training and aerobic exercise conferred a greater benefit."

A Prospective Study of Weight Training and Risk of Type 2 Diabetes Mellitus in Men

Anders Grøntved, MPH, MSc; Eric B. Rimm, ScD; Walter C. Willett, MD, DrPH; Lars B. Andersen, PhD, DrMED; Frank B. Hu, MD, PhD

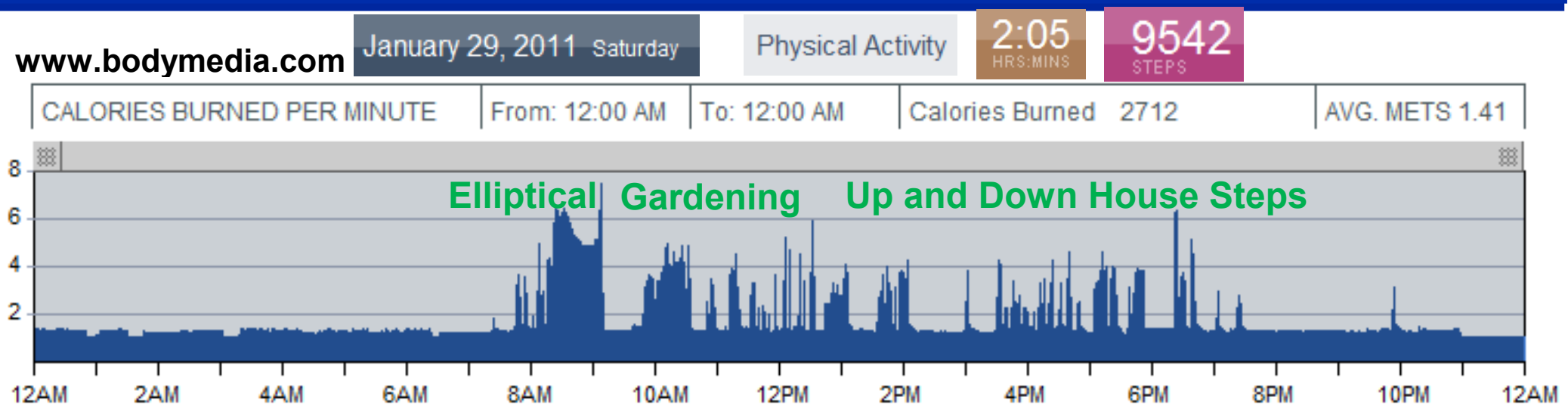
Sep 24, 2012,

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The Biofeedback of Monitoring Enables Me To Increase My Daily Caloric Burn

www.bodymedia.com





BODYMEDIA®
Know your Body. Change your life

25 Week Average:
2473 Calories Burned/Day
1:19 hr Physical Activity/Day (>3 METs)
6887 Steps/Day (~3.4 Miles)

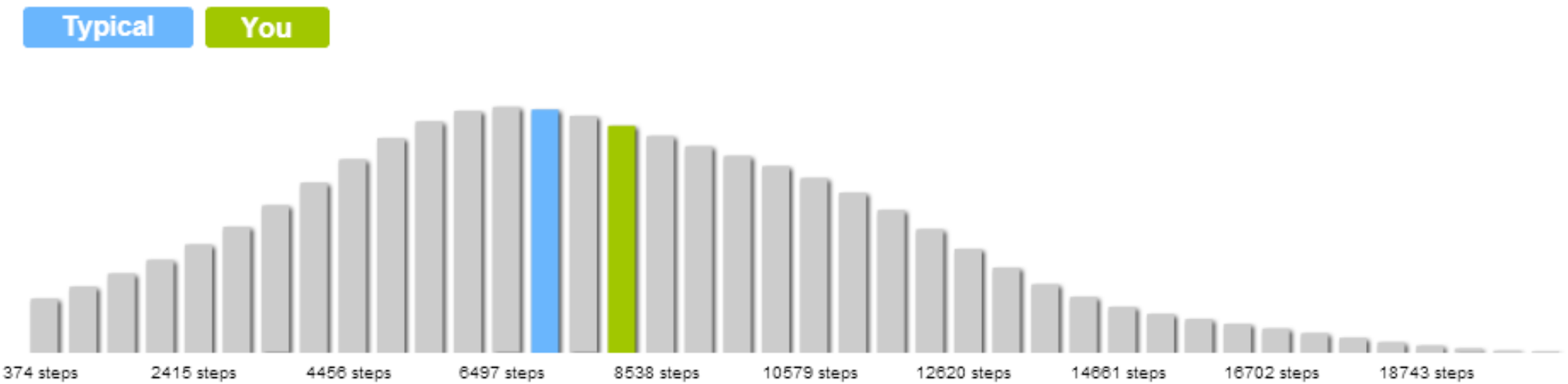
Now Using Fitbit
Average 8000 Steps/Day



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FitBit Compares Your Steps to Population of Your Age and Sex



This week you walked

8028 steps

15% more than the median for men 55 to 64 yrs who are normal or underweight

You are in the

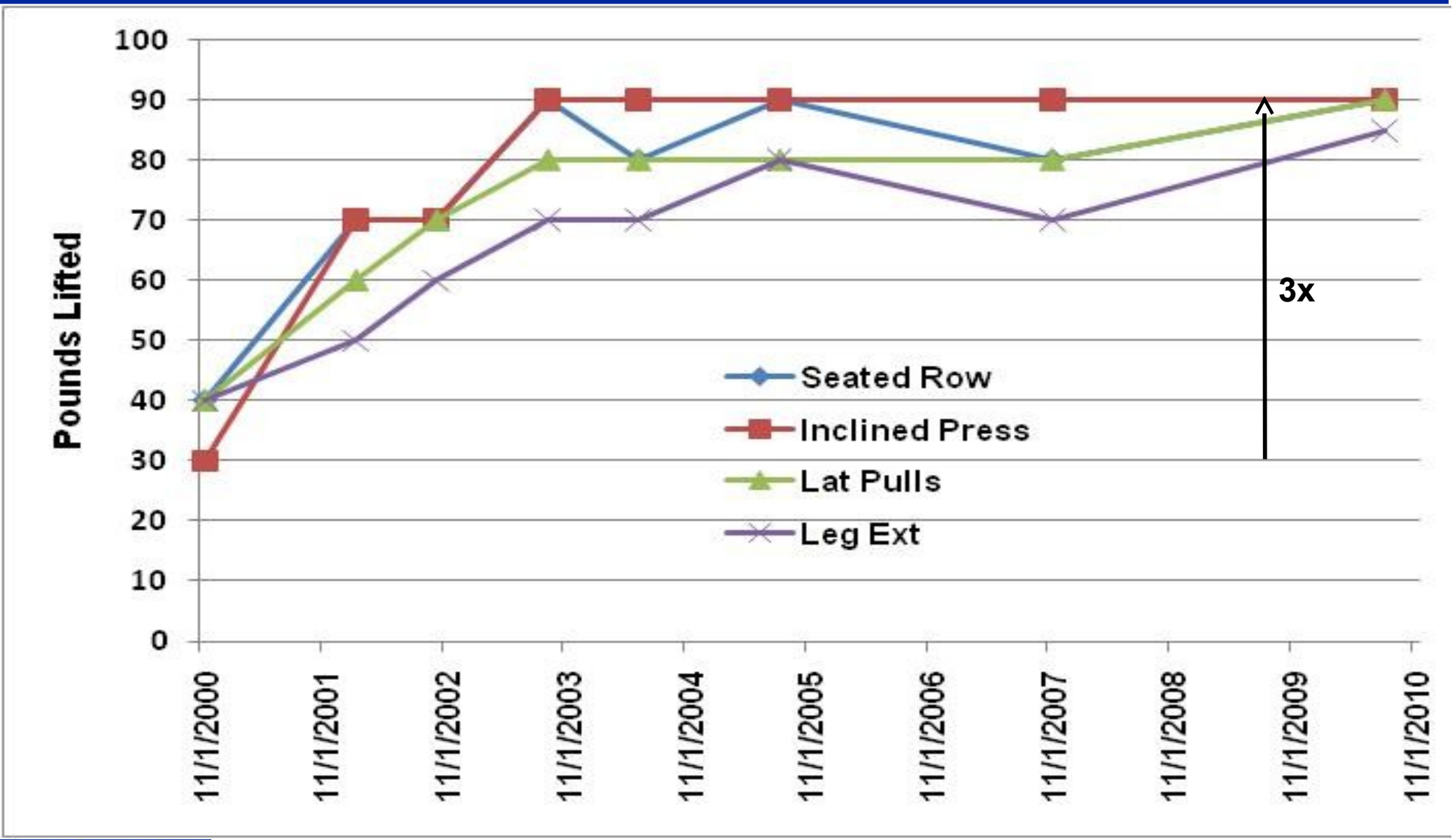
60 percentile

of all men 55 to 64 yrs who are normal or underweight

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Goal: Use Strength Training to Raise My Rest Metabolic Rate



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Source: Terry Martin, LS Trainer

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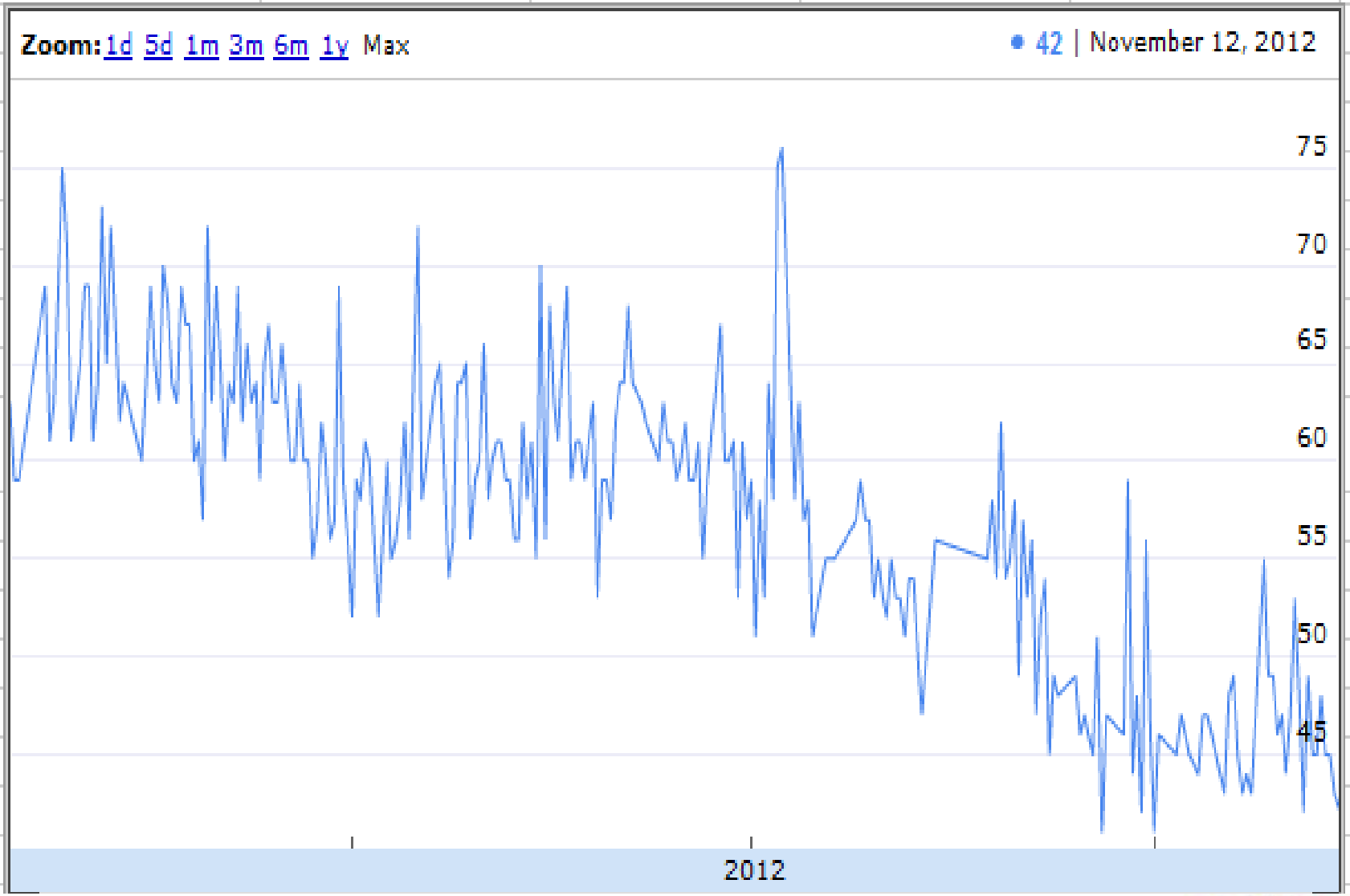
LS Resting Heart Rate

Year	Resting Heart Rate
2000	60
2005	50
2010	45
2012	40

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Another Example of the Efficacy of Aerobic Exercise on Lowering Heart Rate

Heart Rate Chart

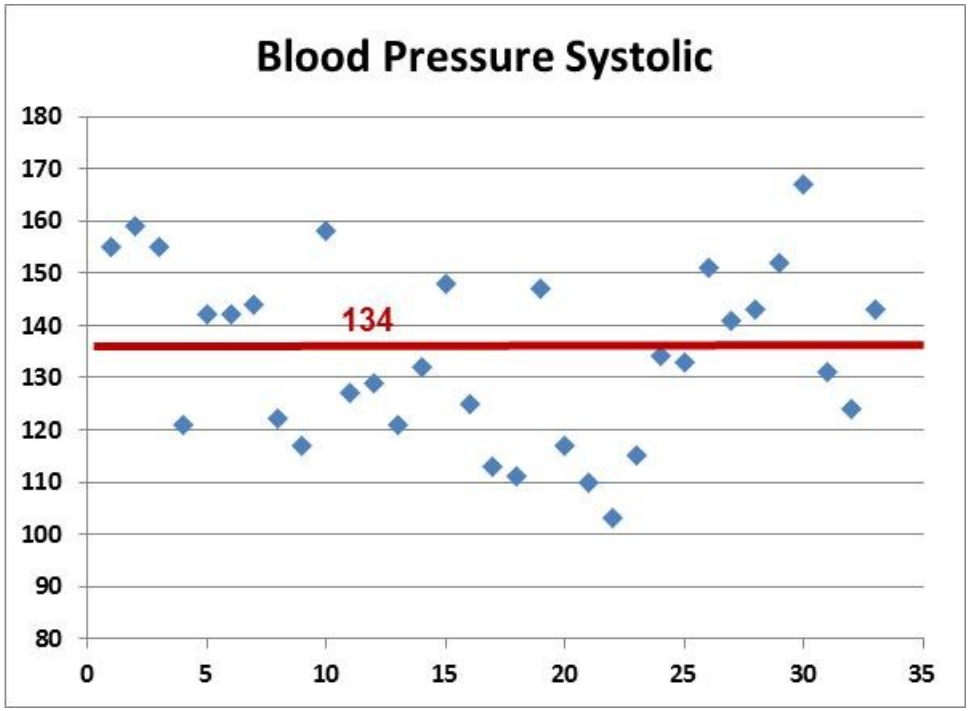


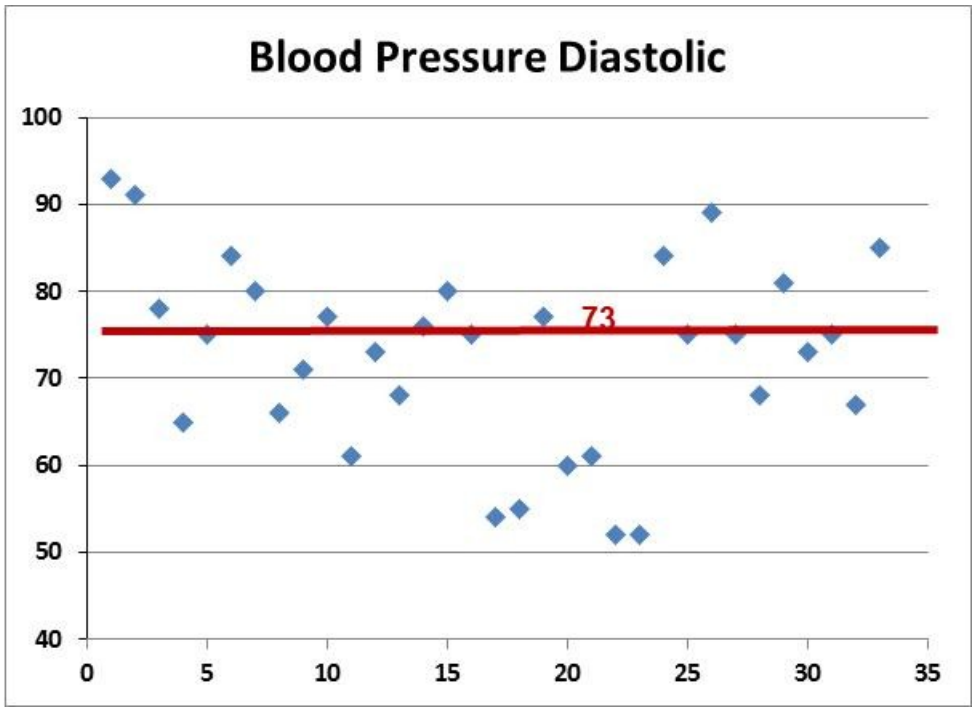
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Data from Rajesh Gupta, Chair CSE, UCSD

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Blood Pressure Home Monitoring Problem: Wide Scatter in Results Over Time





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LS Feb-March 2010
40mg Benicar Daily

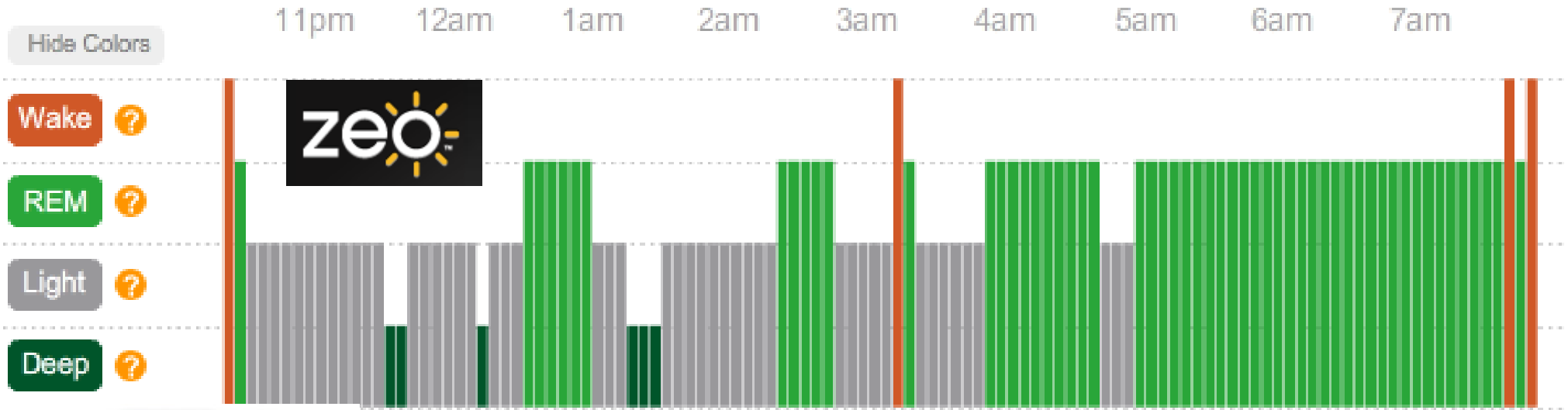
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Change in LS Blood Pressure Under Different Blood Pressure Medications

Year	Blood Pressure Drug	Average Systolic	Average Diastolic
2010	Benecar 20mg	134	73
2012	Losartan 100mg	143	82
2012	Lotrel 5/10mg combo	125	70

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Quantifying My Sleep Pattern Using a Zeo - Increased My Average to 8 Hours/Night

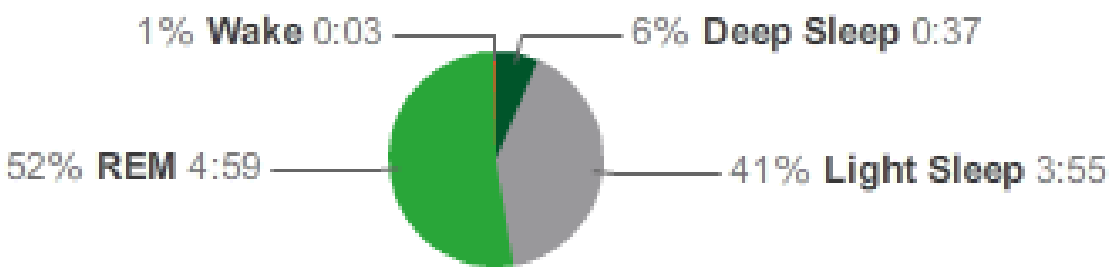




Stroke risk increased by sleeping less than six hours a night
-M. Ruiter, *Sleep* 2012

Total Z: 9 hr 31 min

Time to Z: 0 hr 2 min



Why are these numbers different from the sleep graph above?

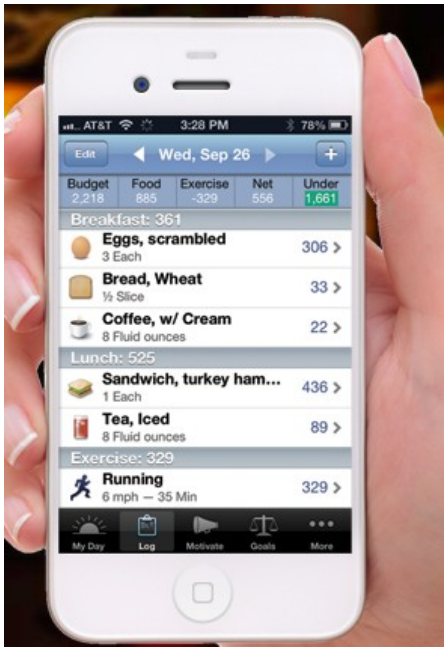
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REM is Normally 20% of Sleep
Mine is Between 45-65% of Sleep

An Infant Typically Has 50% REM

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Challenge-Coupling Personal Sensor Data With Social Networks Across Private Clouds



Lose It-
Calories Ingested



Body Media-
Calories Burned



Withing/iPhone-
Blood Pressure





EM Wave PC-
Stress



Azumio-Heart Rate



Zeo-Sleep

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Invited Paper for Focus Issue of Biotechnology Journal, Edited by Profs. Leroy Hood and Charles Auffray.

Perspective

Quantifying your body: A how-to guide from a systems biology perspective

Larry Smarr

University of California, San Diego, CA, USA

Download Pdfs from my Portal:

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Biotechnol. J. 2012, 7, 980–991