LCHF and Heart Health
What Does it Mean for Me?

Bret Scher, MD FACC
"The Lo-Carb Cardiologist"
Founder and CEO Boundless Health
www.LowCarbCardiologist.com

Financial Disclosures

- None

How do We Test Heart Health?

- **Long term, randomized outcome trials**
  - Heart attacks, strokes, mortality

How do We Test Heart Health?

- Long term, randomized outcome trials
- **Observational Studies**
  - Conflicting results
  - Complicated by confounding variables

Intake of saturated and trans unsaturated fatty acids and risk of all cause mortality, cardiovascular disease, and type 2 diabetes: systematic review and meta-analysis of observational studies

Russell J de Souza,[1,2,3,4] Andrew Mente,[1,2,5] Adriana Maroleanu,[2] Adrian I Cozma,[3,4] Vanessa Ha,[1,3,4] Teruko Kishibe,[6] Elizabeth Uleryk,[7] Patrick Budylowski,[4] Holger Schünemann,[1,8] Joseph Beyene,[1,2] Sonia S Anand[1,2,5,8]

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ABSTRACT

OBJECTIVE

To systematically review associations between intake of saturated fat and trans unsaturated fat and all cause mortality, cardiovascular disease (CVD) and associated mortality, coronary heart disease (CHD) and associated mortality, ischemic stroke, and type 2 diabetes.

DESIGN

Systematic review and meta-analysis.

DATA SOURCES

Medline, Embase, Cochrane Central Registry of Controlled Trials, Evidence-Based Medicine Reviews, and CINAHL from inception to 1 May 2015, supplemented by bibliographies of retrieved articles and previous reviews.

ELIGIBILITY CRITERIA FOR SELECTING STUDIES

Observational studies reporting associations of saturated fat and/or trans unsaturated fat (total, industrially manufactured, or from ruminant animals) with all cause mortality, CHD/CVD mortality, total CHD, ischemic stroke, or type 2 diabetes.

DATA EXTRACTION AND SYNTHESIS

Two reviewers independently extracted data and assessed study risks of bias. Multivariable relative risks were pooled. Heterogeneity was assessed and quantified. Potential publication bias was assessed and subgroup analyses were undertaken. The GRADE approach was used to evaluate quality of evidence and certainty of conclusions.

RESULTS

For saturated fat, three to 12 prospective cohort studies for each association were pooled (five to 17 comparisons with 90 501-339 090 participants). Saturated fat intake was not associated with all cause mortality (relative risk 0.99, 95% confidence interval 0.91 to 1.09), CVD mortality (0.97, 0.84 to 1.12), total CHD (1.06, 0.95 to 1.17), ischemic stroke (1.02, 0.90 to 1.15), or type 2 diabetes (0.95, 0.88 to 1.03). There was no convincing lack of association between saturated fat and CHD mortality (1.15, 0.97 to 1.36; P=0.10). For trans fats, one to six prospective cohort studies for each association were pooled (two to seven comparisons with 12 942-230 135 participants). Total trans fat intake was associated with all cause mortality (1.34, 1.16 to 1.56), CHD mortality (1.28, 1.09 to 1.50), and total CHD (1.21, 1.10 to 1.33) but not ischemic stroke (1.07, 0.88 to 1.28) or type 2 diabetes (1.10, 0.95 to 1.27). Industrial, but not ruminant, trans fats were associated with CHD mortality (1.18 (1.04 to 1.33) *v* 1.01 (0.71 to 1.43)) and CHD (1.42 (1.05 to 1.92) *v* 0.93 (0.73 to 1.18)). Ruminant *trans*-palmitoleic acid was inversely associated with type 2 diabetes (0.58, 0.46 to 0.74). The certainty of associations between saturated fat and all outcomes was "very low." The certainty of associations of trans fat with CHD outcomes was "moderate" and "very low" to "low" for other associations.

CONCLUSIONS

Saturated fats are not associated with all cause mortality, CVD, CHD, ischemic stroke, or type 2 diabetes, but the evidence is heterogeneous with methodological limitations. Trans fats are associated with all cause mortality, total CHD, and CHD mortality, probably because of higher levels of intake of industrial trans fats than ruminant trans fats. Dietary guidelines must carefully consider the health effects of recommendations for alternative macronutrients to replace trans fats and saturated fats.

WHAT IS ALREADY KNOWN ON THIS TOPIC

Contrary to prevailing dietary advice, authors of a recent systematic review and meta-analyses claim that there is no excess cardiovascular risk associated with intake of saturated fat, and the US has recently taken policy action to remove partially hydrogenated vegetable oils from its food supply

OPEN ACCESS

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Dietary Intake of Saturated Fat Is Not Associated with Risk of Coronary Events or Mortality in Patients with Established Coronary Artery Disease[1–3]

Nathalie Genevieve Puaschitz,[4,7]* Elin Strand,[7] Tone Merete Norekvål,[4,5,7] Jutta Dierkes,[8] Lisbeth Dahl,[10] Gard Frodahl Tveitevåg Svingen,[4,7] Jörg Assmus,[5] Hall Schartum-Hansen,[4,7] Jannike Øyen,[6,9,10] Eva Kristine Ringdal Pedersen,[7] Christian Andrè Drevon,[11] Grethe Seppola Tell,[9] and Ottar Nygård[4,7]

Departments of [4]Heart Disease, [5]Research and Development, and [6]Rheumatology, Haukeland University Hospital, Bergen, Norway; Departments of [7]Clinical Science, [8]Clinical Medicine, and [9]Global Public Health and Primary Care, Faculty of Medicine and Dentistry, University of Bergen, Bergen, Norway; [10]The National Institute of Nutrition and Seafood Research, Bergen, Norway; and [11]Department of Nutrition, Institute of Basic Medical Sciences, Faculty of Medicine, University of Oslo, Oslo, Norway

Abstract

Background: Data from recent meta-analyses question an association between dietary intake of saturated fatty acids (SFAs) and risk of cardiovascular disease (CVD). Moreover, the prognostic effect of dietary SFA in patients with established CVD treated with modern conventional medication has not been extensively studied.

Objective: We investigated the associations between self-reported dietary SFA intake and risk of subsequent coronary events and mortality in patients with coronary artery disease (CAD).

Methods: This study included patients who participated in the Western Norway B-Vitamin Intervention Trial and completed a 169-item semiquantitative food-frequency questionnaire after coronary angiography. Quartiles of estimated daily intakes of SFA were related to risk of a primary composite endpoint of coronary events (unstable angina pectoris, nonfatal acute myocardial infarction, and coronary death) and separate secondary endpoints (total acute myocardial infarction, fatal coronary events, and all-cause death) with use of Cox-regression analyses.

Results: This study included 2412 patients (81% men, mean age: 61.7 y). After a median follow-up of 4.8 y, a total of 292 (12%) patients experienced at least one major coronary event during follow-up. High intake of SFAs was associated with a number of risk factors at baseline. However, there were no significant associations between SFA intake and risk of coronary events [age- and sex-adjusted HR (95% CI) was 0.85 (0.61, 1.18) for the upper vs. lower SFA quartile] or any secondary endpoint. Estimates were not appreciably changed after multivariate adjustments.

Conclusions: There was no association between dietary intake of SFAs and incident coronary events or mortality in patients with established CAD. *J Nutr* 2015;145:299–305.

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Annals of Internal Medicine®

ORIGINAL RESEARCH | 7 SEPTEMBER 2010

Low-Carbohydrate Diets and All-Cause and Cause-Specific Mortality: Two Cohort Studies

Teresa T. Fung, ScD; Rob M. van Dam, PhD; Susan E. Hankinson, ScD; Meir Stampfer, MD, DrPH; Walter C. Willett, MD, DrPH; Frank B. Hu, MD, PhD

Article, Author, and Disclosure Information

Abstract

Background: Data on the long-term association between low-carbohydrate diets

Conclusion—A low-carbohydrate diet based on animal sources was associated with higher all-cause mortality in both men and women, whereas a vegetable-based low-carbohydrate diet was associated with lower all-cause and cardiovascular disease mortality rates.

Design: Prospective cohort study of women and men who were followed from 1980 (women) or 1986 (men) until 2006. Low-carbohydrate diets, either animal-based (emphasizing animal sources of fat and protein) or vegetable-based (emphasizing

Both men and women who had higher overall and animal low-carbohydrate scores had higher BMI and more likely to be current smokers, but lower intakes of fruits and vegetables

Annals of Internal Medicine 2010;153:289-298

(Un)Healthy User Bias!

How do We Define Heart Health?

- Long term, randomized outcome trials
- Observational Studies
- **Surrogate outcomes**
  - Blood Pressure, Lipids, Insulin and glucose control

Benefits of LCHF lifestyle

- Increased HDL, Lowered TG
- Improved insulin sensitivity, glucose control
- Treatment and reversal of diabetes
- Reversal of metabolic syndrome
- Weight loss- specifically fat loss
- Decreased inflammation
- Improved energy
- Decreased hunger

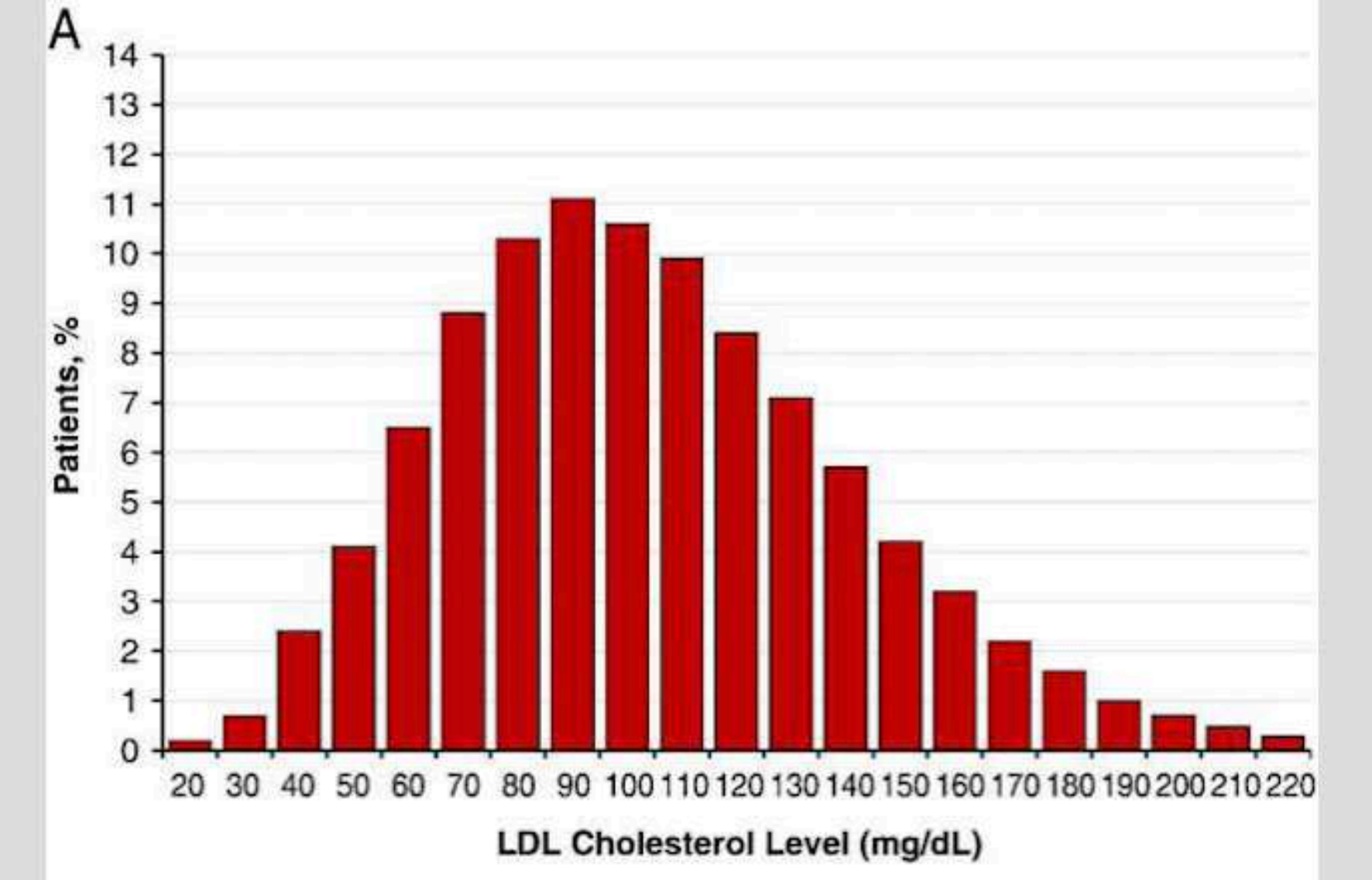
Does LDL Actually Go Up on LCHF?

- 10% increase in LDL-C with no change in ApoB
  - *Diabetes Ther (2018). https://doi.org/10.1007/s13300-018-0373-9*
  - *Am J Clin Nutr 2009;90:23-32*
- Initial 7% increase drops back to normal at 1-year
  - *Nutrition and Diabetes 2017;7:304*
- No Significant Increase or slight decrease
  - *NEJM 2003;348:2074-2081, J Clin Endocrinol Metab 2003;88:1617-23*
  - *Arch Intern Med 2004;1164:2141-6, Ann Intern Med 2004 May 18;140(10):769-77.*
  - *Clin Endo Metab 2004;89:2717-23, JACC 2008;51:59-67*

LDL Hyper-responders

- Rise in LDL 50-100% from baseline
- Estimated between 5 and 30%
- Is it dangerous? Unknown

Average LDL level in patients hospitalized with an MI



Am Heart J 2009;157:111-117

Lower Your Risk Without Lowering LDL

- Stop Smoking
- Reverse Diabetes
- Improve Lifestyle

ARIC Results

	Favorable Lifestyle N = 2,459	Intermediate Lifestyle N = 3,162	Unfavorable Lifestyle N = 2,193	P-value
Age, years	55 (5.8)	54 (5.6)	54 (5.6)	<0.001
Male Sex	1,100 (45%)	1,453 (46%)	1,002 (46%)	0.65
History of Hypertension	548 (22%)	822 (26%)	650 (30%)	<0.001
History of Diabetes Mellitus	148 (6%)	241 (8%)	243 (11%)	<0.001
Family History of Premature CAD	228 (11%)	296 (11%)	227 (12%)	0.23
Body-mass Index, kg/m^2	25.3 (3.2)	26.6 (4.3)	29.3 (6.0)	<0.001
Lipid Levels				
LDL Cholesterol, mg/dl	134 (37)	136 (37)	140 (38)	<0.001
HDL Cholesterol, mg/dl	39 (11)	37 (11)	34 (10)	<0.001
Triglycerides, mg/dl	102 (73 – 147)	112 (81 – 160)	129 (95 – 177)	<0.001

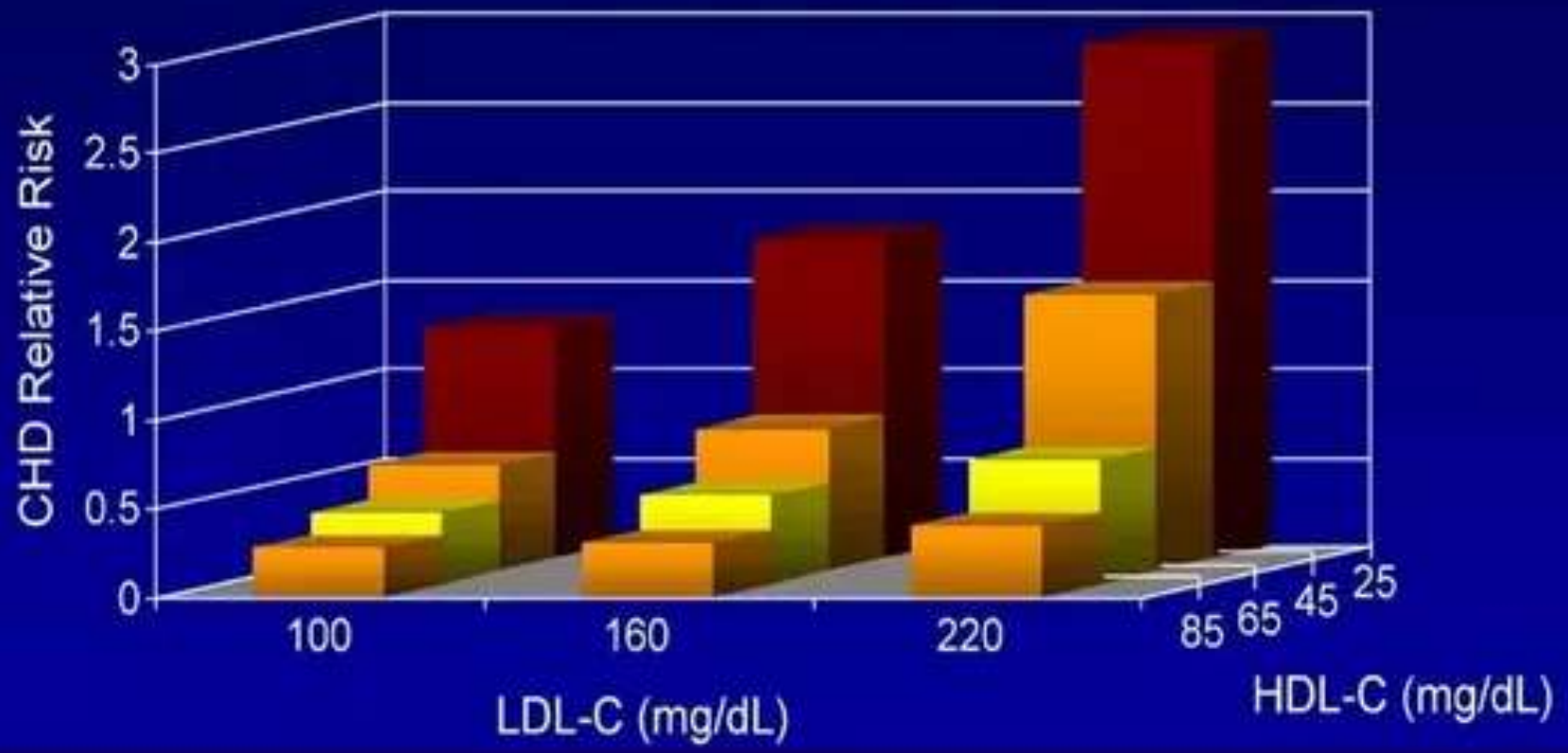
NEJM 2016;375/2349-2358

MDCS Results

	Favorable Lifestyle N = 7,210	Intermediate Lifestyle N = 10,234	Unfavorable Lifestyle N = 4,945	P-value
Age, years	58.2 (7.7)	58.1 (7.8)	57.4 (7.5)	<0.0001
Male Gender	3,065 (43%)	3,722 (36%)	1,728 (35%)	<0.0001
History of Hypertension	4,212 (58%)	6,149 (60%)	3,192 (65%)	<0.0001
History of Diabetes Mellitus	279 (4%)	371 (4%)	254 (5%)	<0.0001
FH of CAD	2,322 (32%)	3,350(33%)	1,553(31%)	0.26
Body-mass Index, kg/m^2	24.9 (2.9)	25.4 (3.6)	27.4 (5.2)	<0.0001
Lipid Levels				
LDL Cholesterol, mg/dl	160 (38)	161 (38)	164 (40)	0.06
HDL Cholesterol, mg/dl	55 (15)	54 (15)	50 (13)	<0.0001
Triglycerides, mg/dl	97 (72-134)	102 (76-141)	117 (86-162)	0.0001

NEJM 2016;375/2349-2358

Framingham Heart Study: Risk of CAD in Men Aged 50–70 by LDL-C and HDL-C Levels

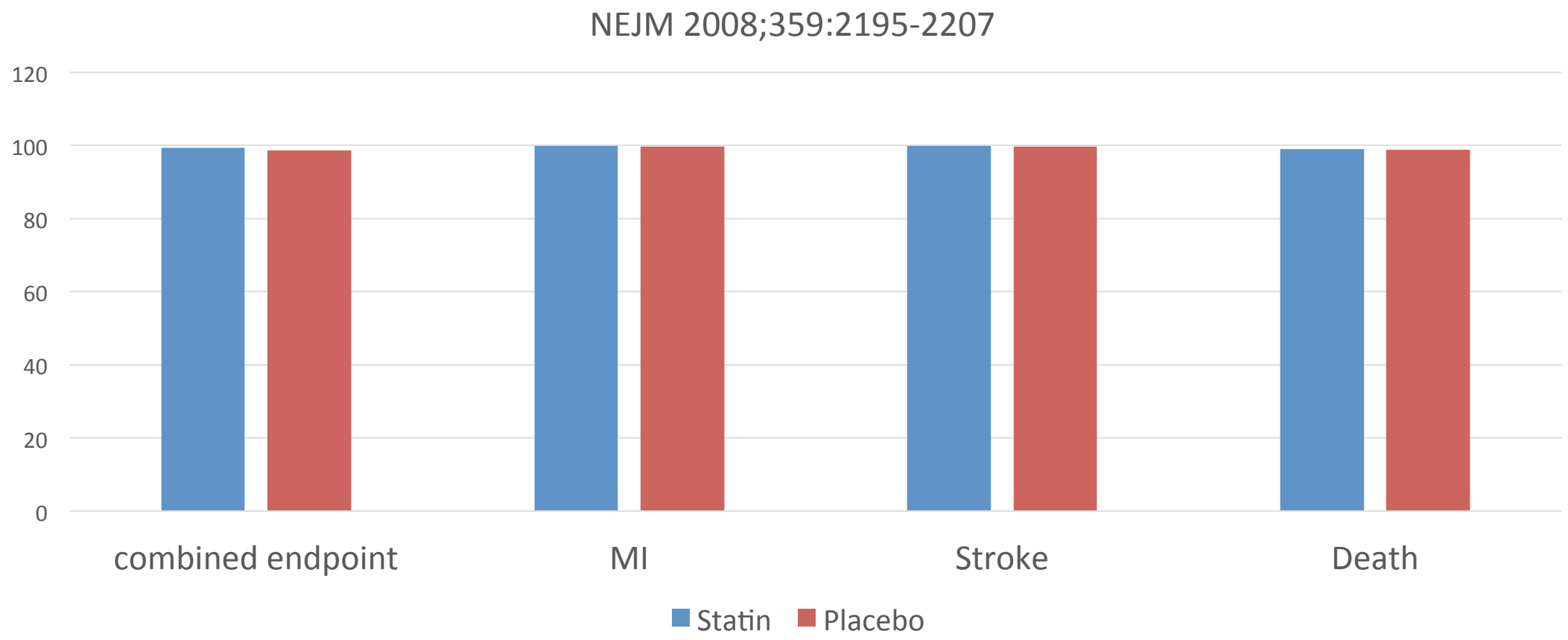


Castelli W. *Can J Cardiol*. 1988;4(suppl A):5A-10A.

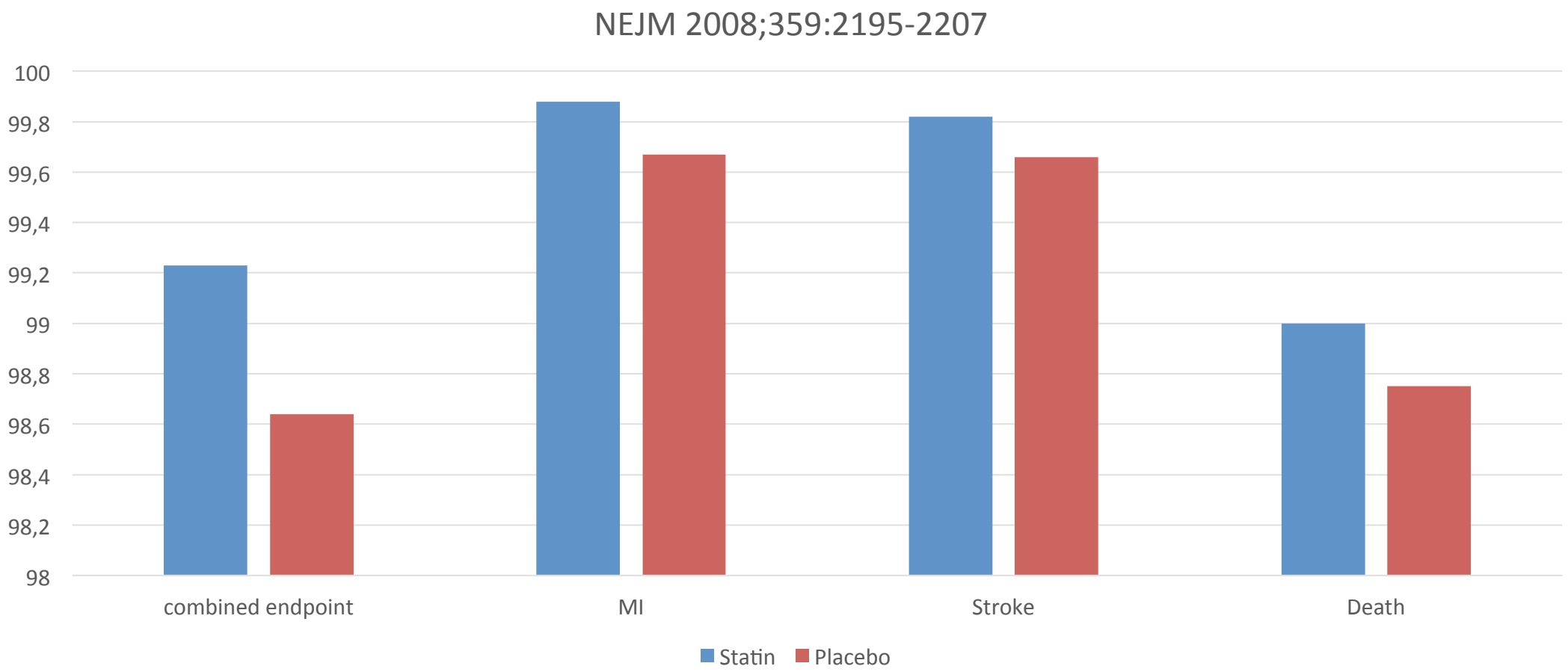
LDL lowering in Context

- Secondary prevention
  - Treat 83 people for 5 years to save 1 life
  - 39 people for 5 years to prevent 1 heart attack
- Primary Prevention
  - Treat 60 people for 5 years to save 1 MI
  - Lower risk need to treat 217
  - No consistent mortality difference
  - *www.nnt.com*

Jupiter Trial- 44% or 0.6% Benefit?



LDL Reduction in Context



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age (p <0.01 for all); the opposite occurred for HDL cholesterol (p <0.01). Triglycerides and ratio of triglycerides to HDL cholesterol wer the most powerful, independent variables related to precocity of CAD.

Am J Cardiol, 2005;96(12)/1640-3

for lipid-lowering therapy. Total/high-density lipoprotein (HDL) cholesterol and LDL/HDL cholester ratios are risk indicators with greater predictive value than isolated parameters used independently, particularly LDL. Future recommendations regarding the diagnosis and treatment of dyslipidemia,

vasc health risk manag. 2009;5/757-765

Conclusion Variation in the TC/HDL-C ratio may be associated with more substantial alterations in metabolic indices predictive of ischemic heart disease risk and related to the insulin resistance syndrome than variation in the LDL-C/HDL-C ratio.

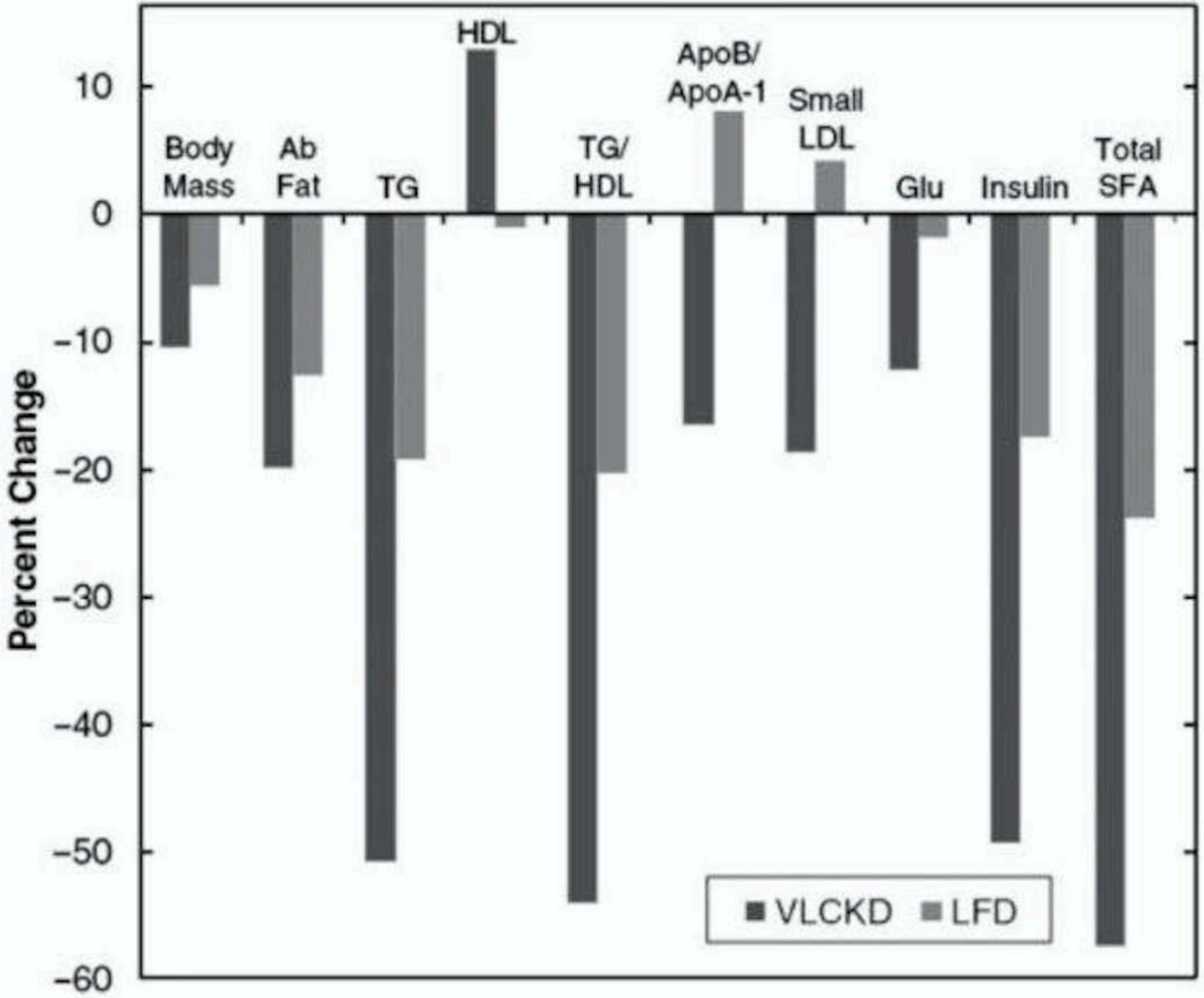
Arch Intern Med 2001;161(22)/2685-2692

Look At the Whole Picture

- TC:HDL ratio
- TG:HDL ratio
- Specifics of LDL
  - LDL-P, ApoB, Size, density, oxidation

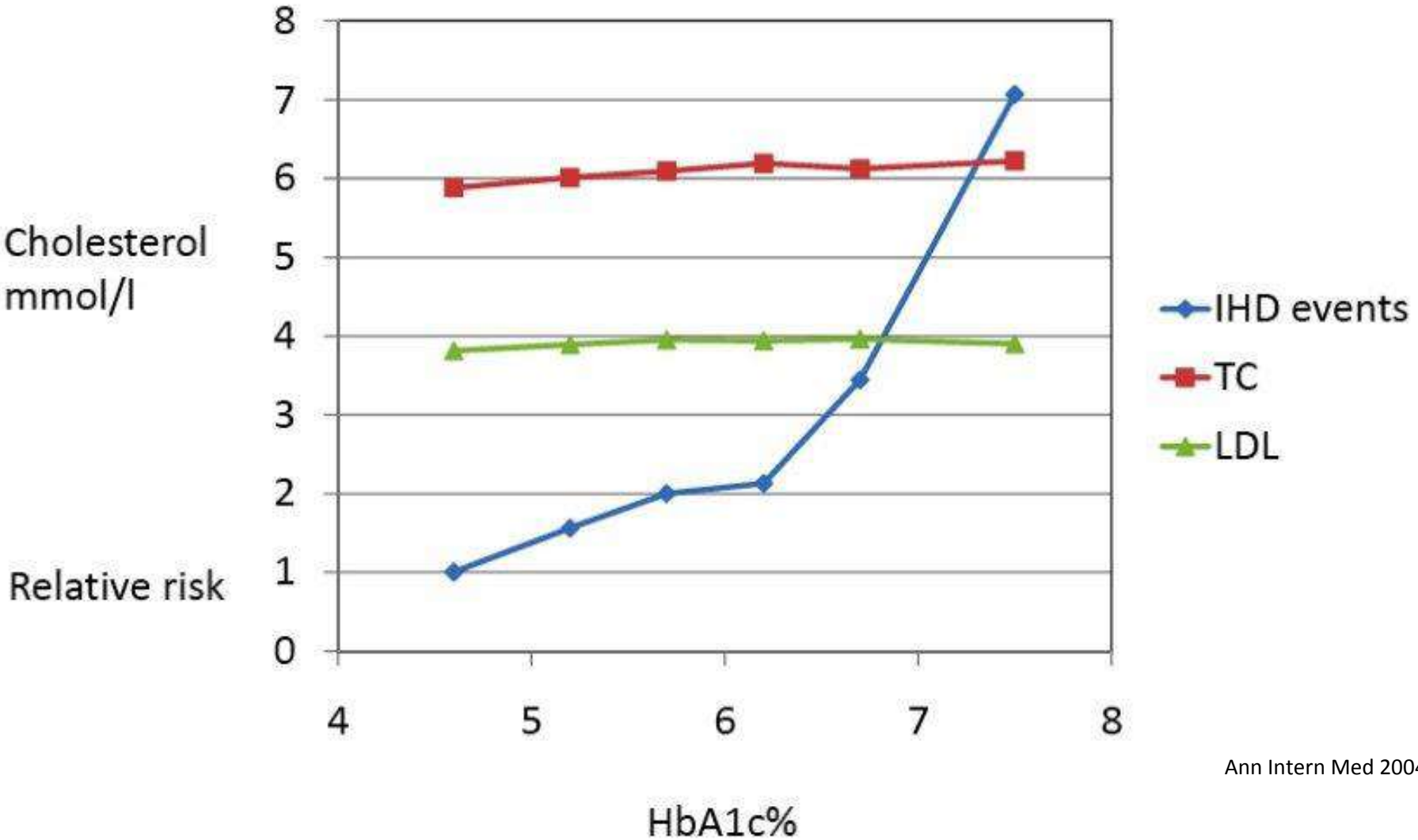
LCHF vs Low Fat Diets

nutr clin pract 2011 26 300-8



EPIC 2004:

Relative risk of CHD episodes vs. total and LDL cholesterol:



Ann Intern Med 2004;141:413-20

Circulation

ARTICLES

Insulin Sensitivity and Atherosclerosis

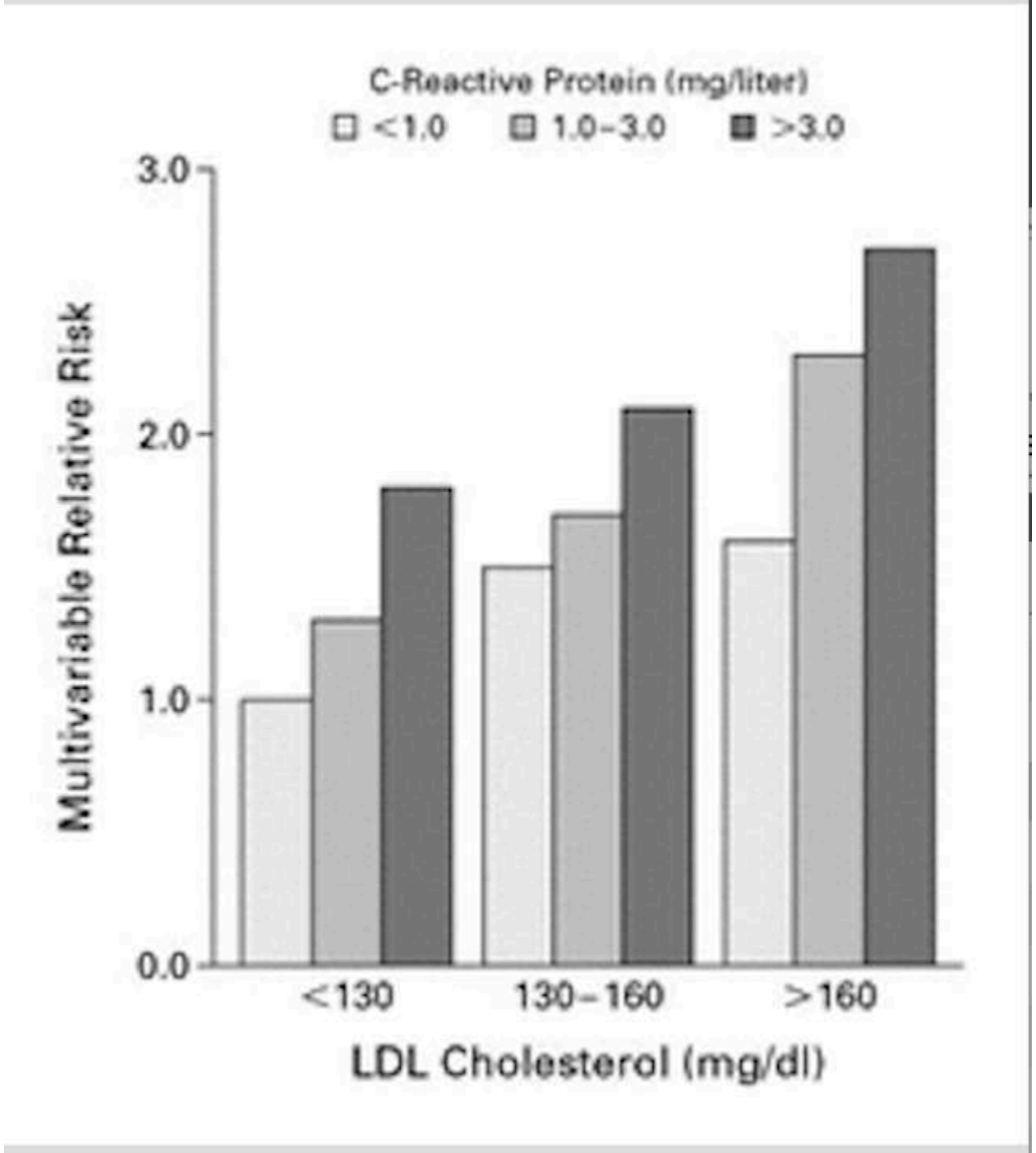
George Howard, Daniel H. O'Leary, Daniel Zaccaro, Steve Haffner, Marian Rewers, Richard Hamman, Joe V. Selby, Mohammed F. Saad, Peter Savage, Richard Bergman

DOI https://doi.org/10.1161/01.CIR.93.10.1809
Circulation. 1996;93:1809-1817
Originally published May 15, 1996

Higher levels of insulin sensitivity are associated with less atherosclerosis

Don’t Forget About Inflammation!

NEJM 2002;347:1557-1565



Diabetes Therapy
April 2018, Volume 9, Issue 2, pp 583–612 | Cite as

Effectiveness and Safety of a Novel Care Model for the Management of Type 2 Diabetes at 1 Year: An Open-Label, Non-Randomized, Controlled Study

Authors | Authors and affiliations

Sarah J. Hallberg, Amy L. McKenzie, Paul T. Williams, Nasir H. Bhanpuri, Anne L. Peters, Wayne W. Campbell, Tamara L. Hazbun, Brittanie M. Volk, James P. McCarter, Stephen D. Phinney, Jeff S. Volek

A1c decreased from 7.6 to 6.3, reduced or eliminated insulin in 94%!
CRP reduced 39%, HDL increased 18%, no change in Apo B, SBP 7mmHg

Saslow *et al. Nutrition and Diabetes* 20177:304
DOI 10.1038/s41387-017-0006-9

Nutrition & Diabetes

BRIEF COMMUNICATION Open Access

Twelve-month outcomes of a randomized trial of a moderate-carbohydrate versus very low-carbohydrate diet in overweight adults with type 2 diabetes mellitus or prediabetes

Laura R. Saslow[1], Jennifer J. Daubenmier[2], Judith T. Moskowitz[3], Sarah Kim[4], Elizabeth J. Murphy[4], Stephen D. Phinney[5], Robert Ploutz-Snyder[1], Veronica Goldman[4], Rachel M. Cox[6], Ashley E. Mason[4], Patricia Moran[4] and Frederick M. Hecht[4]

Subjects reduced A1c from 6.6 to 6.1 *AND* 60% eliminated sulfonylureas and DPP-4 inhibitors
LDL went up 7%, CRP went down 28%, HDL went up 10%

Take Home Message:
Look at The Whole Picture!

- Cardiovascular Disease is Multifactorial
- LDL has a purpose! It's not all "Bad"
- Vascular injury/plaque rupture risk factors:
  - Insulin resistance
  - Inflammation
  - Oxidation
  - Endothelial dysfunction

Don’t Forget The Rest of Lifestyle

- Physical Activity
- Sleep
- Stress
- Social Connections

LCHF Diet and Cardiovascular Health

- Is there reason to believe LCHF can be beneficial for heart health?
- Reframe how we see and measure health- A1c example
- What and how we measure is key- data is king
- LDL has a vital role in our bodies and is not the only risk factor
- Metabolic health impacts our cardiovascular health and can be reflected in our lipid profile and other tests
- If you lose body fat, decrease inflammation, reverse metabolic syndrome/insulin resistance/diabetes, increase HDL, decrease TG naturally, then it makes sense that CV health improves!

LCHF Diet and Cardiovascular Health

- **Measure your patient's progress**
- LDL, HDL, TG, TC:HDL, TG:HDL
- Insulin, HgbA1c, OGTT
- Inflammation (CRP)
- BP, visceral adipose, metabolic health
- Subjective measures
- Coronary calcium score