Pasta: A High-Quality Carbohydrate Food

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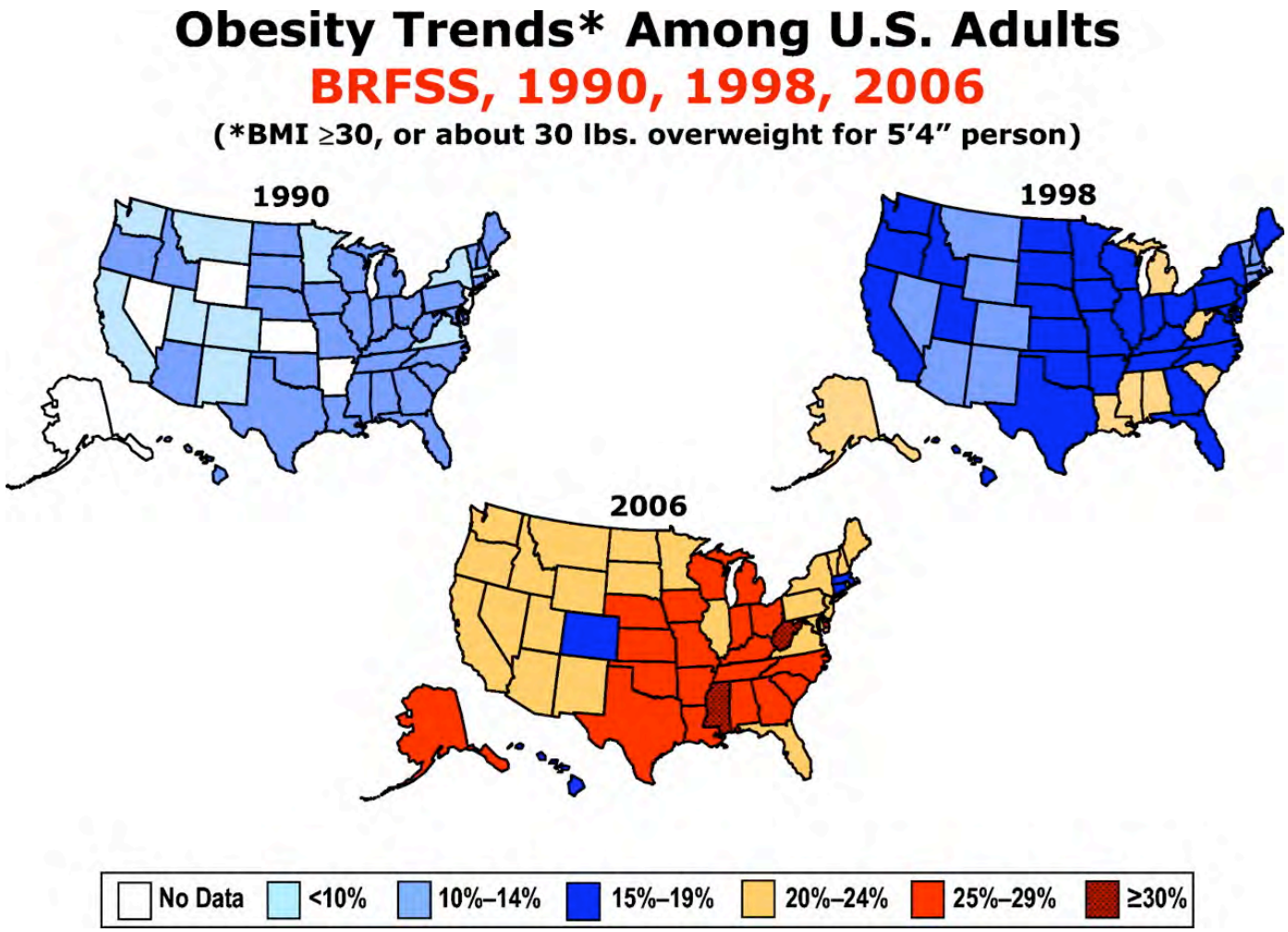
OBESITY

Trends in the prevalence of obesity (BMI >= 30 kg/m2) among U.S. adults aged 18 yr or older, Behavioral Risk Factor Surveillance System (BRFSS)

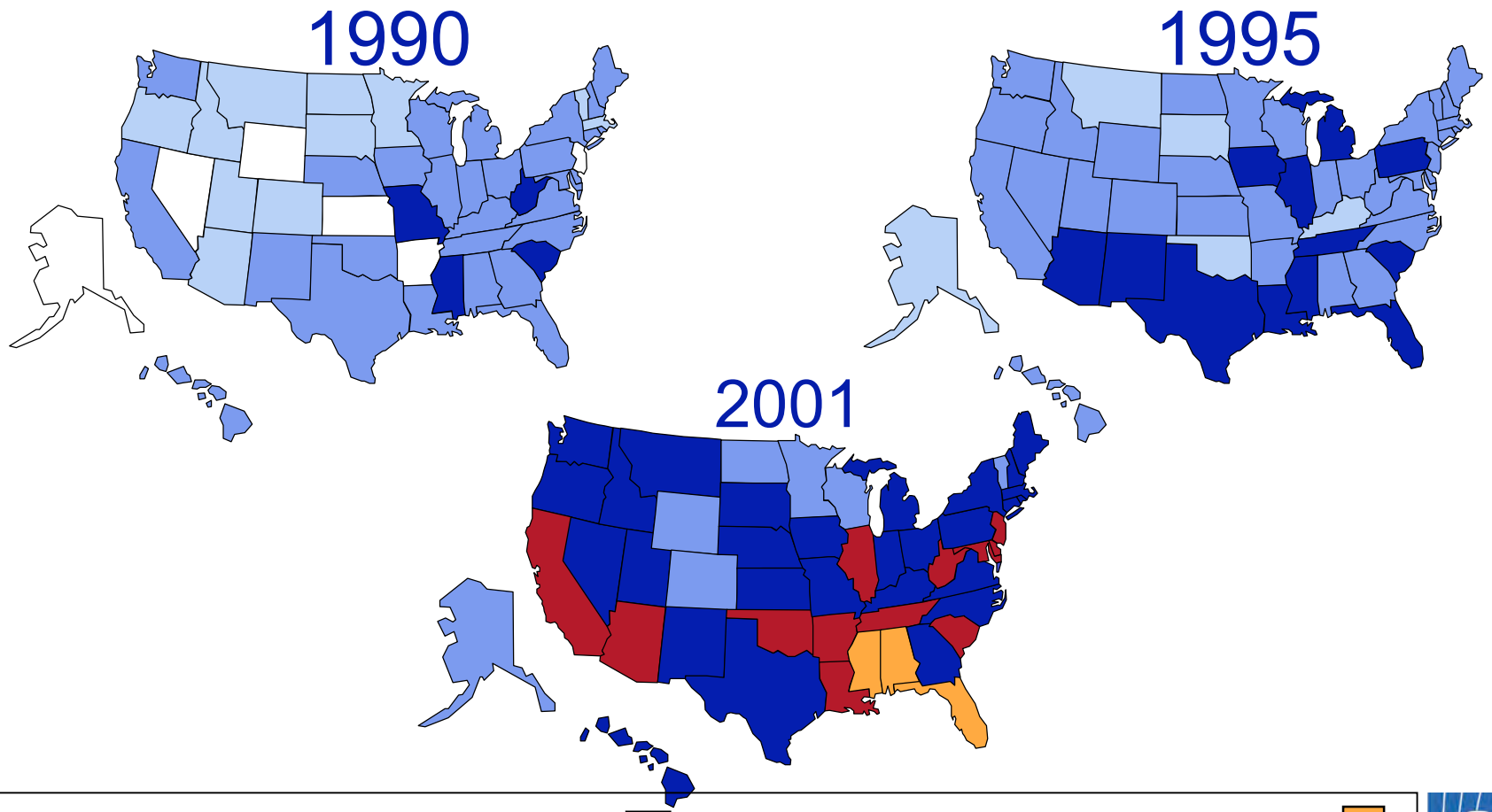


Ford, E. S. et al. J Clin Endocrinol Metab 2008;93:s1-s8

THE JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM

DIABETES

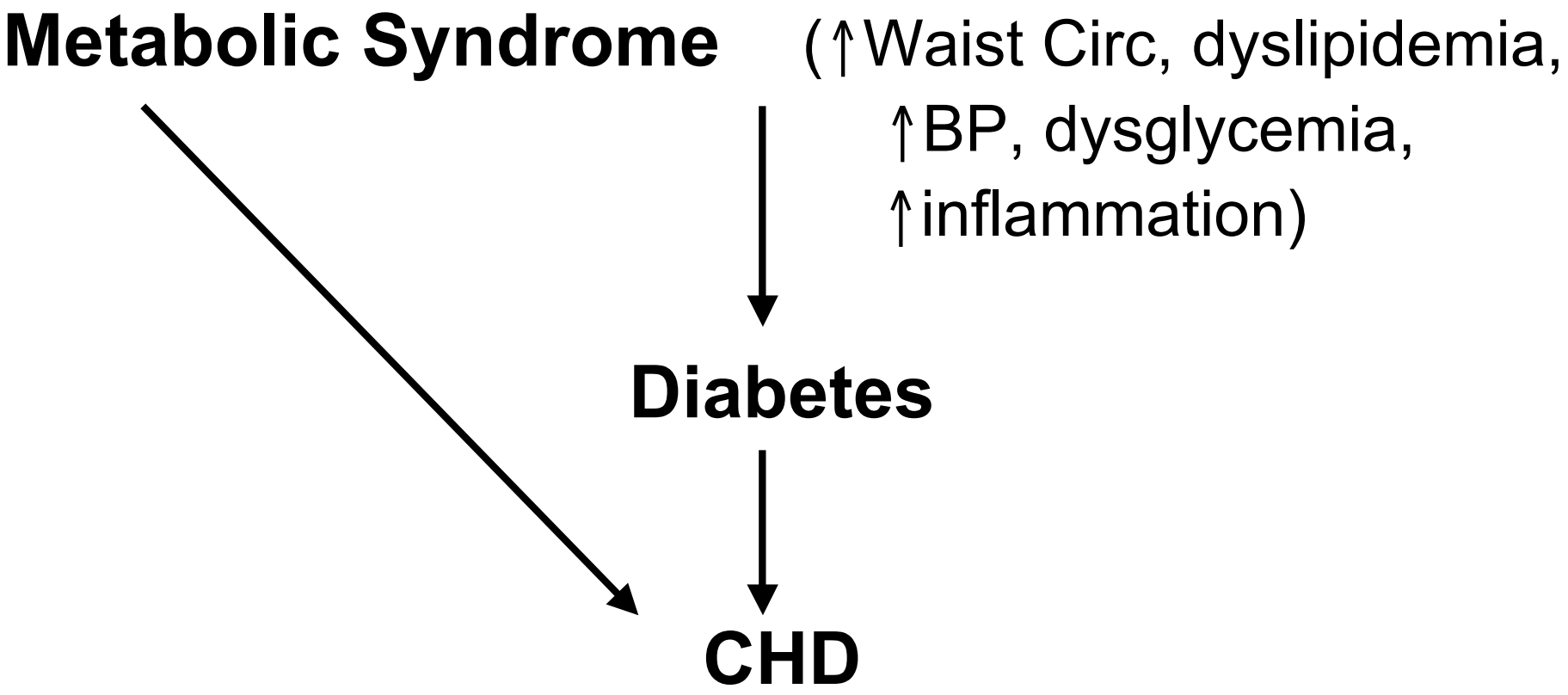
Diabetes and Gestational Diabetes Trends Among Adults in the U.S., BRFSS 1990, 1995 and 2001



Mokdad AH, Ford ES, Bowman BA, et al. Prevalence of obesity, diabetes, and other obesity-related health risk factors, 2001. JAMA 2003 Jan 1;289(1).

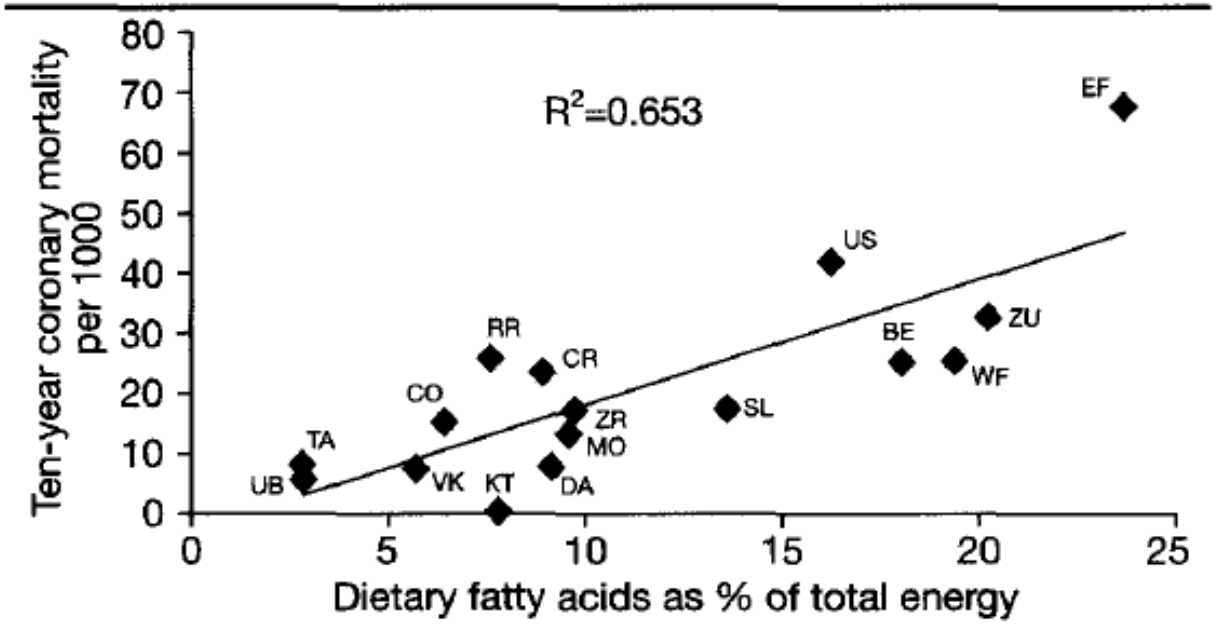
CDC
CENTERS FOR DISEAS
CONTROL AND PREVENTIO

Current Problem → Chronic Diseases



Dietary Dilemma
Relationship of saturated fat intake to Coronary Heart Disease Before 1970

Seven Countries Study. Relation between sample average dietary fatty acids and sample 10-year coronary mortality in 16 cohorts. Reconstructed from published data.



US: US Railroad, United States; EF: East Finland, Finland; WF: West Finland, Finland; ZU: Zutphen, The Netherlands; CR: Crevalcore, Italy; MO: Montegiorgio, Italy; RR: Rome Railroad, Italy; DA: Dalmatia, Croatia, former Yugoslavia; SL: Slavonia, Croatia, former Yugoslavia; VK: Velika Krsna, Serbia, former Yugoslavia; ZR: Zrenjanin, Serbia, former Yugoslavia; BE: Belgrade, Serbia, former Yugoslavia; KT: Crete, Greece; CO: Corfu, Greece; TA: Tanushimaru, Japan; UB: Ushibuka, Japan

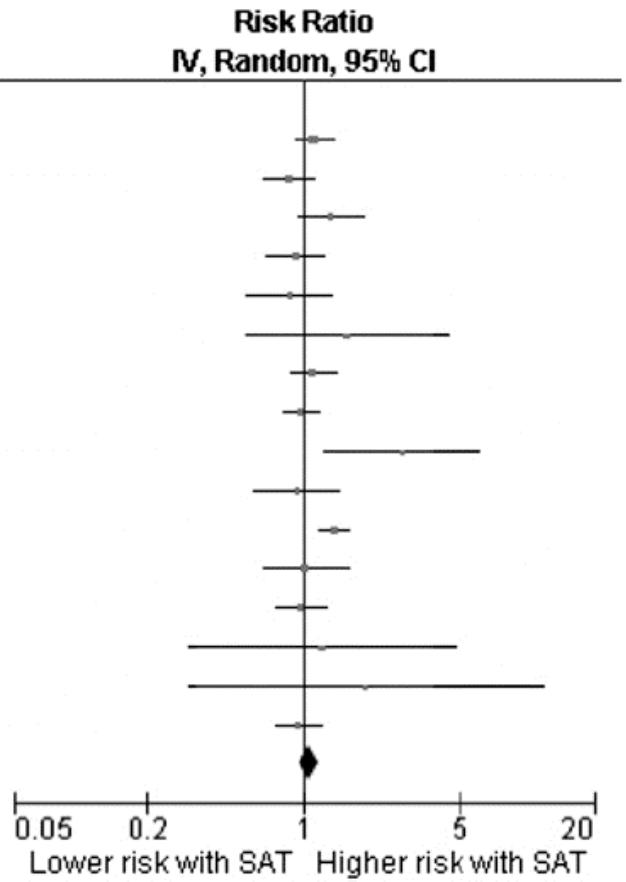
Mancini and Stamler ; Nutr Metab Cardiovasc Dis (2004) 14:52-57
(Keys A Circulation (1970) 41 (Suppl. 1): 1-211)

Relationship of Saturated Fat Intake to Coronary Heart Disease

Study or Subgroup	Risk Ratio IV, Random, 95% CI	Year
Coronary Heart Disease		
Shekelle et al(17)	1.11 [0.91, 1.36]	1981
McGee et al(9)[1]	0.86 [0.67, 1.12]	1984
Kushi et al(13)	1.33 [0.95, 1.87]	1985
Posner et al(16)	0.92 [0.68, 1.24]	1991
Goldbourt et al(35)[1]	0.86 [0.56, 1.35]	1993
Fehily et al(28)	1.57 [0.56, 4.42]	1994
Ascherio et al(4)[1]	1.11 [0.87, 1.42]	1996
Esrey et al(6)	0.97 [0.80, 1.18]	1996
Mann et al(32)	2.77 [1.25, 6.13]	1997
Pietinen et al(15)	0.93 [0.60, 1.44]	1997
Boniface et al(5)[1]	1.37 [1.17, 1.60]	2002
Jakobsen et al(8)[1]	1.03 [0.66, 1.60]	2004
Oh et al(33)	0.97 [0.74, 1.27]	2005
Tucker et al(18)[1]	1.22 [0.31, 4.77]	2005
Xu et al(10)	1.91 [0.31, 11.84]	2006
Leosdottir et al(14)	0.95 [0.74, 1.21]	2007
Subtotal (95% CI)	**1.07 [0.96, 1.19]**	

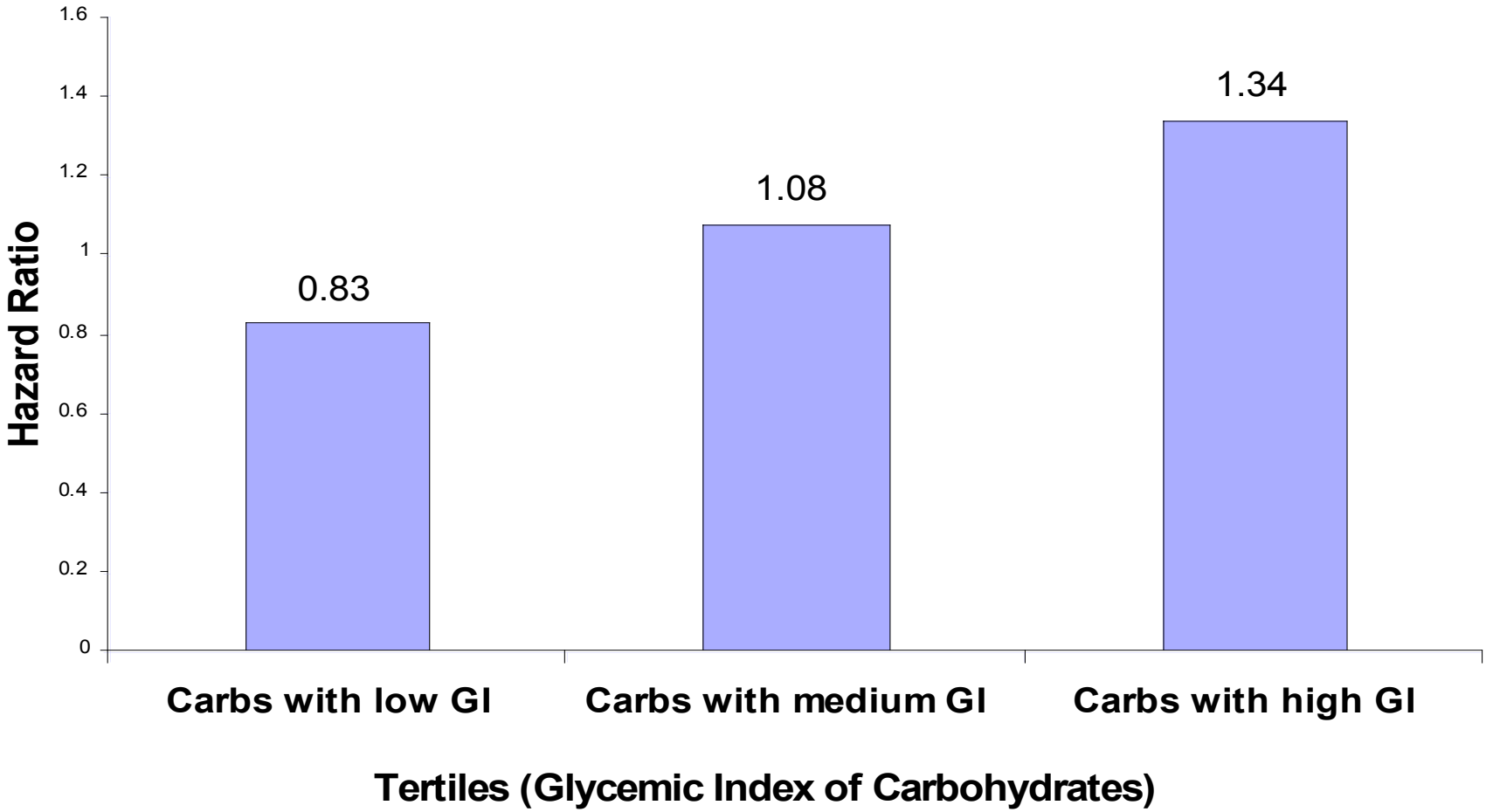
Heterogeneity: $Tau^2 = 0.02$; $Chi^2 = 25.54$, df = 15 (P = 0.04); $I^2 = 41\%$

Test for overall effect: Z = 1.22 (P = 0.22)



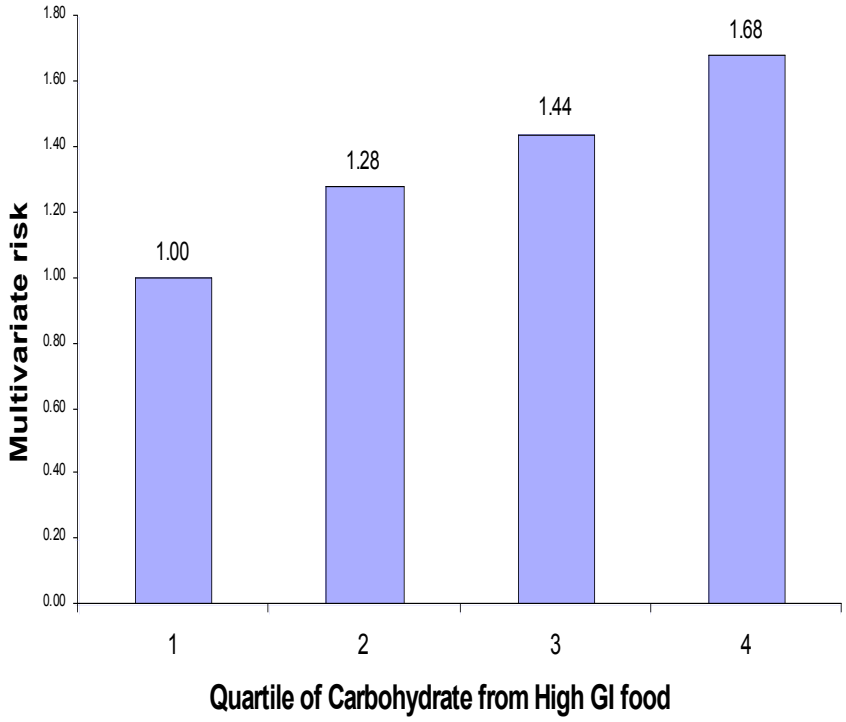
Siri-Tarino et al. Am J Clin Nutr (2010)

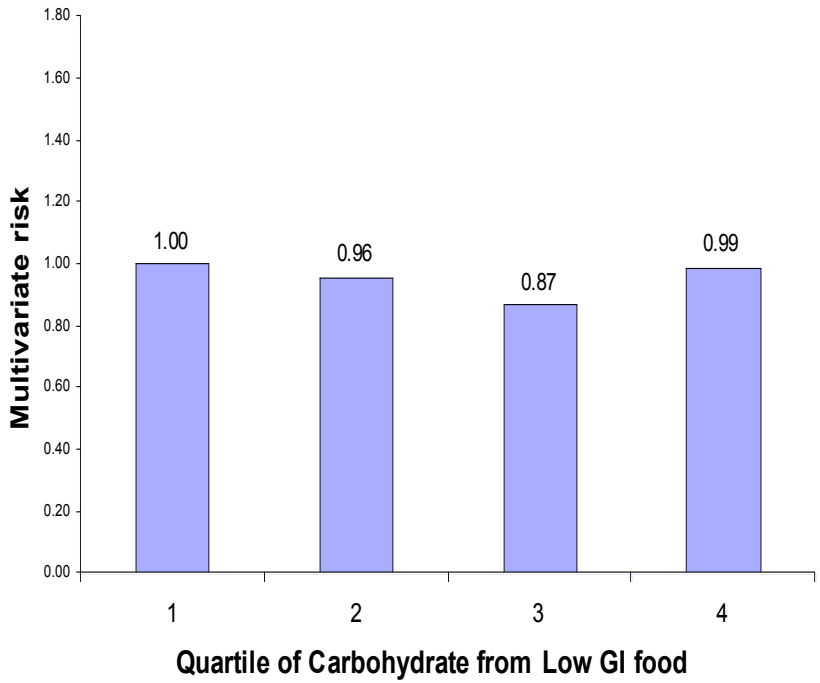
Hazard Ratios for Myocardial Infarction for Danish Men (N= 25,149 for 12 y)



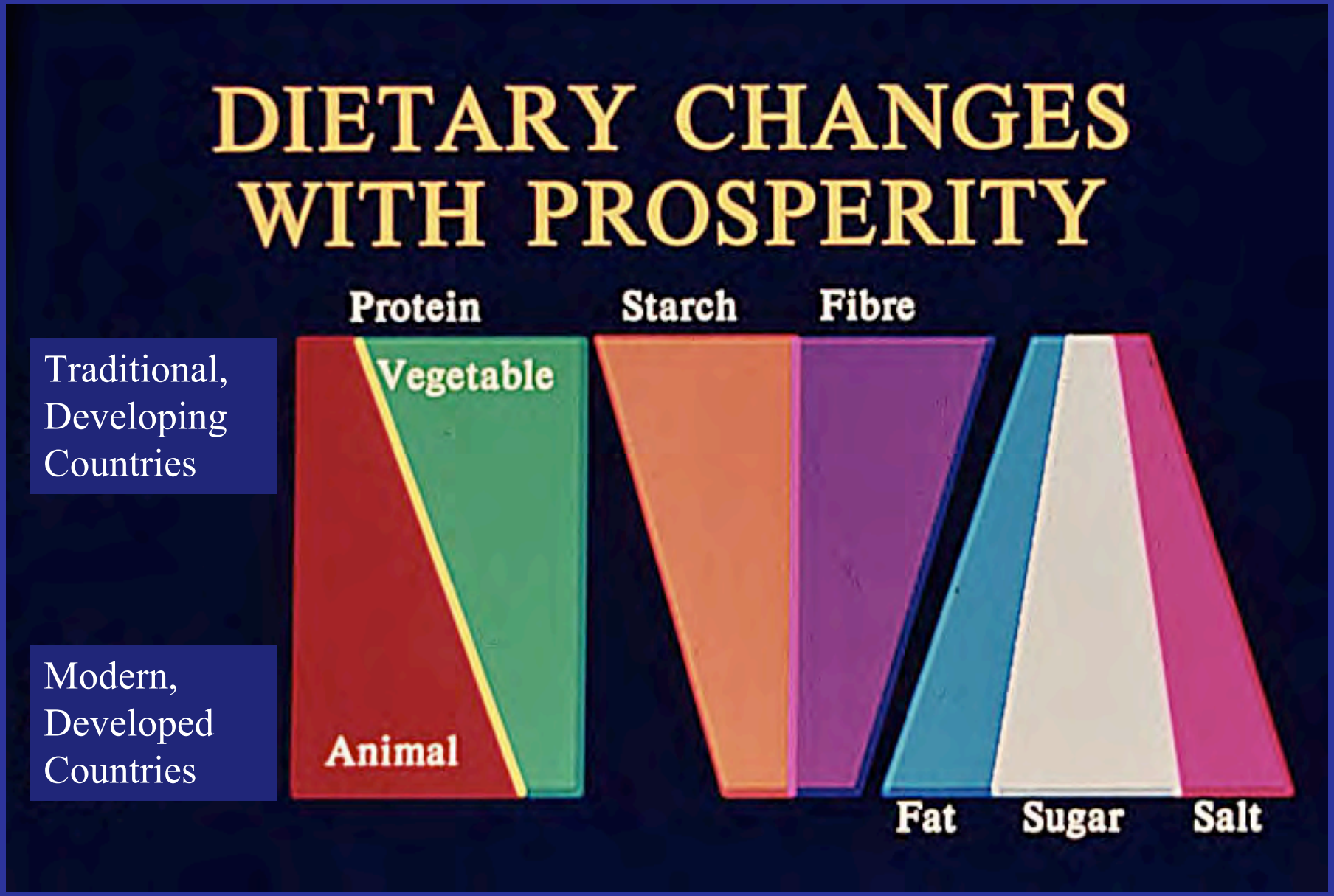
Jakobsen MU et al. Am J Clin Nutr (2010)

Risk of Coronary Heart Disease in Italian Women on High and Low GI Carbohydrate intake (n=32,578 for 7.9 y)





Sieri S et al. Arch Intern Med (2010)


DIETARY CHANGES WITH PROSPERITY
Protein
Starch
Fibre
Traditional, Developing Countries
Vegetable
Modern, Developed Countries
Animal
Fat
Sugar
Salt

Hyperglycemia (high 2-h blood glucose or HbA1c) is associated with all-cause and CVD mortality in non-diabetic populations

- Helsinki Policeman Study (Pyorala et al. 1979)
- The Framingham Study (Singer et al. 1980)
- The Whitehall Study (Fuller et al. 1983)
- The Chicago Heart Study (Pan et al. 1986)
- The Rancho Bernardo Study (Park et al. 1996; Barrett-Connor et al., 1998)
- Hoorn study (De Vegt et al. Diabetologia, 1999)
- ARIC study (Vitelli et al. 1997)
- Meta-analysis DECODE study (Lancet 1999)
- EPIC-Norfolk (Khaw et al. 2001)
- The Cardiovascular Health Study (Smith et al. 2002)
- ….many more now

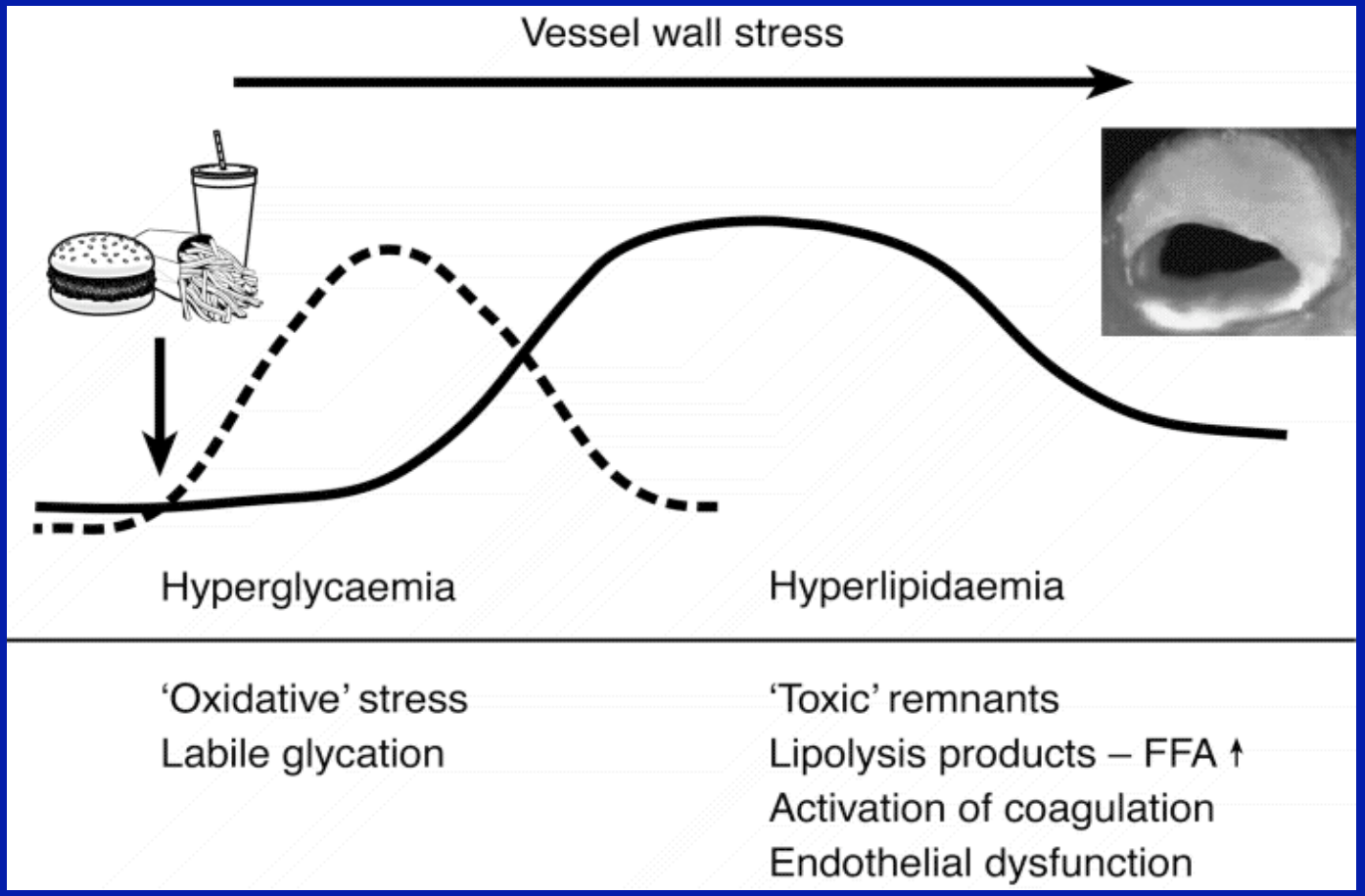
Guidelines for Management of Postprandial Glucose

- "Postmeal and postchallenge hyperglycemia are independent risk factors for macrovascular disease." (Level 1+)

- "A variety of both non-pharmaciological (i.e. low glycemic load (Level 1+) and pharmacologic (Level 1++) therapies should be considered to target postmeal plasma glucose."

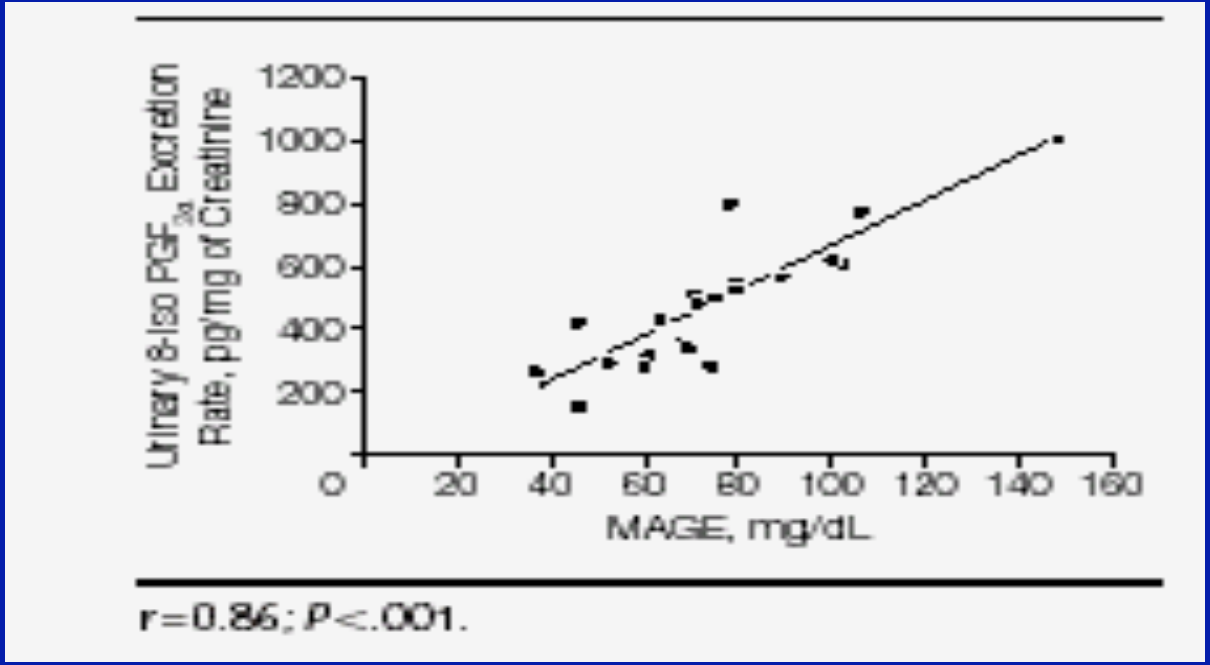
International Diabetes Federation (2007).

Postprandial Metabolism and Oxidative Stress



Ciriello, 2003

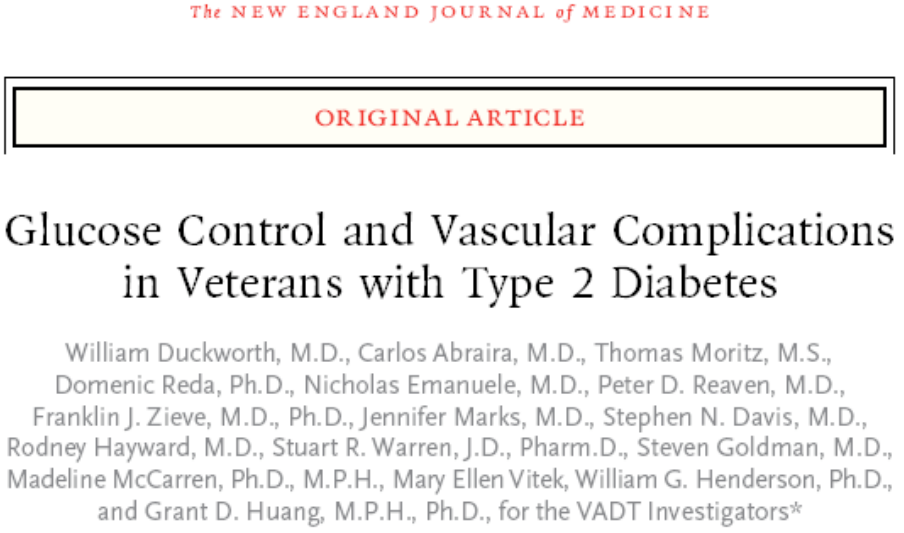
Oxidative Stress & Acute Glucose Fluctuations



Postprandial glucose fluctuation - ⇧ increased oxidative stress.

Monnier et al. JAMA 2006

Failure of Cardiovascular Benefit with Intensive Diabetes Control by Rosiglitazone or Polypharmacy (*ACCORD, ADVANCE, VADT*)



STOP-NIDDM Trial:

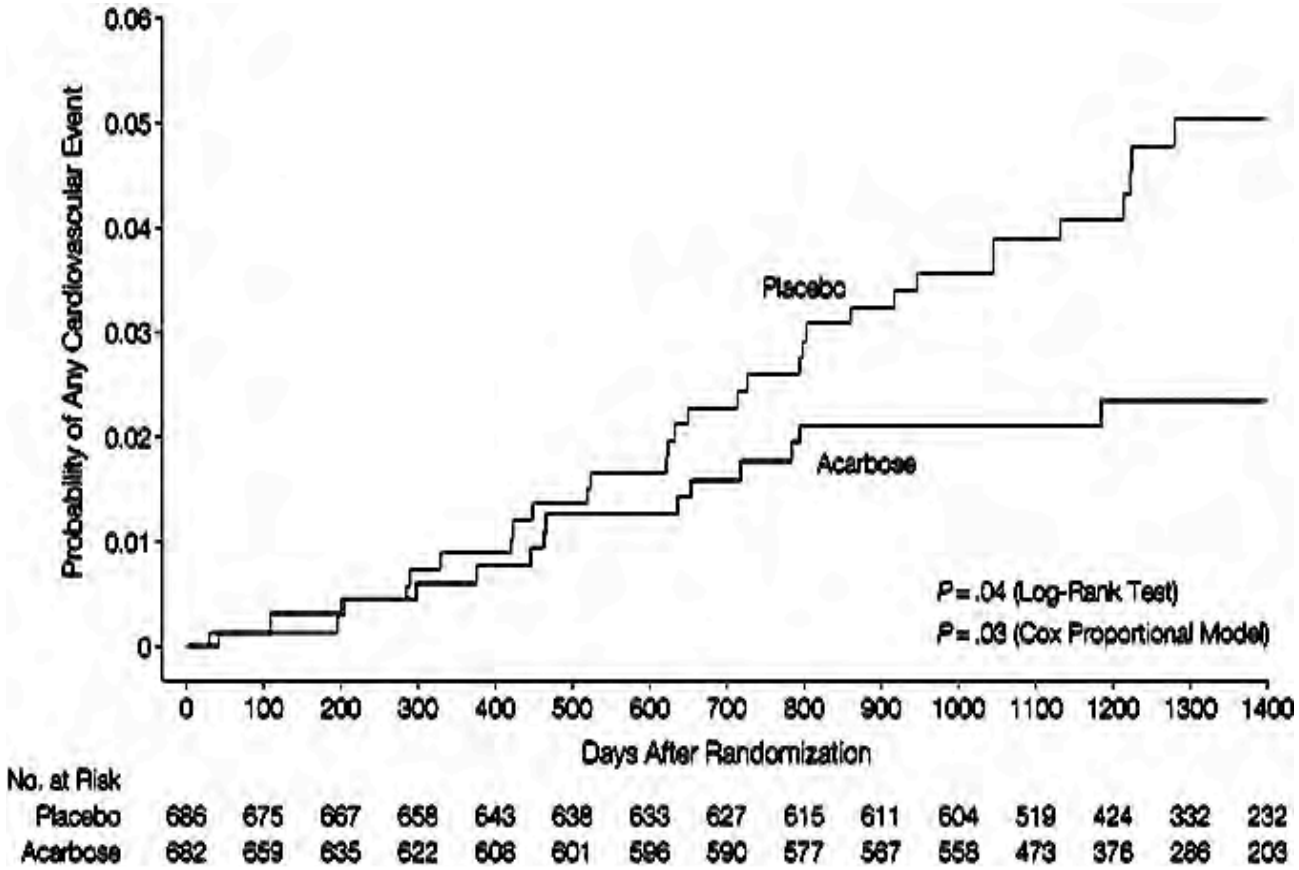
N= 1,386 subjects with Impaired Glucose Tolerance (high risk of developing diabetes)

~50% of subjects received acarbose (α-glucosidase inhibitor, ↓ rate of glucose absorption).

RESULT: ↓ 36% progression to diabetes

Chiasson J-L, Josse RG, Hanefeld M, et al. JAMA 2003;346:393.

STOP-NIDDM Trial:
CV events



CV Events

Acarbose

↓ 49% RR

Chiasson J-L, Josse RG, Hanefeld M, et al. JAMA 2003;346:393.

Glycemic Index

Low vs. High GI Foods:

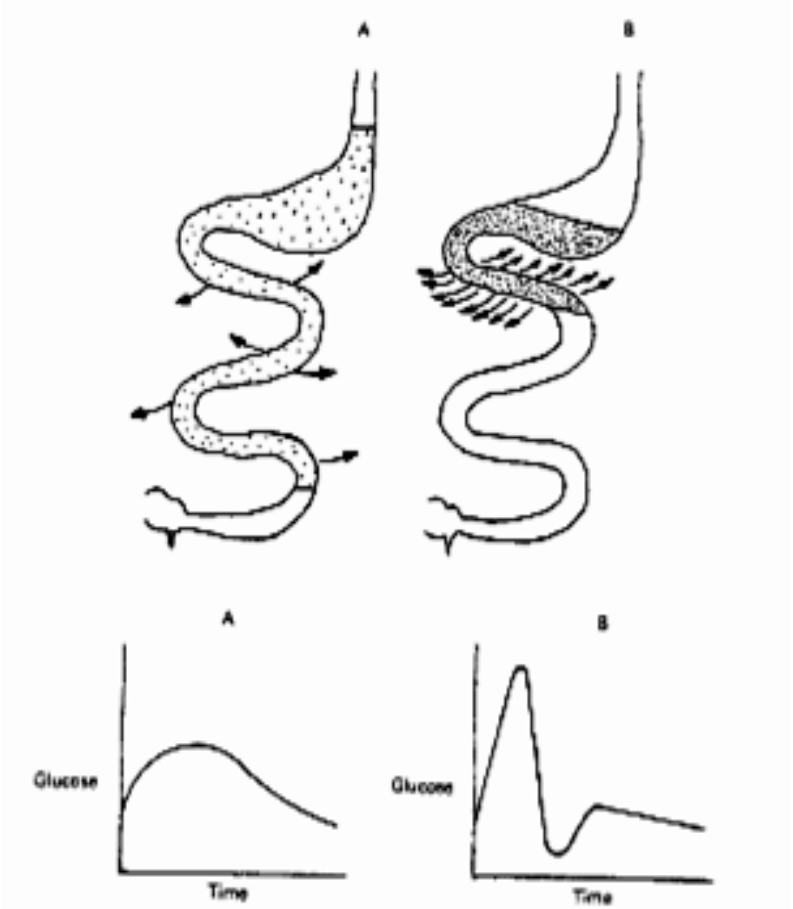
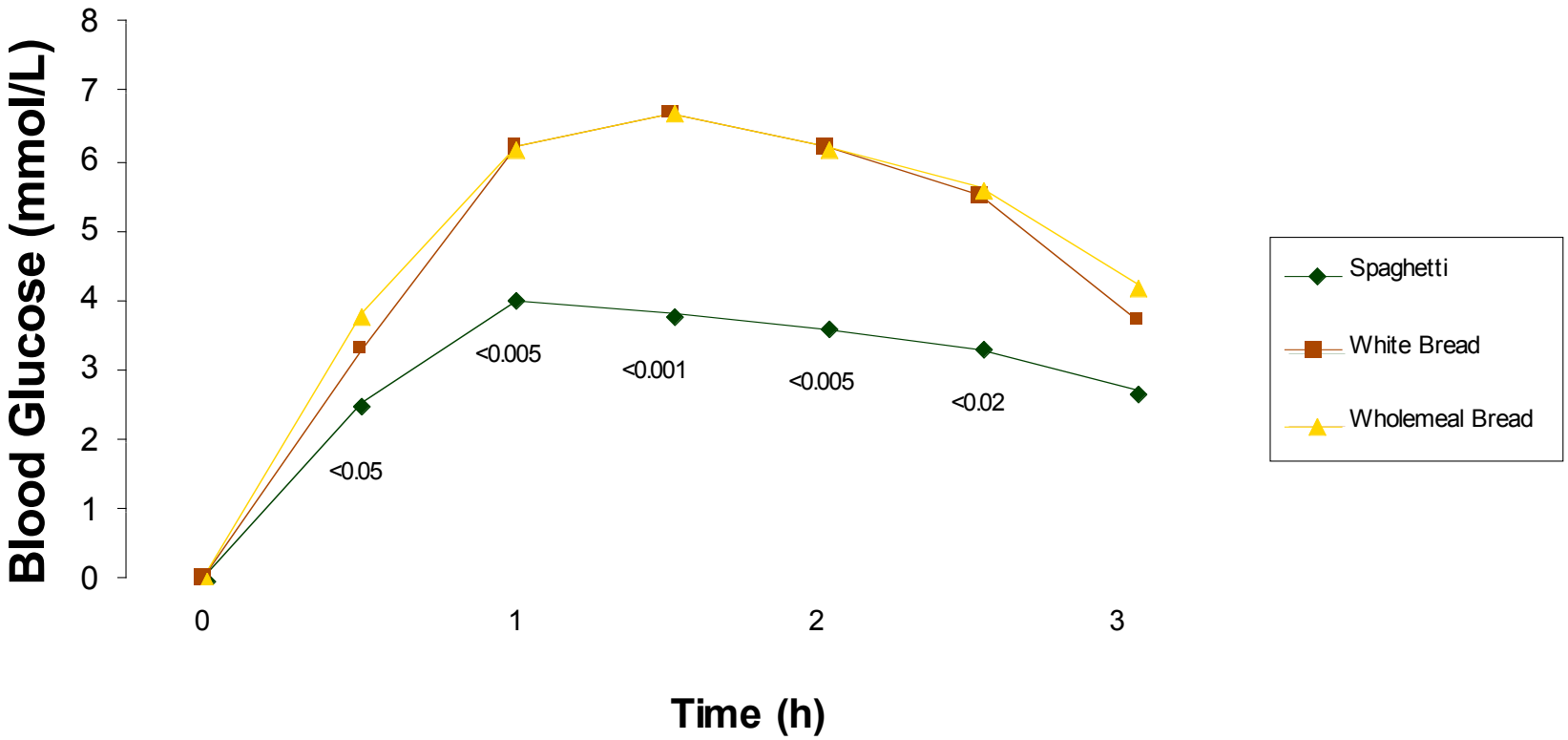


FIGURE 1. Hypothetical effect of feeding diets with a low (A) or high (B) glycemic index on gastrointestinal glucose absorption and postprandial blood glucose.

Some low GI food

- Steel cut oats
- Barley
- Pasta
- Parboiled rice
- Lentils
- Chick peas
- Dried beans
- Pumpernickel breads
- Pita Break Finland Rye
- Little Stream Quinoa

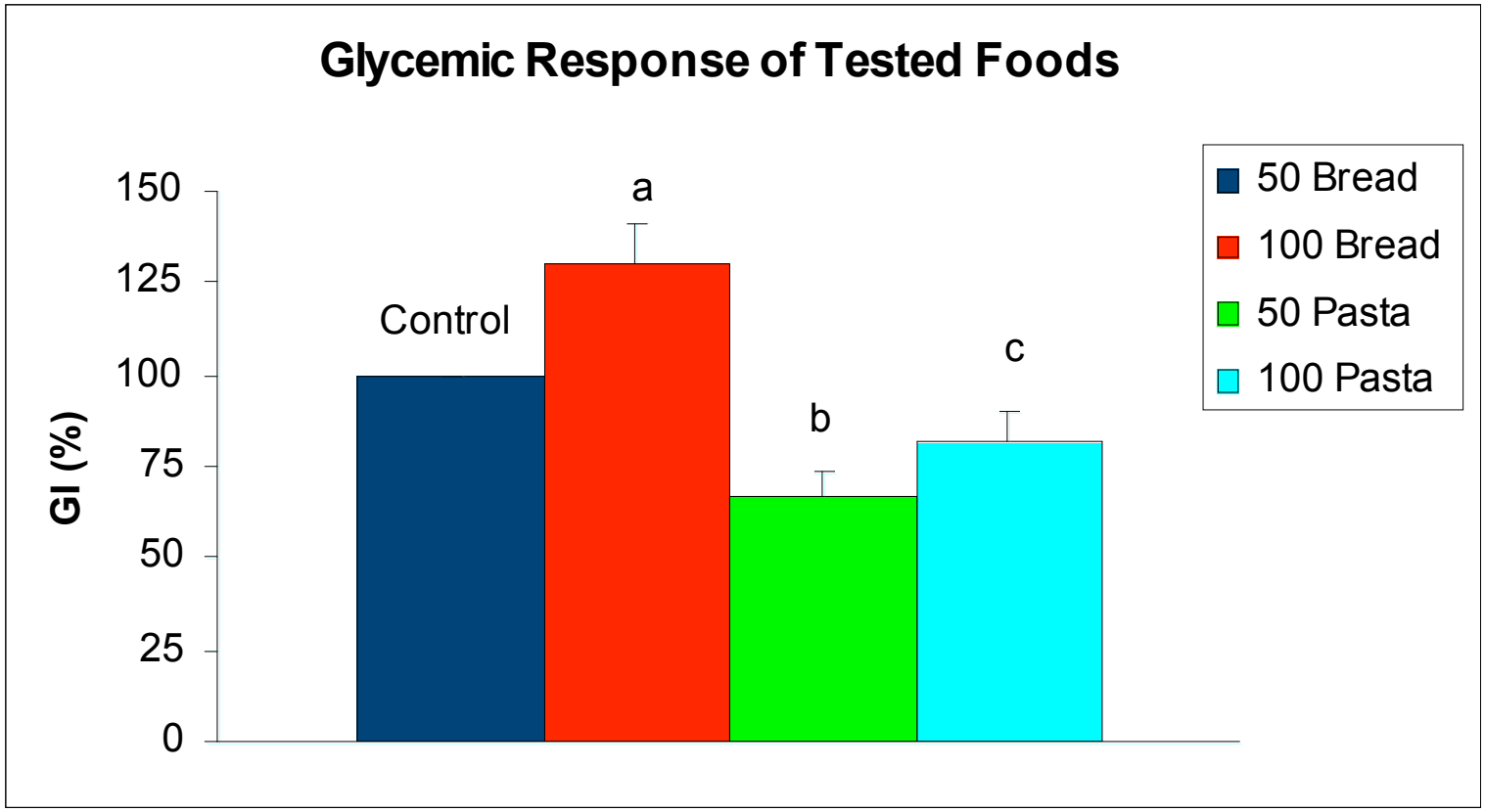
Blood Glucose Increments after Spaghetti, White and Wholemeal Bread (n=9)



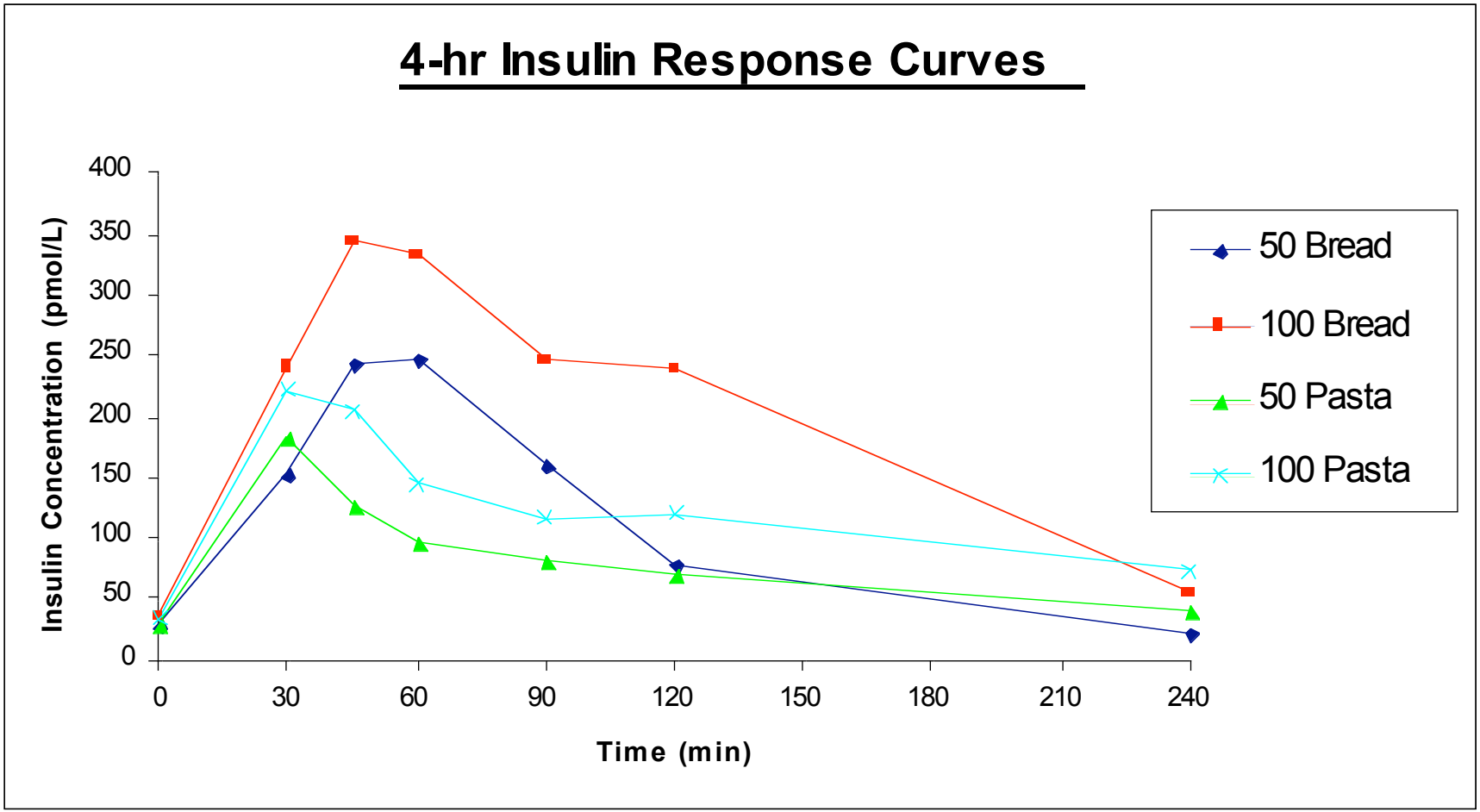
Jenkins *et al*. Diab Care 1983;6:155-9

GI & GL and Blood Glucose Response

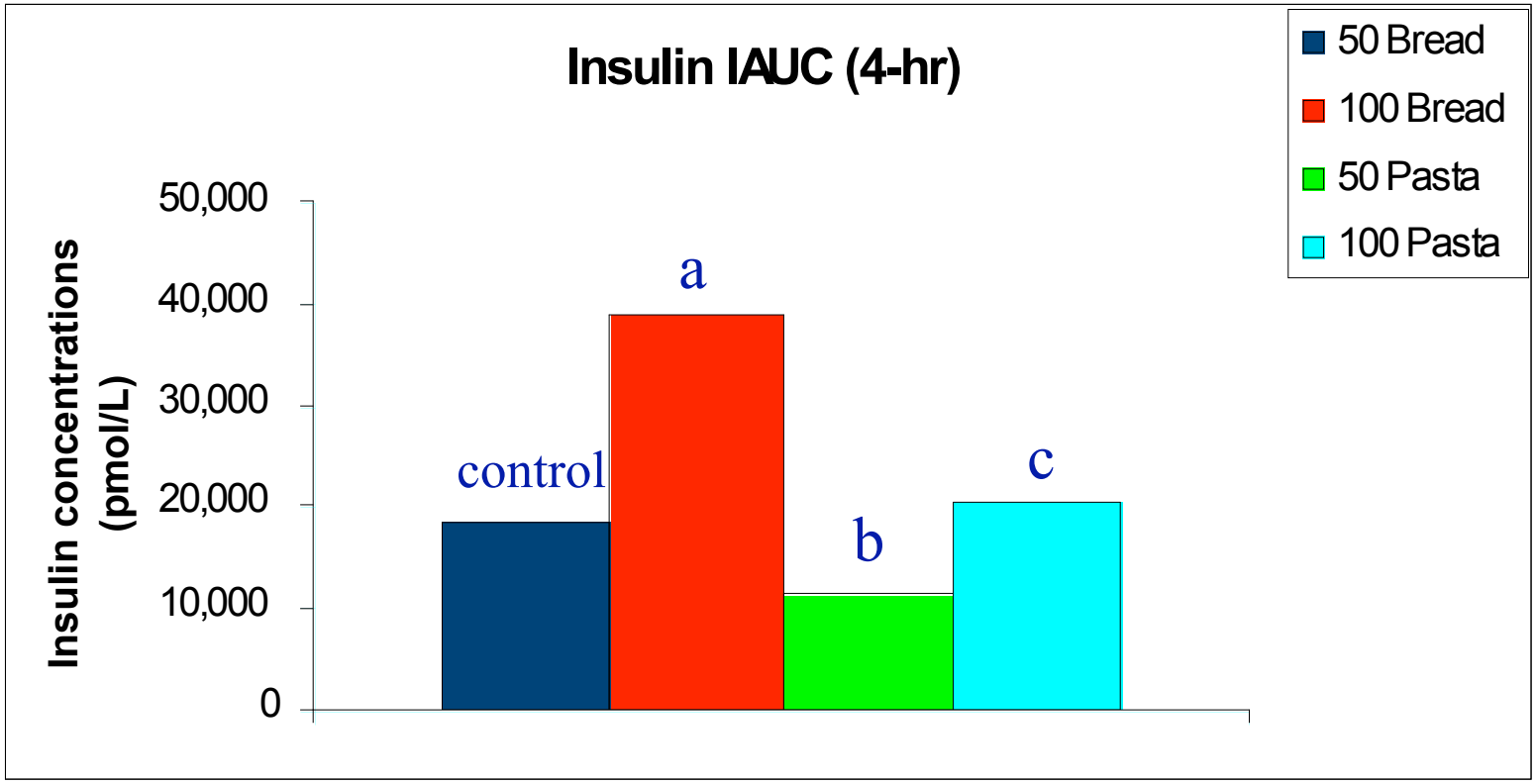
GI & GL and Area Under Curve Blood Glucose



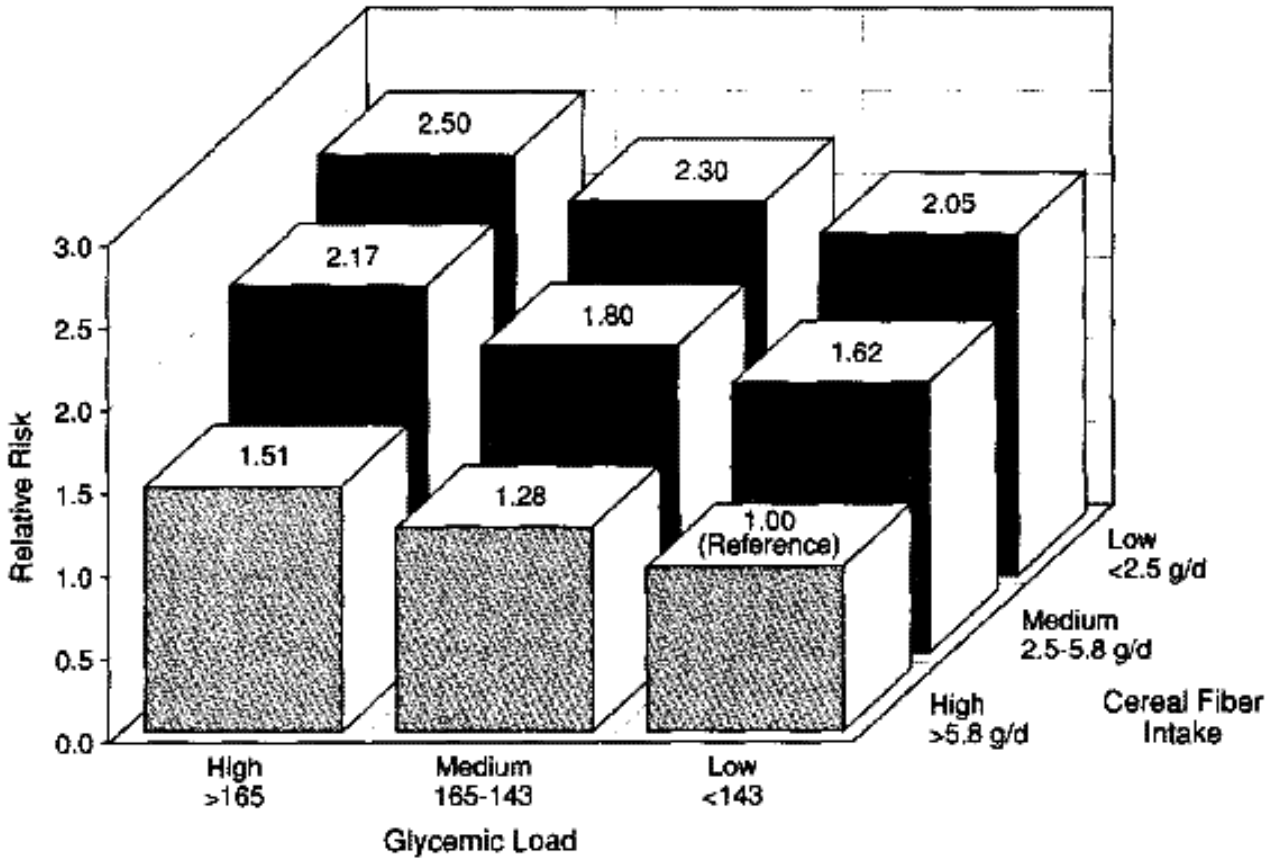
GI & GL and Blood Insulin Response



GI & GL and Area Under Curve Insulin Glucose

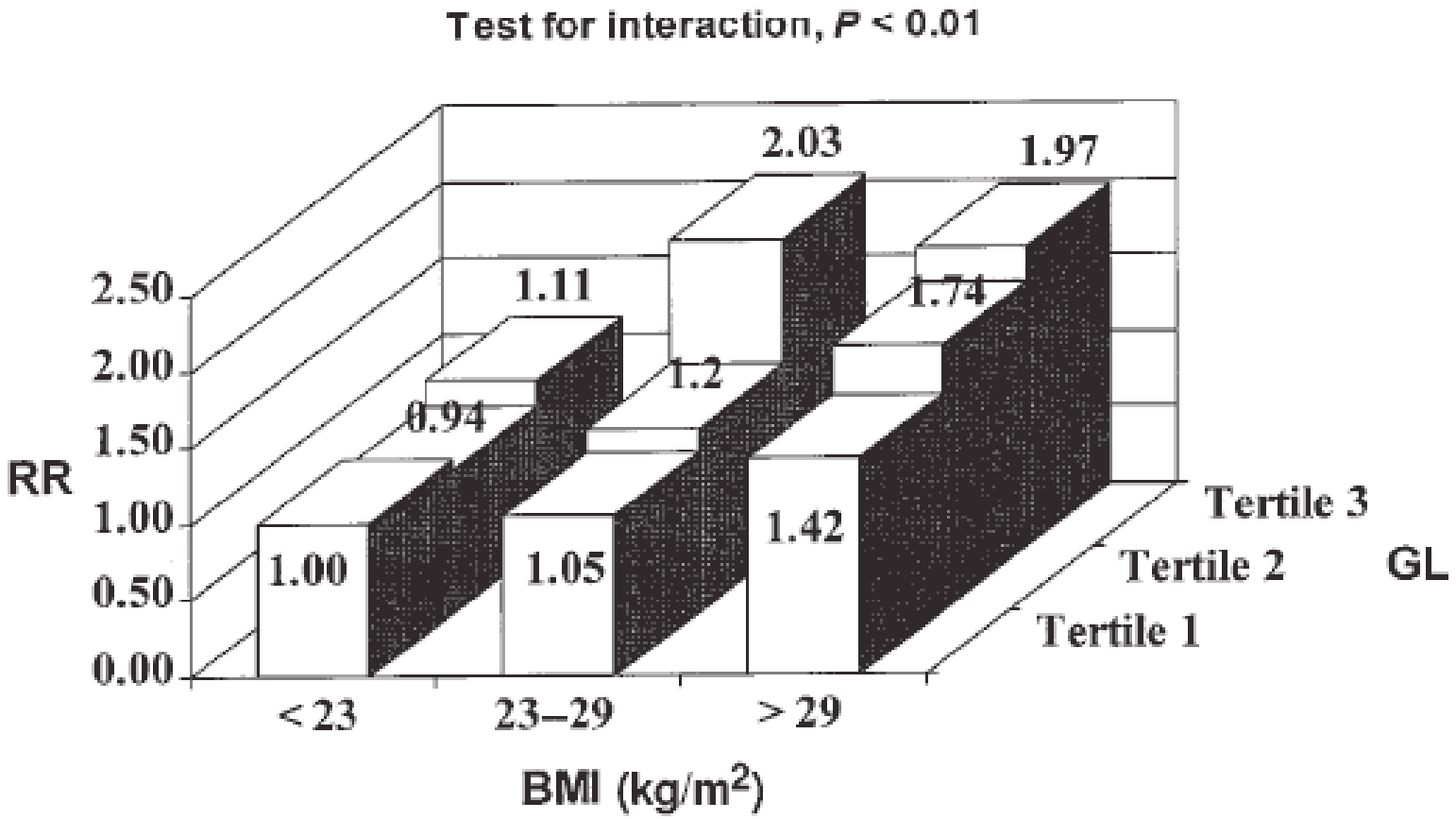


Glycemic Load and Cereal Fiber Intake in Women And Risk of Type II Diabetes



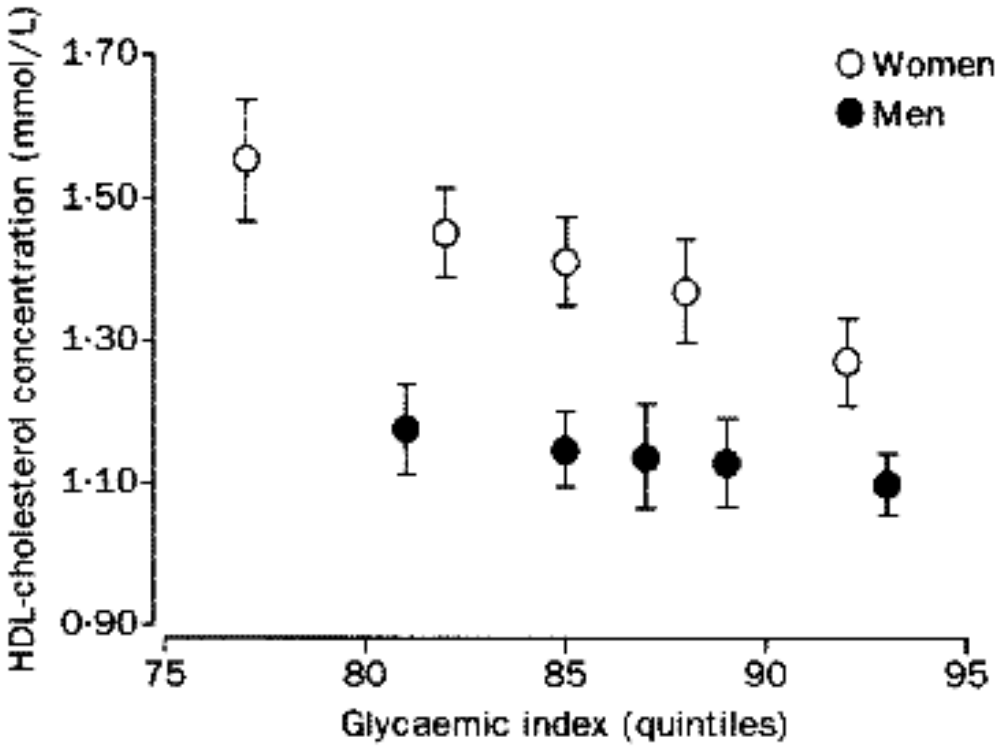
Salmeron *et al*. JAMA 1997;277:472-7

Multivariate RR of CHD according to body mass index (BMI) and Glycemic load (GL): 10y of follow-up in the Nurses Health Study (n=65,000).



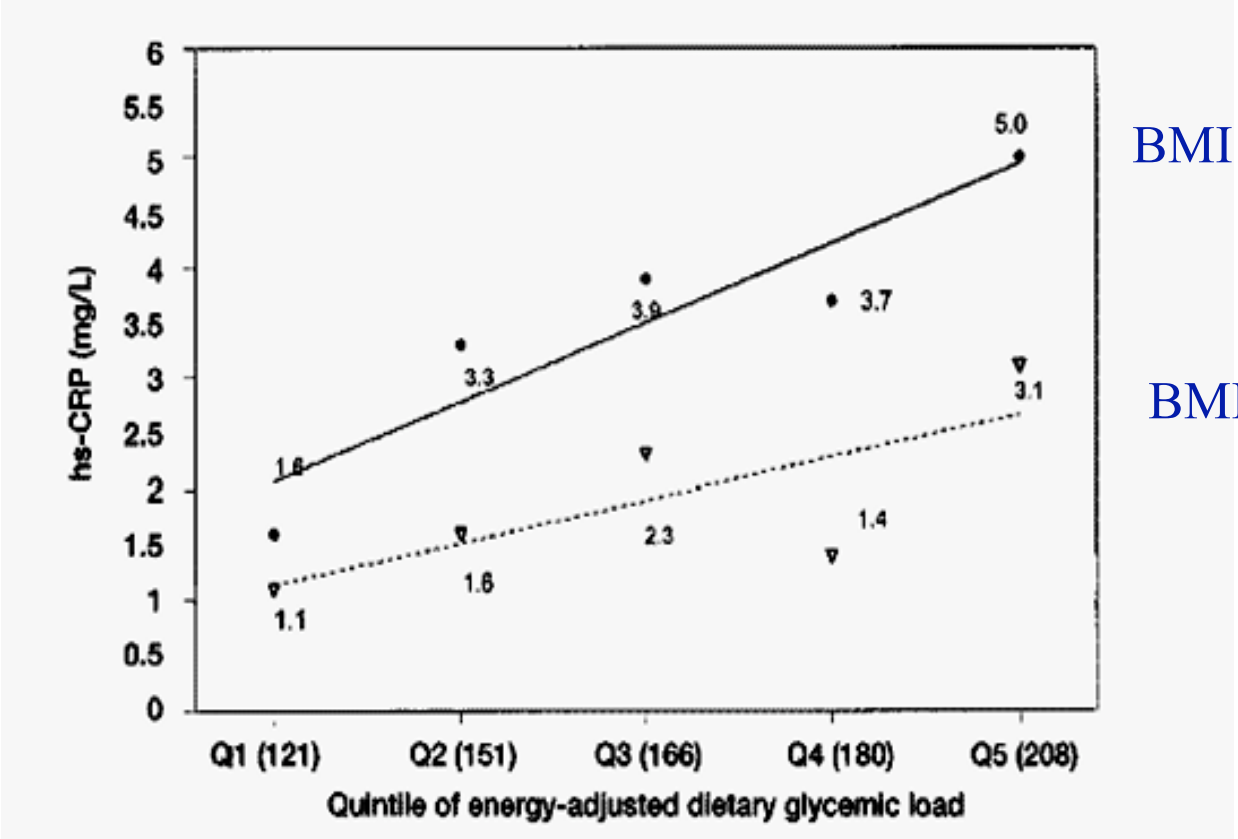
Liu *et al*. Am J Clin Nutr. 2000 Jun;71(6):1455-61.

Glycemic index and HDL-cholesterol



Frost *et al*. Lancet 1999;353:1045-8

Glycemic Load and C-Reactive Protein



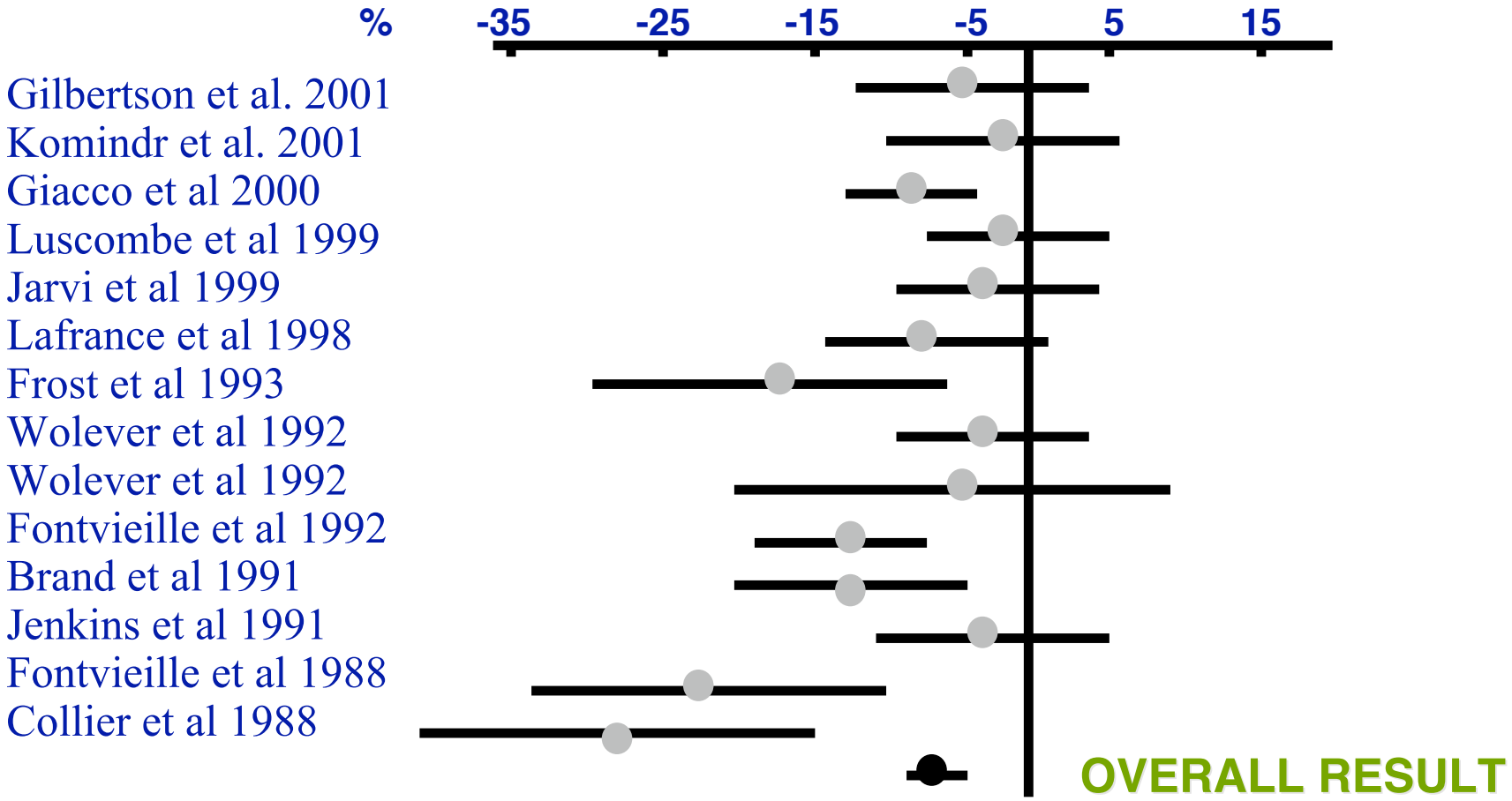
BMI > 25

BMI < 25

244 women of the Women's Health Study

Liu *et al*. Am J Clin Nutr 2002;75:492-8

Low vs High GI Diet: a Meta-Analysis
% Difference in Glycated Proteins



Mean %difference in 14 studies = -7.4% (CI -8.8 to -6.0%)

Brand-Miller et al, Diabetes Care 2003;26:2261-67

Low GI Diet in Diabetes Control: Effectiveness Study *(n=210)*

Study Design

Recommended Study Foods

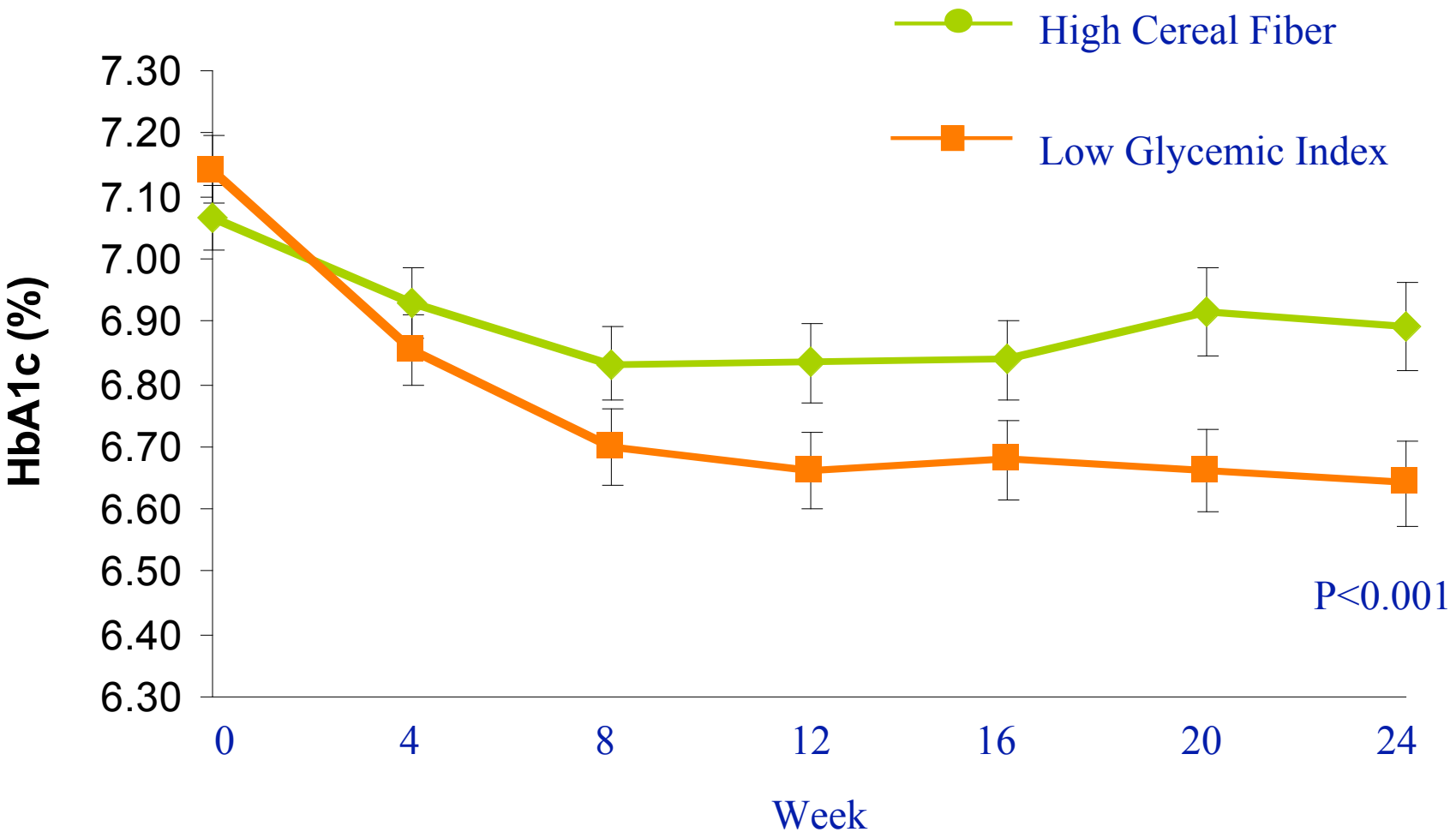
Low GI Diet (Test)	High Cereal Fiber Diet (Control)
Pasta (al dente)	Potato (baked, mashed)
Parboiled rice	White / Brown rice
Beans, Chickpeas, Lentils	Vegetable soup
Pumpernickel bread (Dimpflmeier)	Whole wheat bread
Barley	Rye crackers
Bulgur	Whole wheat crackers
Oatmeal	Bran flakes
Red River cereal	Shredded Wheat
GI < 70	**GI = 80**

Low Glycemic Index Diets and Diabetes Control

	Control	Test
Energy (kcal)	1,648	1,664
Fat (%)	29.4	32.6
SFA	*8.9*	*9.1*
MUFA	*11.6*	*12.9*
PUFA	*5.9*	*6.5*
Cholesterol (mg/100kcal)	*145*	*143*
Protein (%)	21.0	21.5
Carbohydrate (%)	48.1	44.4
Fiber (g/1000 kcal)	16.5	19.7
GI	**84**	**70**

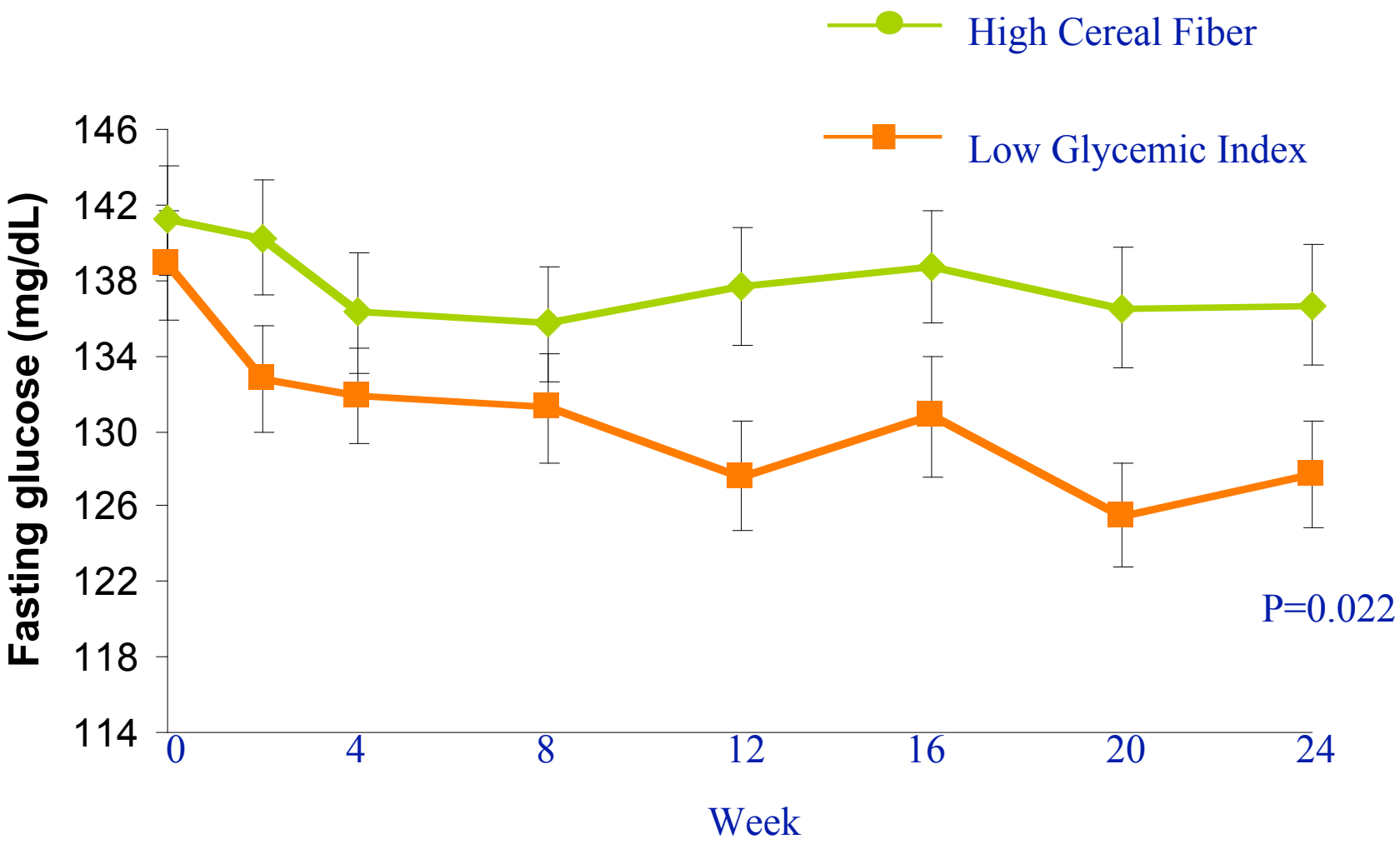
Jenkins DJ, Kendall CW et al. JAMA 2008.

HbA1c (intent to treat, n=210)



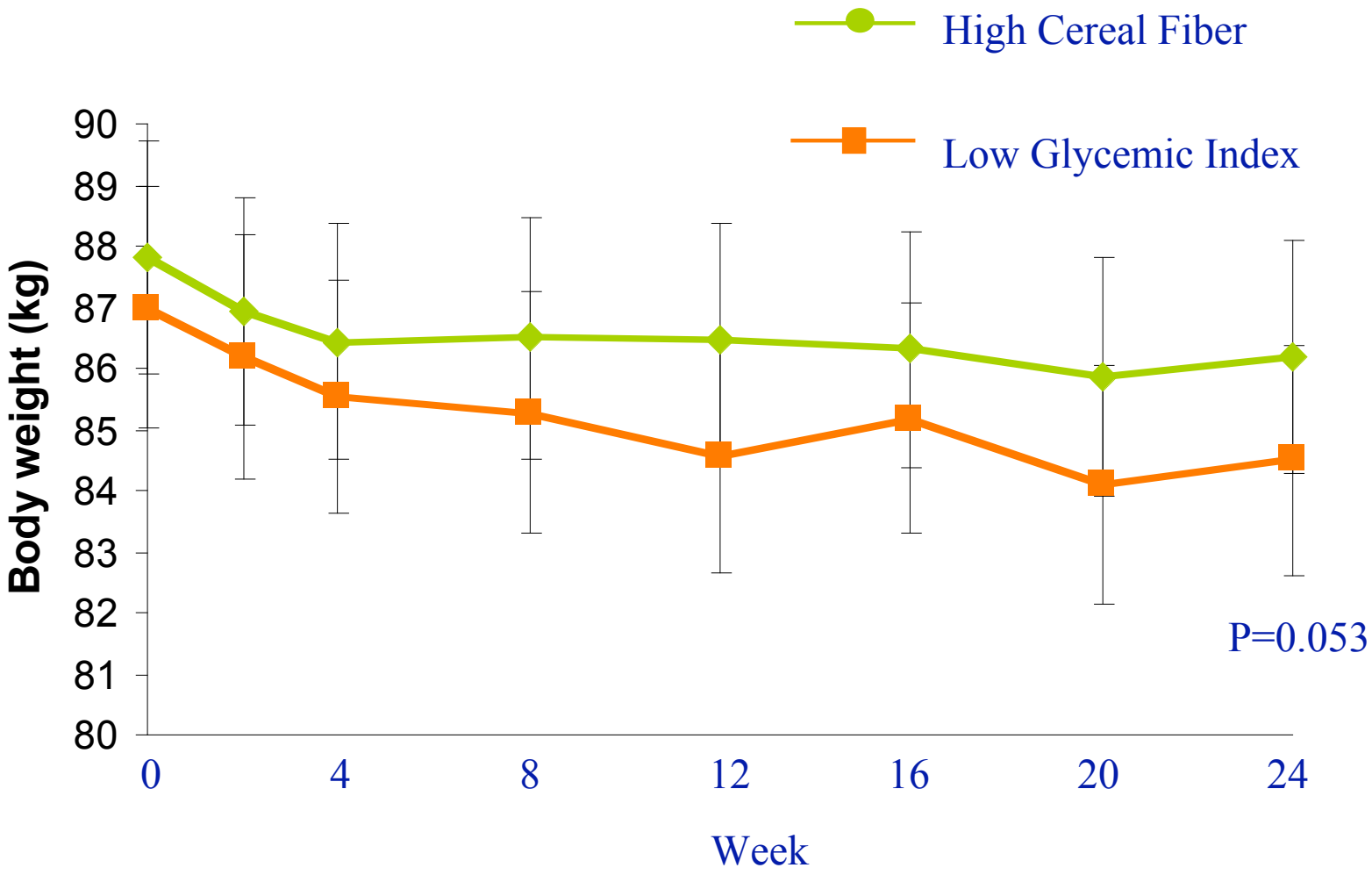
Jenkins DJ, Kendall CW et al. JAMA 2008.

Fasting Glucose



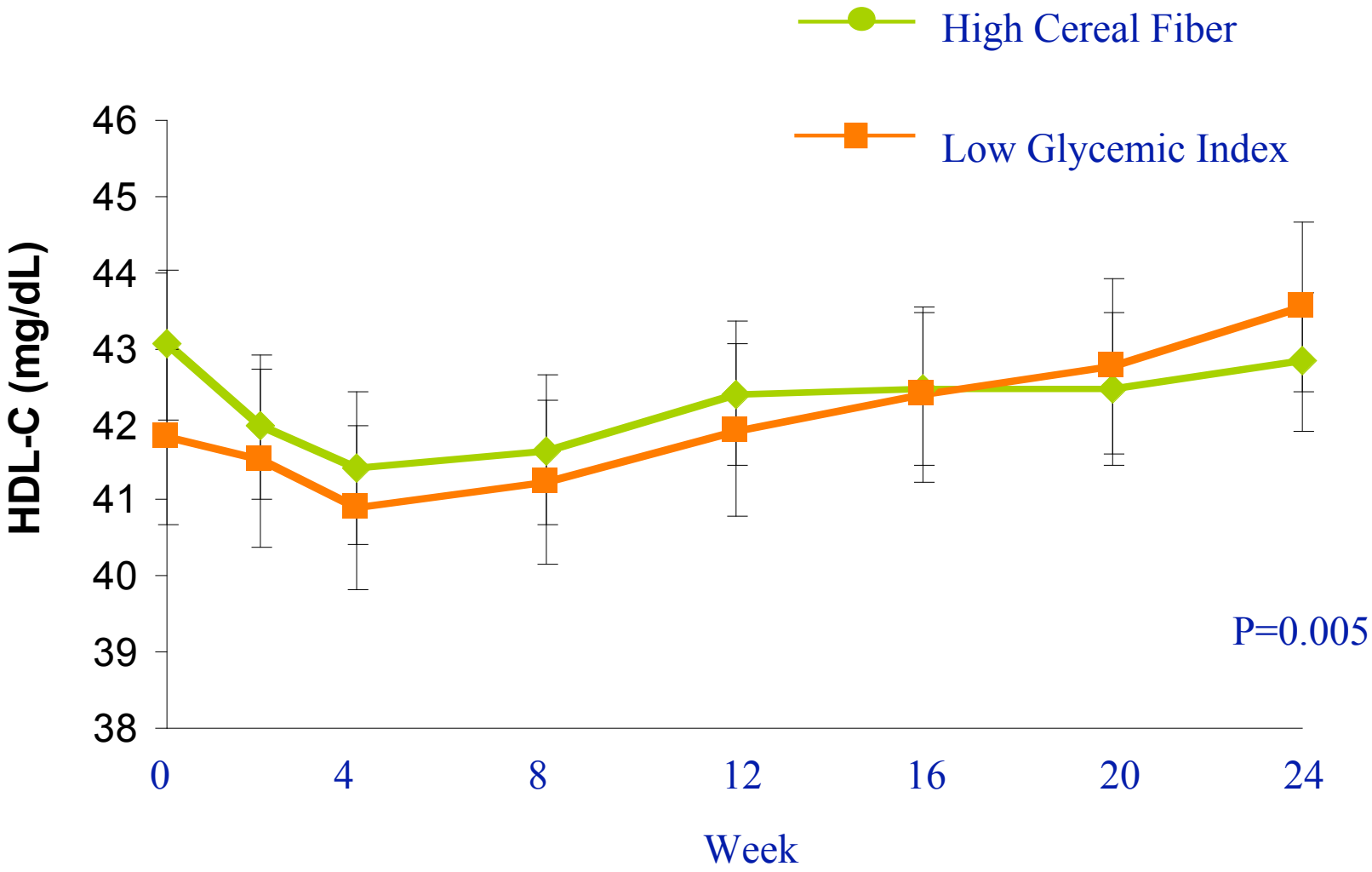
Jenkins DJ, Kendall CW et al. JAMA 2008.

Body Weight (kg)



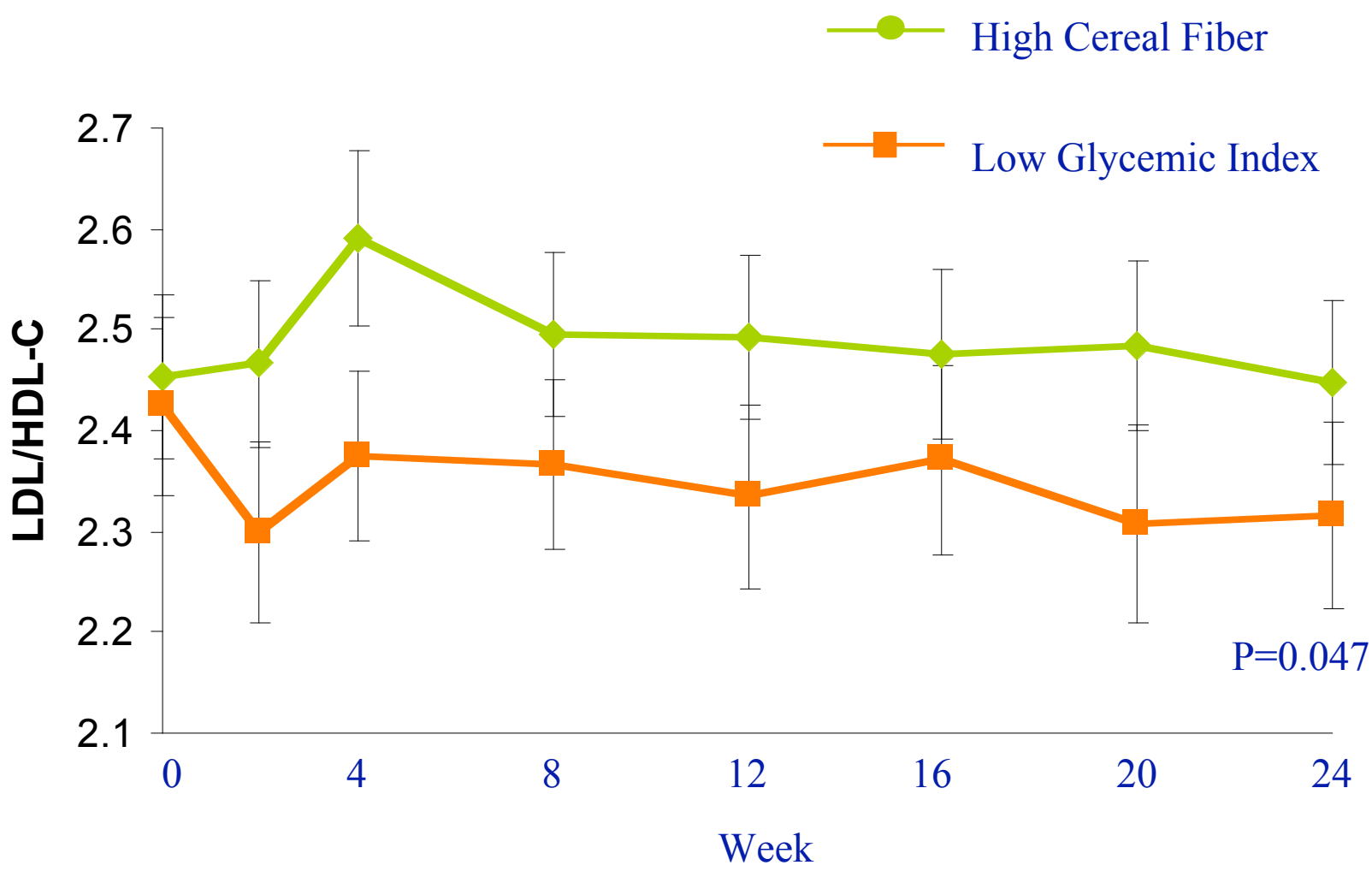
Jenkins DJ, Kendall CW et al. JAMA 2008.

HDL-C



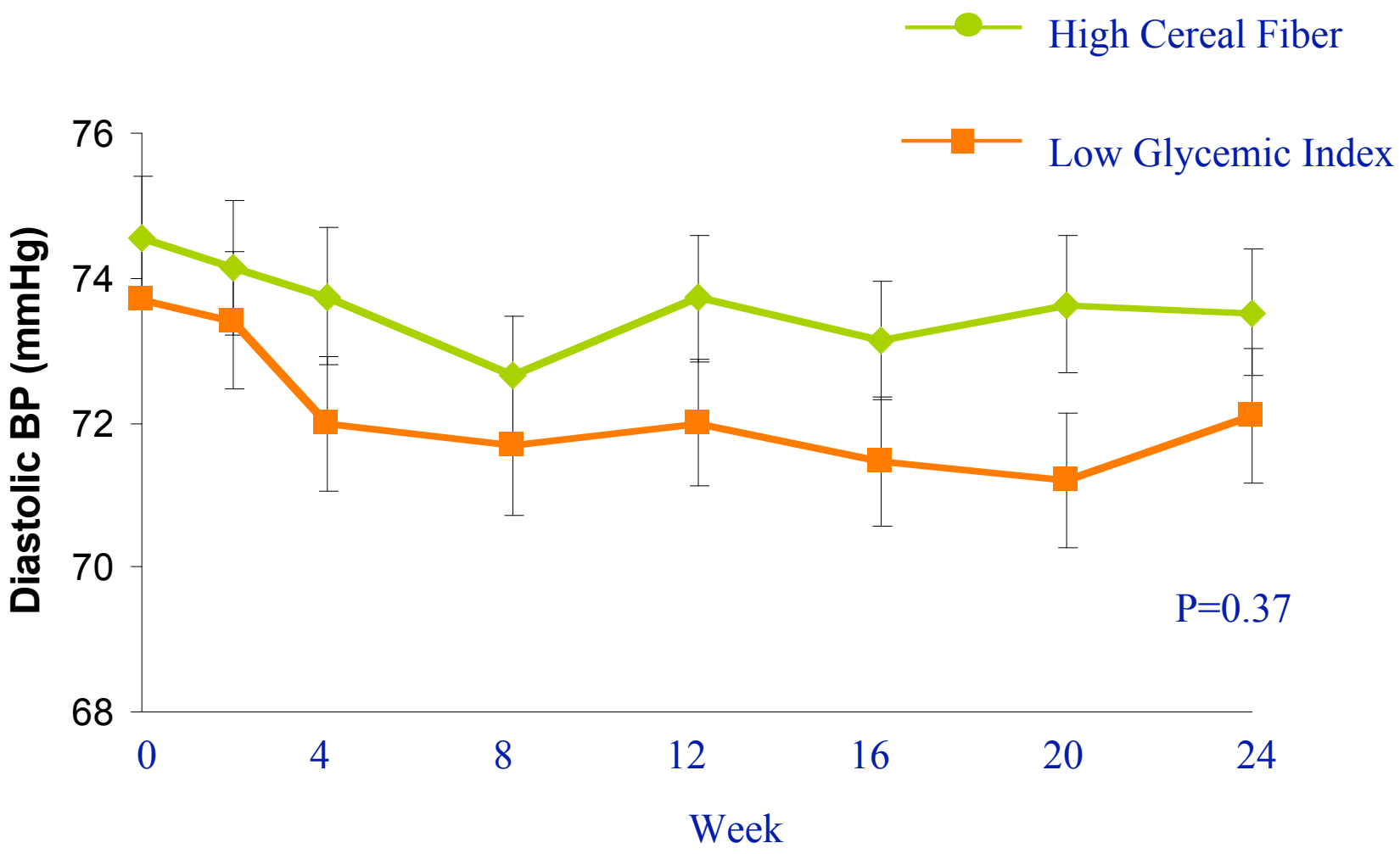
Jenkins DJ, Kendall CW et al. JAMA 2008.

LDL/HDL-C



Jenkins DJ, Kendall CW et al. JAMA 2008.

Diastolic BP



Jenkins DJ, Kendall CW et al. JAMA 2008.

Summary

- Pasta and other low glycemic index foods appear to have metabolic benefits for individuals with type 2 diabetes treated with oral agents.
- Part of the effect appears to be slowing carbohydrate absorption. The effect of altering the rate of nutrient delivery requires further investigation.

Thank you for your attention