

GI – What special people benefit?

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Conflict of Interest

- ***Griffin Hospital***, New Haven- For the development of the Nuval System. C, H, SAB
- ***The Canola & Flax Councils of Canada***. C, H,SAB
- ***Pulse Canada*** - SAB
- ***Saskatchewan Pulse Growers*** – SAB
- ***Canadian Institute of Health Research (CIHR)*** – G
- ***Canadian Foundation for Innovation (CFI)*** –G
- ***Ontario Research Fund (ORF)*** – G
- ***Advanced Foods and material Network (AFMNet)*** – G
- ***International Tree Nut Council Nutrition Research and Education Foundation and the Peanut Institute*** – G, H
- ***Abbott Laboratories***, Algorithms for Diabetes Management. C, H, SAB
- ***Alpro Soy Foundation*** - H

C = Consultancies; H = Honorarium; SAB = Scientific Advisory Boards; G = Grants

Conflict of Interest

- ***Oldways Preservation Trust***, Boston, MA – A not for profit organization promoting traditionally “healthy” ways of eating (eg. Mediterranean Diet, etc.) H
- ***Almond Board of California, Modesto***, CA – A branch of the USDA (therefore “not for Profit”) to promote the use of almonds. C,H,G
- ***The California Strawberry Commission***, Watsonville, CA – Another USDA not for profit group to explore possible health benefits and to promote the use of strawberries. SAB
- ***Bayer Consumer Care***, Springfield NJ – Marketing of nutritional supplements/nutraceuticals. SAB
- ***Orafti***, Tienen, Belgium Development of prebiotics for modification of colonic microflora. SAB, G

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Conflict of Interest

- **Sanitarium Company**, Sydney, Australia – Australia's largest health food manufacturing company and soy food producer. G, SAB
- **Solae**, St. Louis – The major US producer of soy protein isolate. C,G
- **Barilla**, Italy – A general food company. Producer of pasta and baked goods. G
- **Haine Celestial**, CA – One of the largest Health Food companies in the US. G
- **Loblaws Supermarkets** – Canada's largest supermarket chain. G, SAB
- **Unilever**, Vlaardingen, Netherlands – Major margarine producers including Becel and Take Control (plant sterol enriched margarine). G, GP

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Conflict of Interest

- ***Herbalife International***, Century City, CA – A nutraceutical company with an emphasis on sourcing plant derived components for weight loss. SAB
- ***Nutritional Fundamentals for Health***, Montreal, QE – A new nutraceutical company exploring and aiming to market food derived components for health. SAB
- ***Pacific Health Laboratories INC***, Matawan, NJ – a nutrition technology company with functional food and nutraceutical products researched and commercialized for sports performance weight loss and type 2 diabetics which can be marketed without prior approval of the FDA. SAB, Stock
- ***Metagenics/MetaProteomics***, Gig Harbor WA – a company assessing natural products from hops which will positively impact individuals with specific genetic susceptibilities for chronic disease. SAB

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Conflict of Interest

- **Unilever** - Canada – Guidelines for the management of hyperlipidemia. G,C,H
- **Agriculture and Agrifoods Canada (AAFC)** – SAB
- **Canadian Agriculture Policy Institute (CAPI)** – SAB
- **White wave- Dean Foods**, Colorado – SAB, C, H
- **The Coco Cola sugar Advisory Board** . C, H,SAB
- **Orafti**, Tienen, Belgium Development of prebiotics for modification of colonic microflora. SAB, G
- **Wife and is a Director of Glycemic Index Laboratories**, Toronto, CA – Financial relationship of a spouse
- **Kellogg's**, Canada – C, H, SAB
- **Quaker Oats**, Canada-C, H, SAB

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Common ways of Reducing post prandial glycemia

1) Improving blood glucose disposal

direct tissue sensitization: biguanides (metformin), thiazolidinediones; or increase insulin: sulfonylureas, DPP4 inhibitors, incretins/analogues; insulin itself

2) Increasing glucose losses

SGLT2 inhibitors – urine; Bypass surgery- Small intestine

3) Reducing the amount of “bad” carbohydrates

by increasing fat calories, ↑ fat, ↑ protein (Atkins) low GI/GL diets, **olive oil**, nuts(PREDIMED)

4) Altering the Quality carbohydrate to a “lente” (slow release) form

Acarbose, Low GI/GL diets, ↑ fat, ↑ protein, gastric banding

To Discuss # 3 & 4

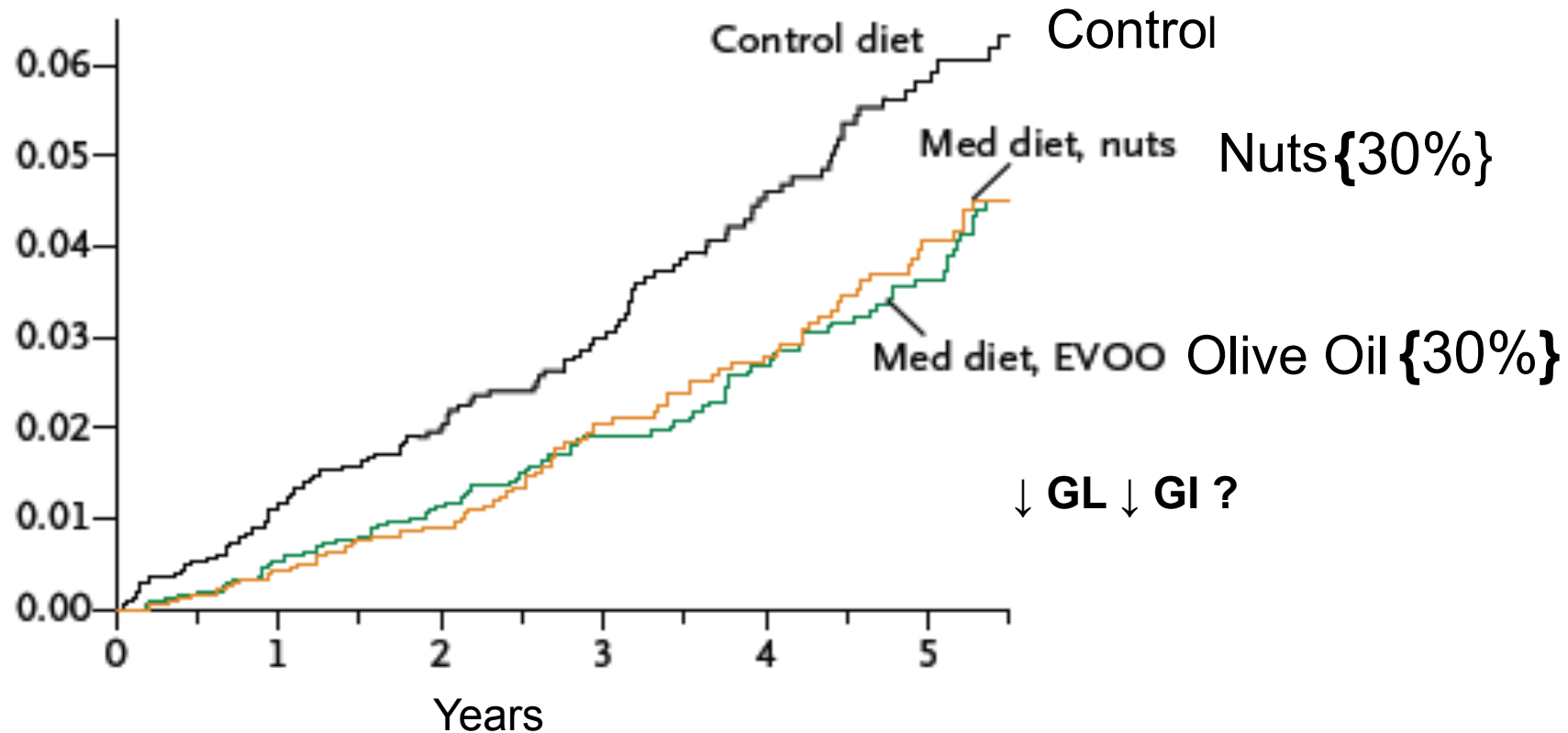
3) Reducing the amount of dietary carbohydrate

by increasing fat calories, ↑ fat, ↑ protein (Atkins), **olive oil**, nuts(PREDIMED), low GI/GL diets

Reducing Glycemic Load Reducing Carbohydrate (-3%) with Fat (+4%)

PREDIMED Study

Primary End Point (acute myocardial infarction, stroke, or death from cardiovascular causes)



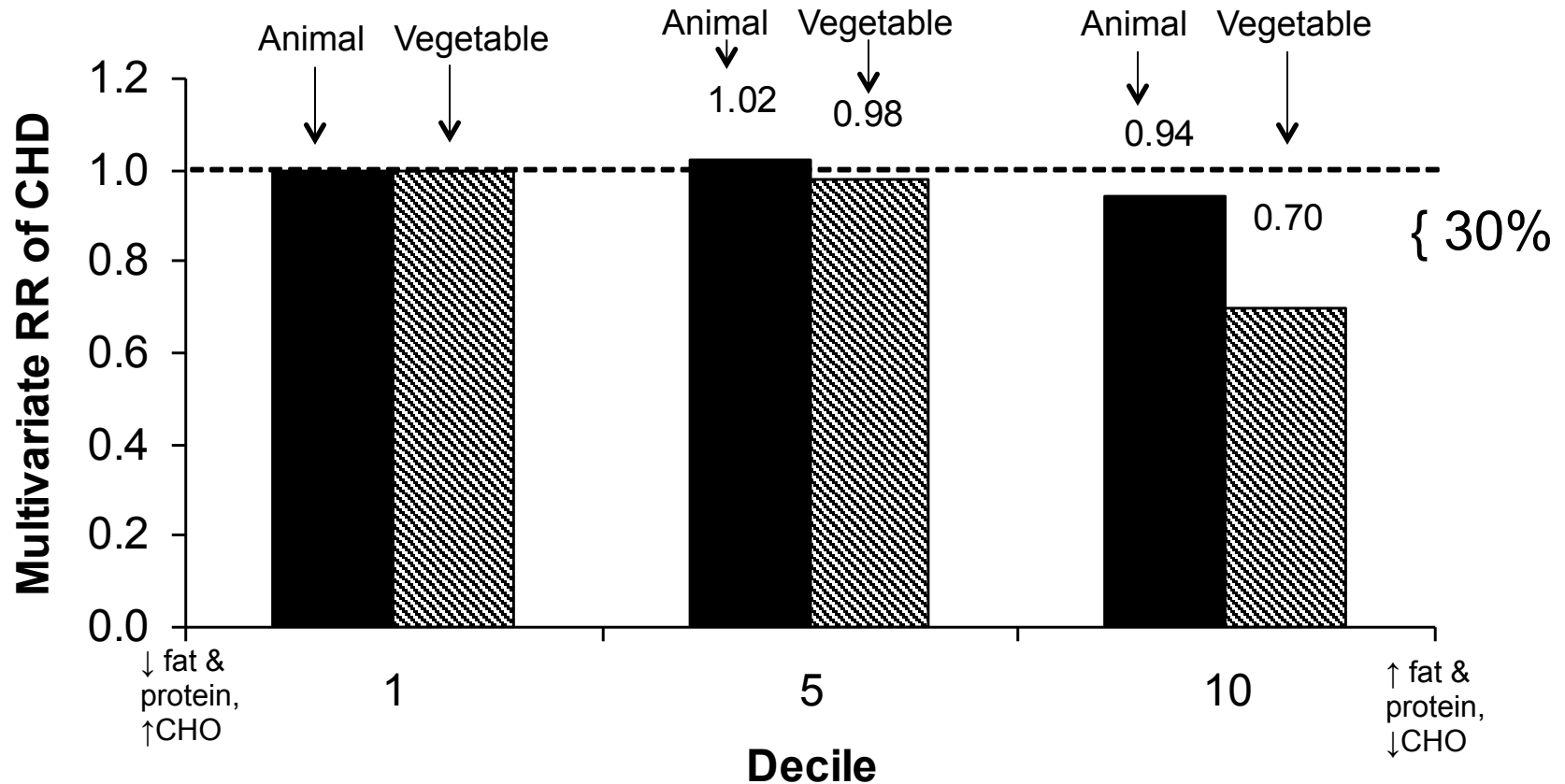
Med diet, EVOO: hazard ratio, 0.70
(95% CI, 0.53–0.91); P=0.009

Med diet, nuts: hazard ratio, 0.70
(95% CI, 0.53–0.94); P=0.02

Reducing Glycemic Load

CHD: Dietary Patterns: Vegetable Oil and Vegetable Protein

Nurses' Health Study: Low-CHO-Diet Score and Risk of CHD

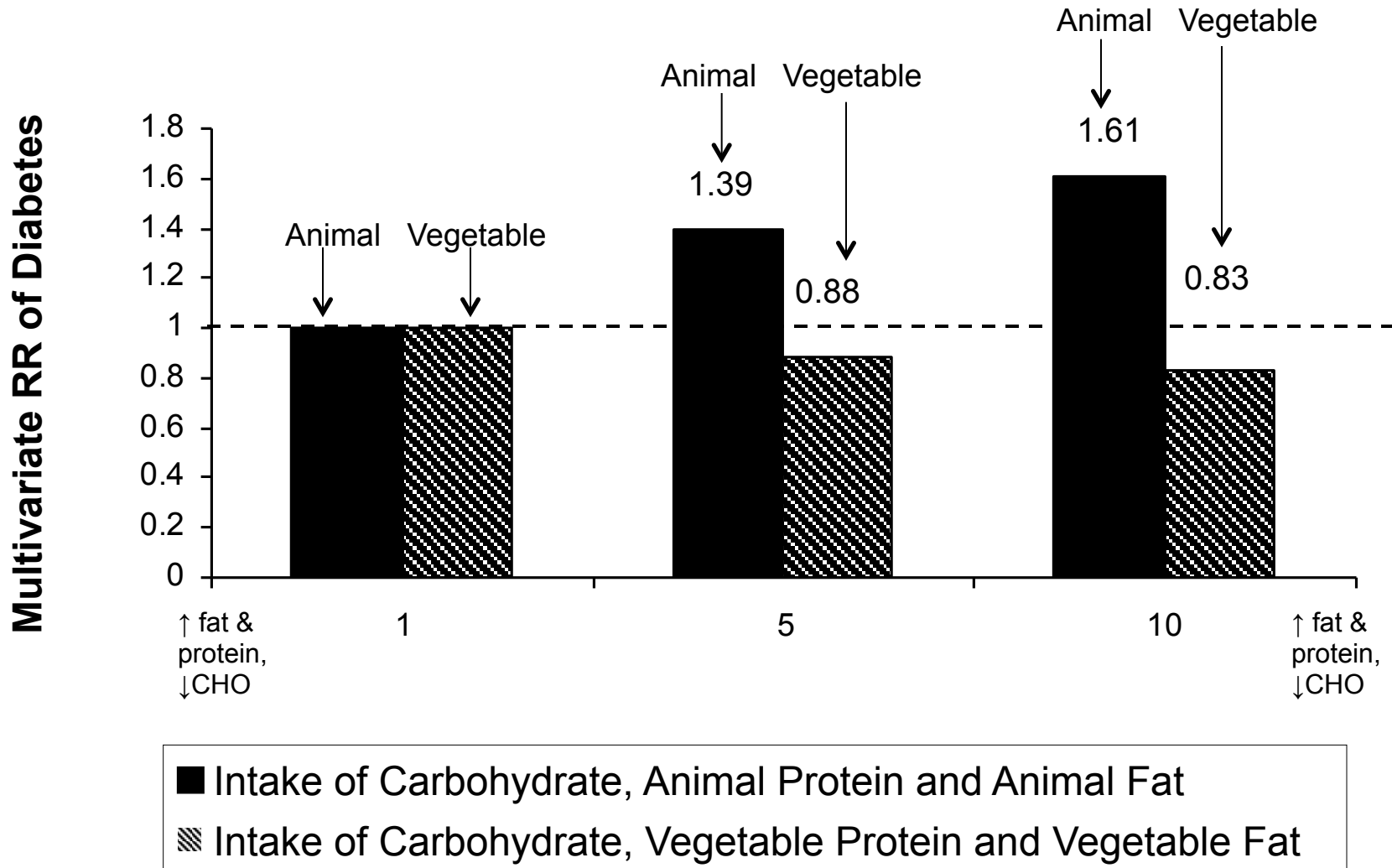


- Intake of Carbohydrate, Animal Protein and Animal Fat
- ▨ Intake of Carbohydrate, Vegetable Protein and Vegetable Fat

Reducing Glycemic Load

Diabetes: Dietary Patterns: Vegetable Oil and Vegetable Protein

Nurses' Health Study: Low-CHO-Diet Score and Risk of Diabetes



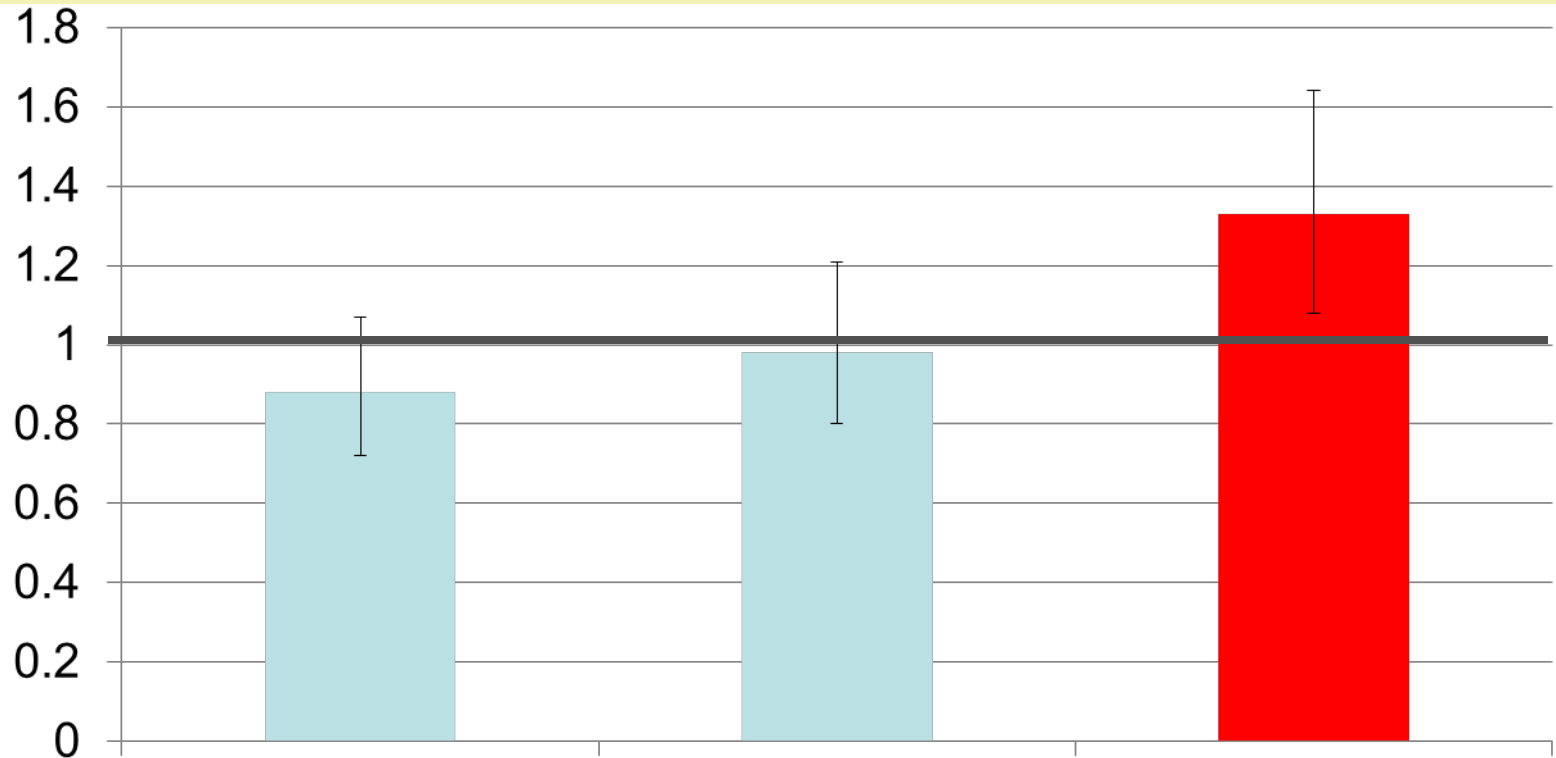
Swapping CH₂O for SFA

Increasing Glycemic Load

DANISH PROSPECTIVE COHORT: Diet, Cancer and Health

n=53,644 men and women

Effect of replacement of 5% energy from SFA with 5% energy from carb



Outcome	Replace 5% of energy from SFA with		
	Low-GI	Medium-GI	High-GI
Myocardial Infarction	0.88 (0.72, 1.07)	0.98 (0.80, 1.21)	1.33 (1.08, 1.64)

CHD

Higher/ Medium GI diets $\equiv$ SFA replacement nutrient

High / Medium GI
Carbohydrate Replacing SFA

Predicted Effect from TC:HDL Change

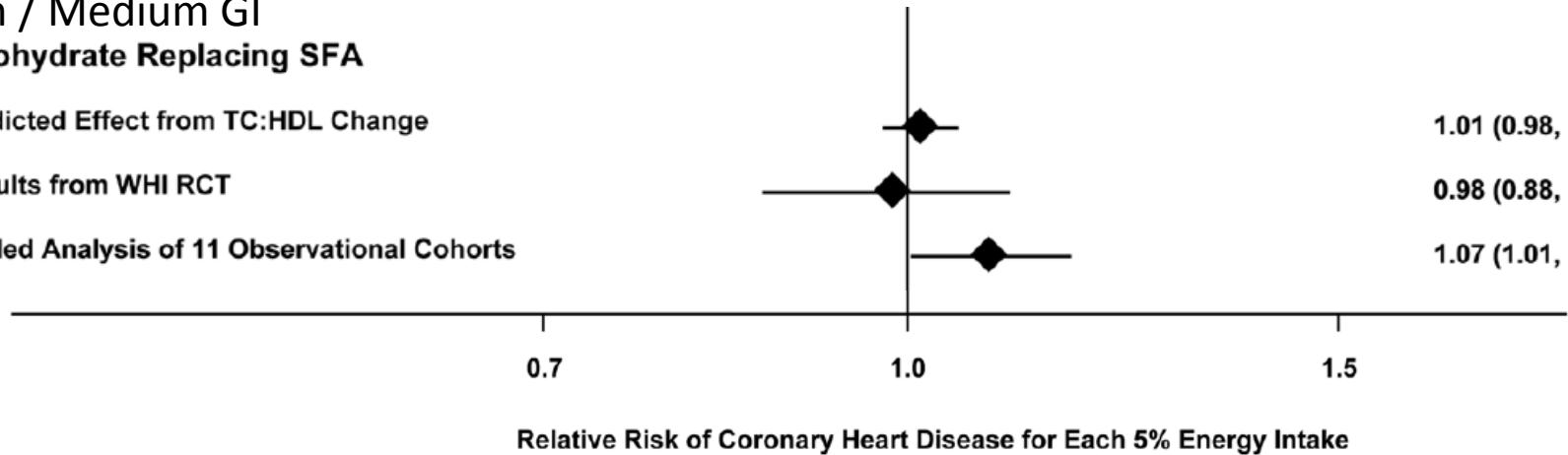
1.01 (0.98, 1.04)

Results from WHI RCT

0.98 (0.88, 1.09)

Pooled Analysis of 11 Observational Cohorts

1.07 (1.01, 1.14)



4) Altering the Quality carbohydrate as a “lente” (slow release) form

Acarbose, Viscous fibers, Low GI/GL diets, ↑ fat, ↑ protein, gastric banding

We can reduce rate of absorption (“Lente”, Carbohydrate) with Acarbose

Acarbose

Viscous Fibers

Low glycemic foods

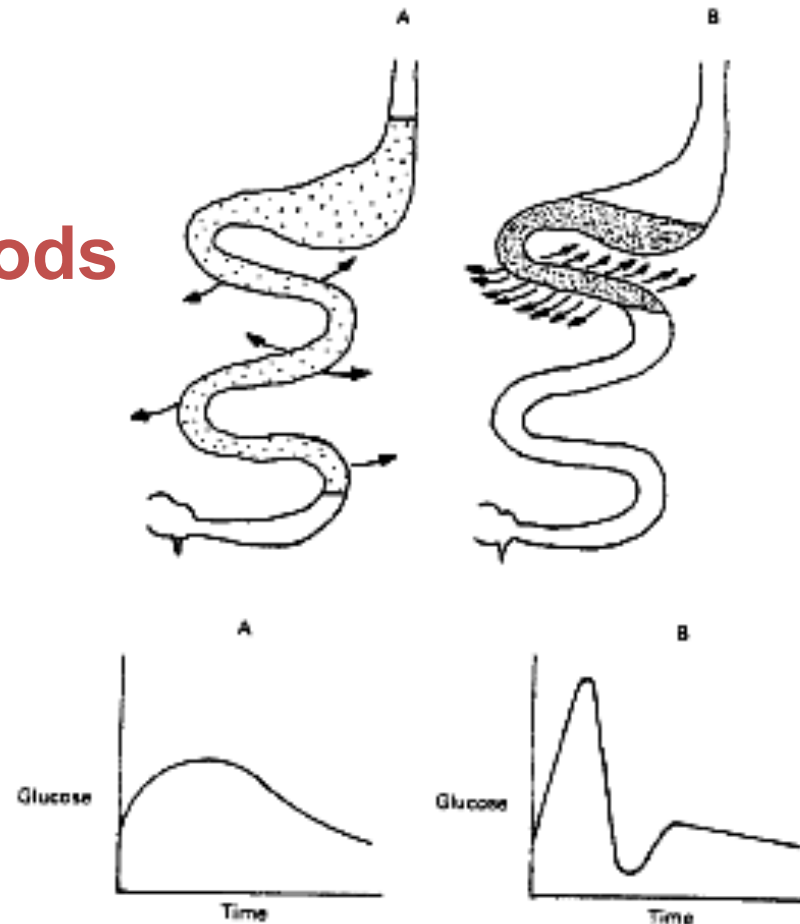


FIGURE 1. Hypothetical effect of feeding diets with a low (A) or high (B) glycemic index on gastrointestinal glucose absorption and post-prandial blood glucose.

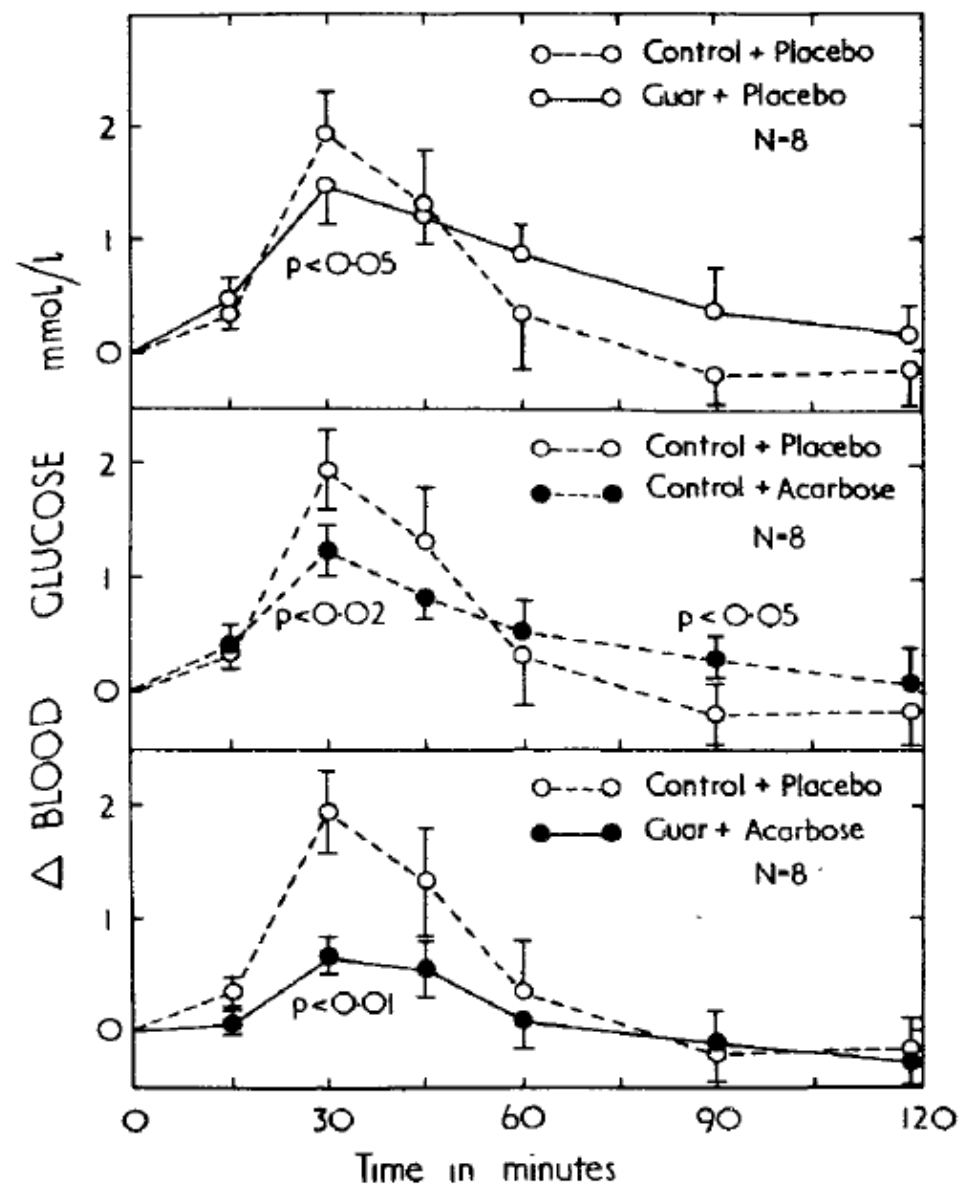
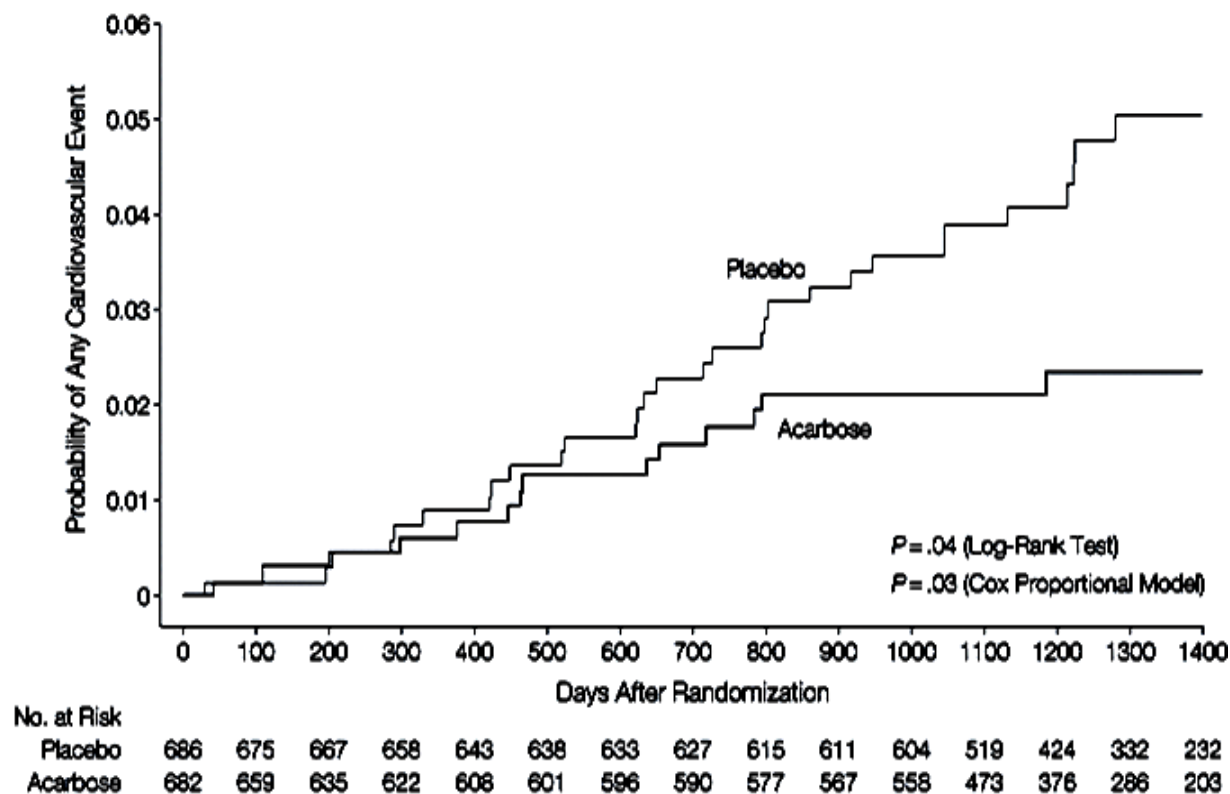


Fig. 2—Mean change in blood glucose in 8 subjects over the 2 h after test meals of control crispbread with placebo tablet, guar crispbread with placebo tablet, control crispbread with acarbose tablet, and guar crispbread with acarbose tablet.

STOP-NIDDM Trial

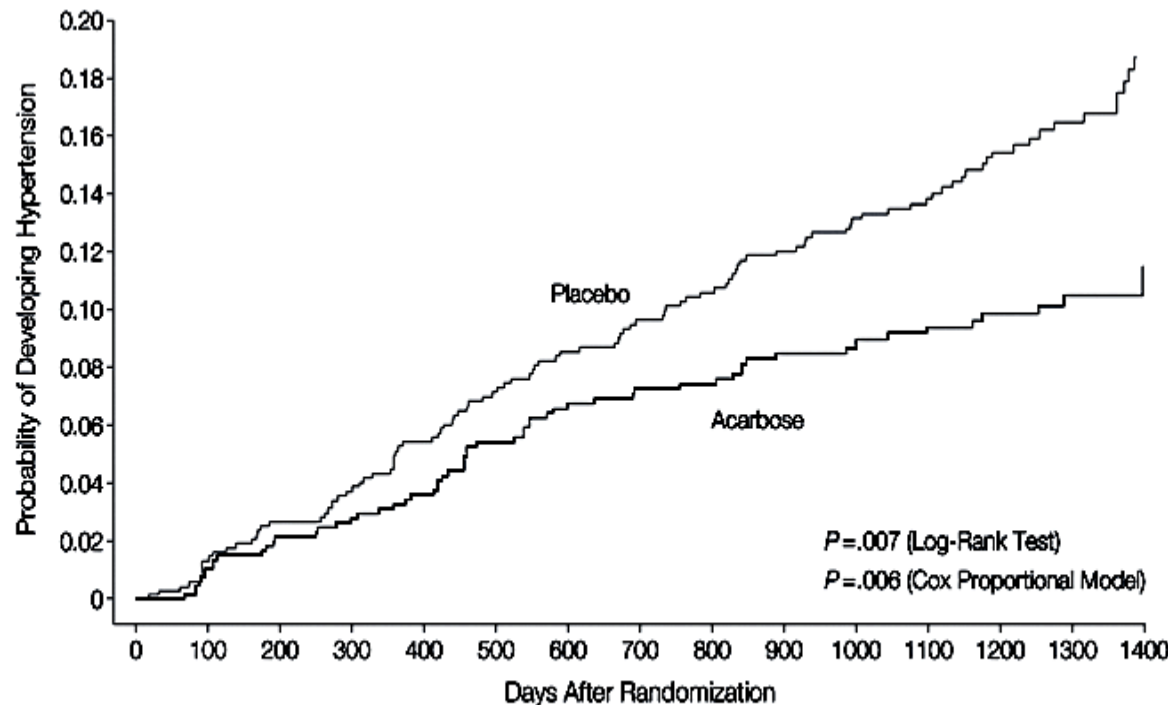


CVD Events

Acarbose

↓ 49% RR

STOP-NIDDM Trial



No. at Risk															
Placebo	686	663	646	632	607	593	581	573	562	550	538	458	368	287	196
Acarbose	682	645	617	601	585	570	559	559	552	524	514	435	342	254	178

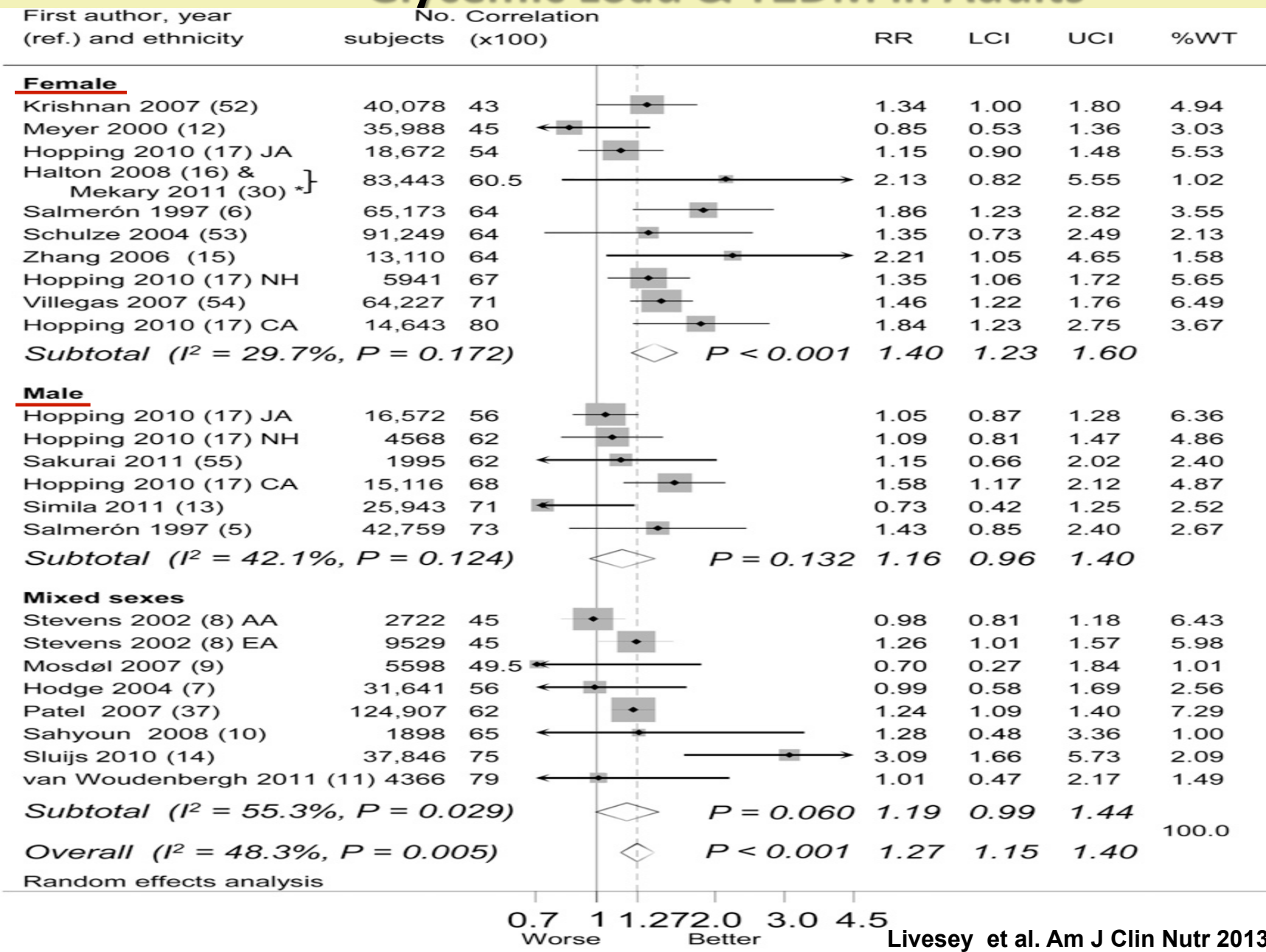
Hypertension
(new cases)

Acarbose

↓ 34% RR

Women more than Men?

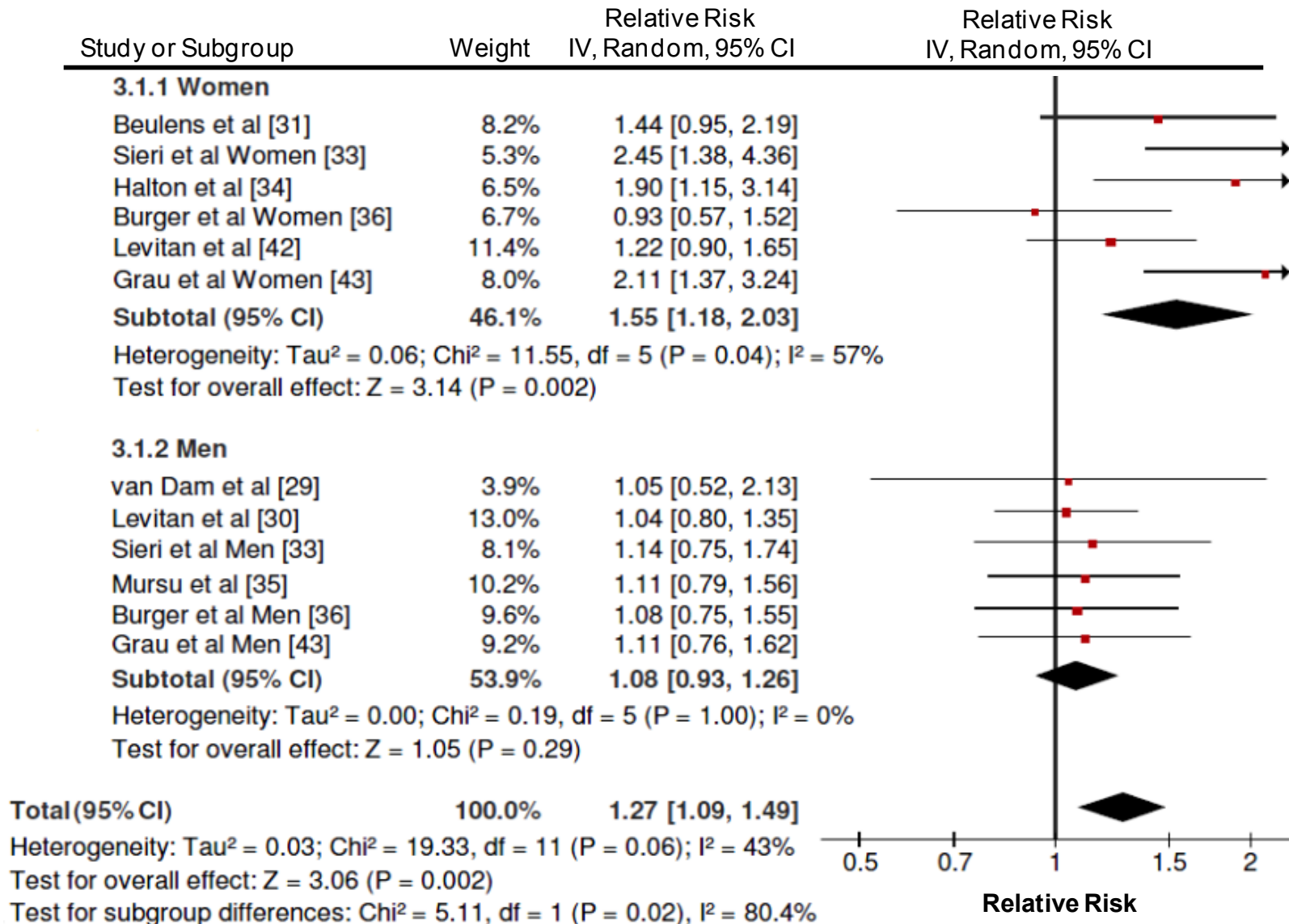
Glycemic Load & T2DM in Adults



Women more than Men?

GL & CHD Risk

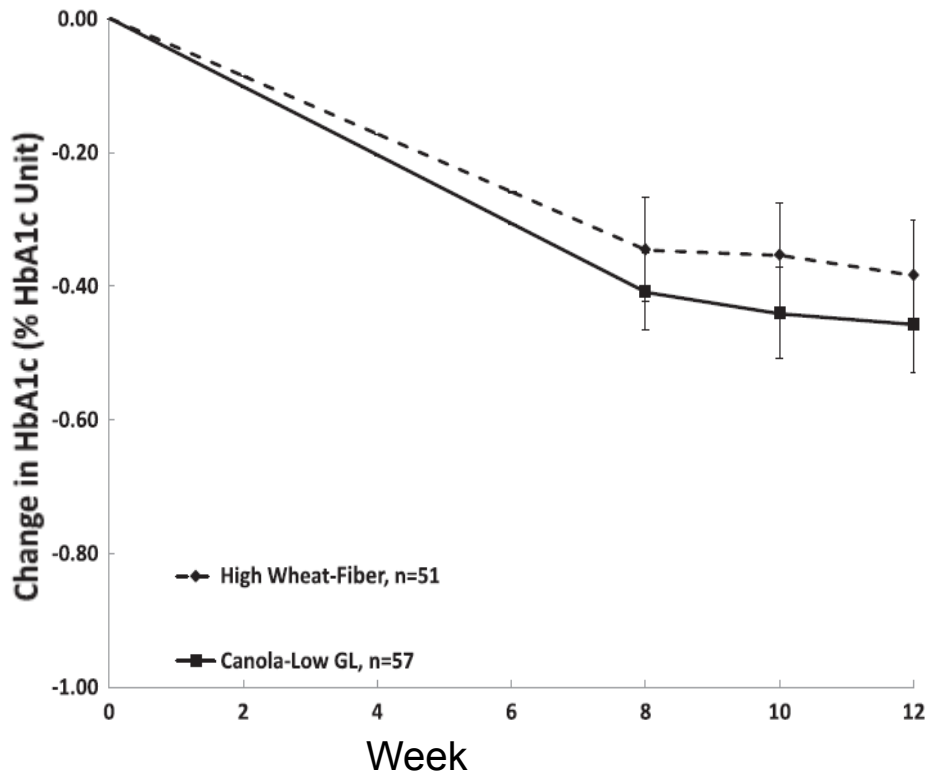
Pooled Risk Estimate for CHD comparing highest to lowest GL quantiles



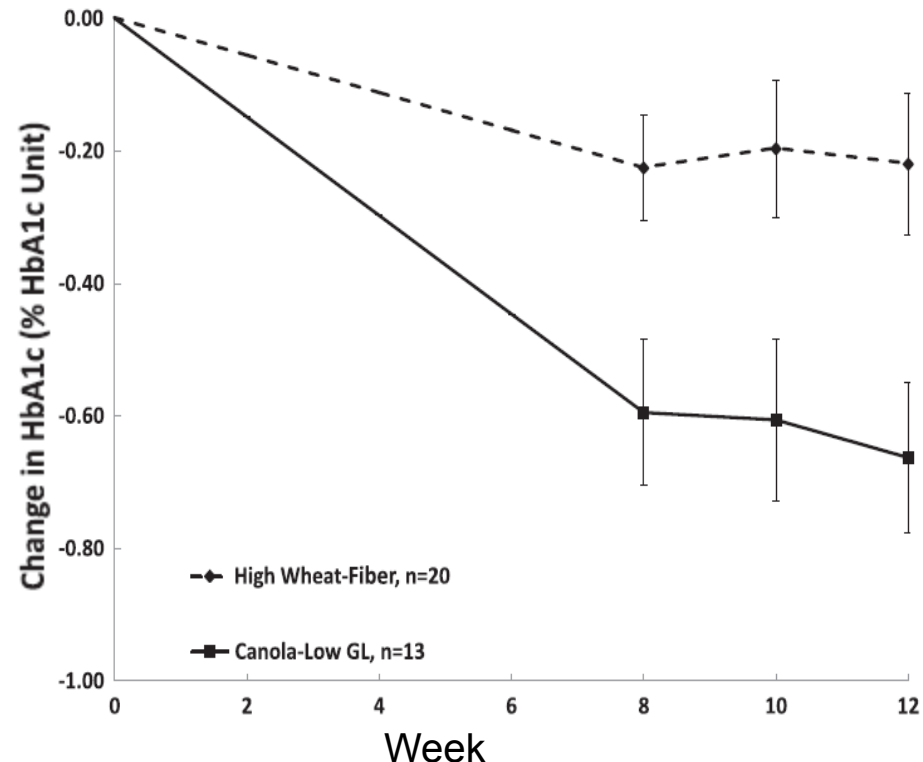
Who Else Benefits ?

Baseline SBP Level determines HbA1c Reduction by Canola oil-Low GL Diet

Baseline SBP<130 mmHg

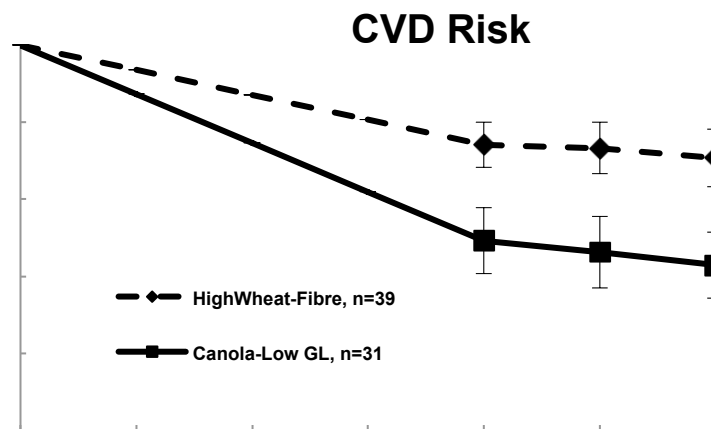
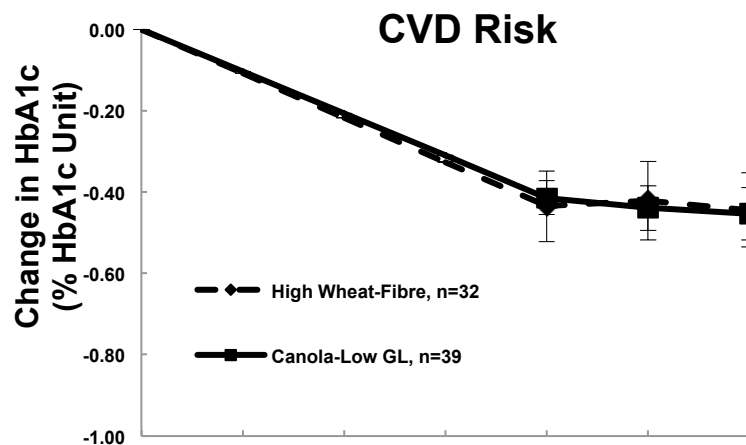
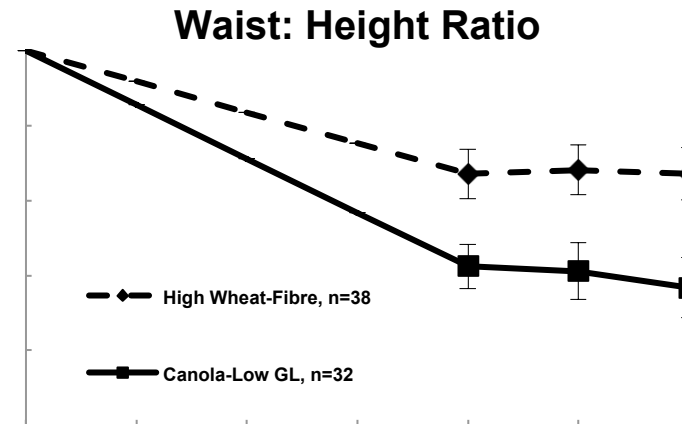
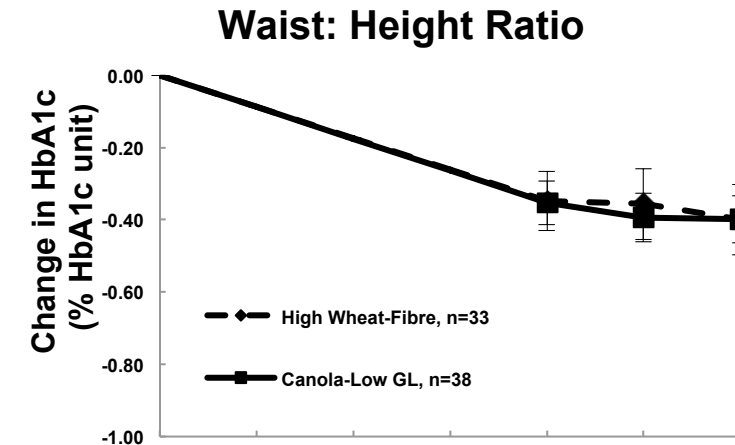


Baseline SBP≥130 mmHg



Changes from Baseline (Week 0) in HbA1c (% HbA1c unit) during Canola oil-Low GL (test) and High Wheat-Fibre (control) Diets in Participants stratified by high and low baseline SBP. HbA1c was reduced more on the test than the control for those with higher baseline SBP (**P<0.003**).

Baseline Waist: Height Ratio and CVD Risk Level determines HbA1c Reduction by Canola oil-Low GI Diet

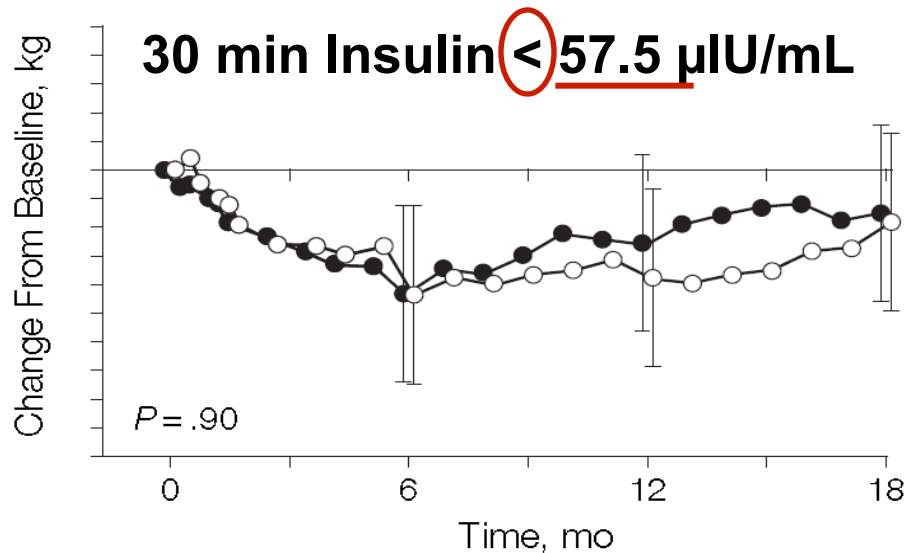


Changes from Baseline (Mean of Week -1 and 0) in HbA1c (% HbA1c unit) during Canola oil-Low GL (test) and High Wheat-Fibre (control) Diets in Participants stratified by Baseline Waist: Height Ratio and Baseline CVD risk.

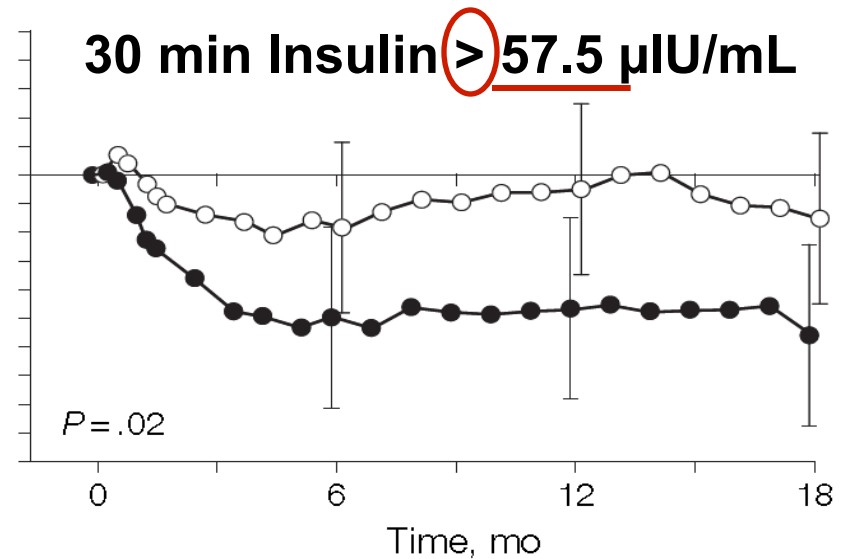
Insulin Response Determines Weight Loss

● Low-Glycemic Load Diet ○ Low-Fat Diet

Insulin Concentration ≤ 57.5 $\mu\text{IU/mL}$ at
30 min After 75-g Dose of Oral Glucose

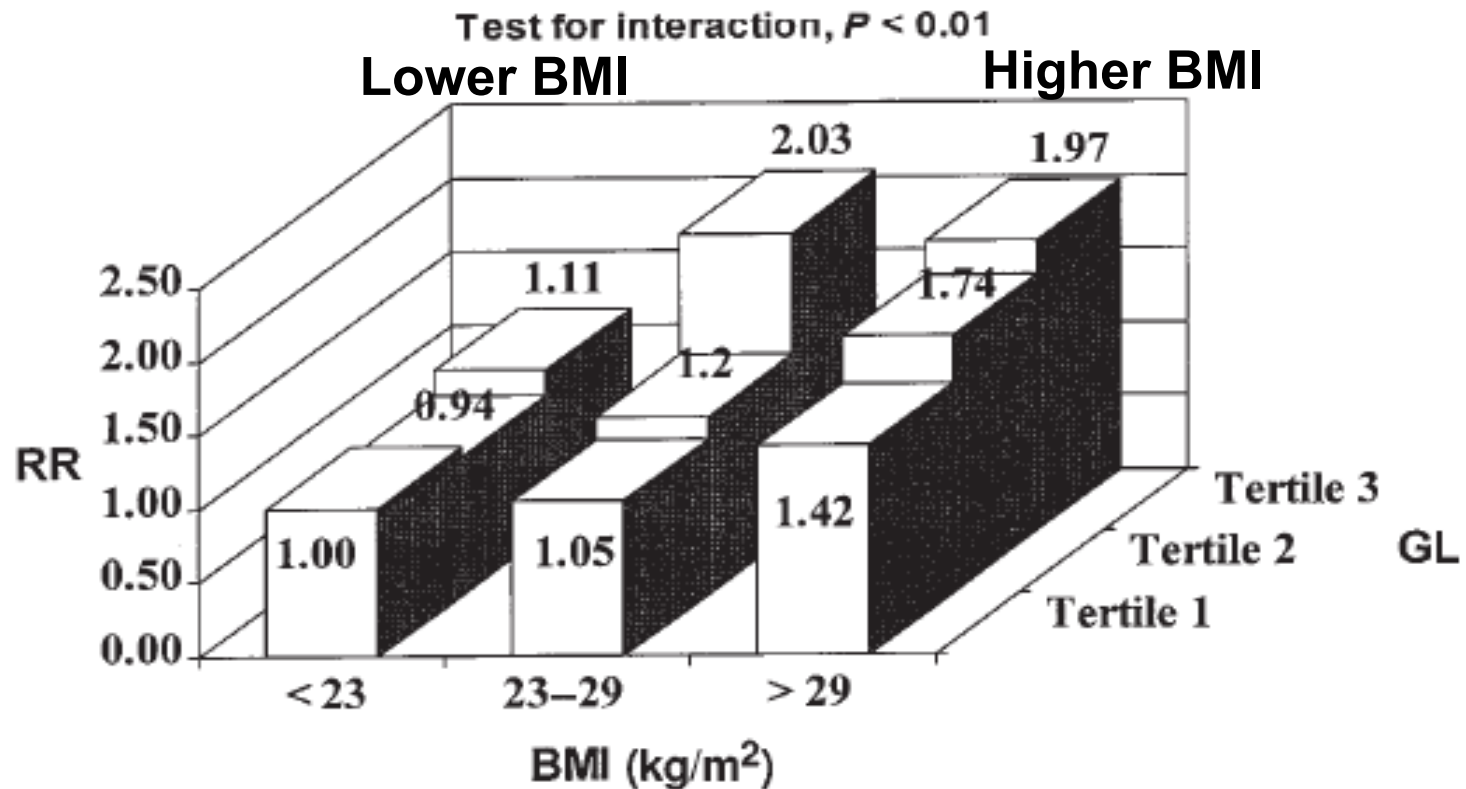


Insulin Concentration > 57.5 $\mu\text{IU/mL}$ at
30 min After 75-g Dose of Oral Glucose



BMI Determines CHD Risk dependent on glycemic load:

10y of follow-up in the Nurses Health Study (n=65,000)



Insulin resistance determines GI effect in producing FATTY LIVER (NAFL) and GI

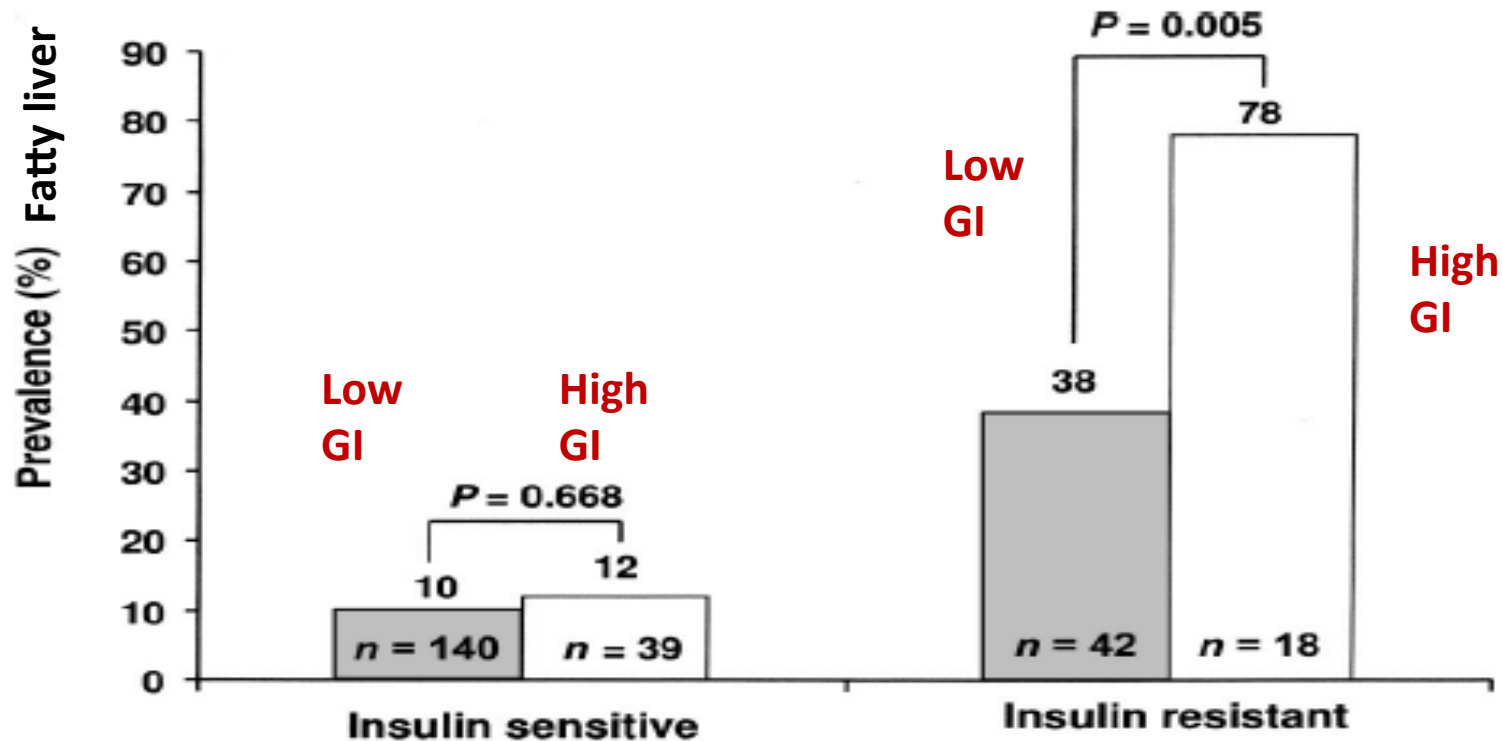
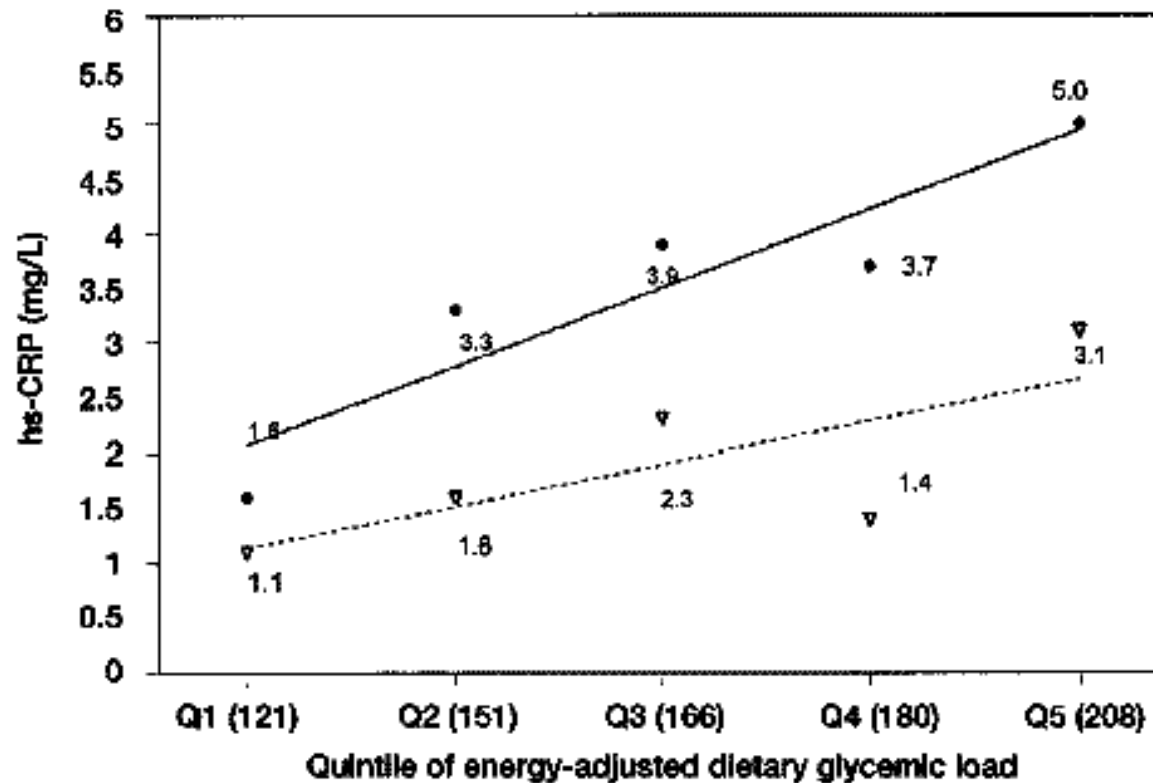


FIGURE 1. The percentage prevalence of high-grade liver steatosis by group of dietary glycemic index (GI) [low GI: first 3 quartiles (■) compared with high GI: 4th quartile (□)] in insulin-sensitive (first 3 quartiles of homeostasis model assessment–insulin resistance) and insulin-resistant (4th quartile of homeostasis model assessment–insulin resistance) subjects. *P* values are chi-square statistics. GI subgroup $\times$ insulin sensitivity status interaction was significant for liver steatosis grade, $P = 0.002$.

Glycemic Load and CRP at High and Low BMI



BMI > 25

BMI < 25

Conclusion:

1. Slowing carbohydrate absorption (e.g. low GI diets / Acarbose) is likely to be most effective in those with greatest insulin resistance and CVD risk.
2. Is this conclusion valid for other treatment approaches?