

# Healthy Fats & Fatty Acids

## Current Dietary Recommendations and Popular Opinions

*Presentation 1 of 2*

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Penn State Nutritional Sciences

# Outline

- Dietary Guidelines recommendations for fat and fatty acids from 1980-2015
- Evidence to support recommendations for SFA, MUFA and PUFA
- Recent SFA research - Conflicts and opinions
- Summary

# Quantitative advice related to dietary fat, Dietary Guidelines for Americans, 1980-2015

	1980	1985	1990	1995	2000	2005	2010	DGAC 2015
Total Fat	Avoid too much	Avoid too much	≤30%	≤30%	≤30%	20-35% <sup>1</sup>	20-35% <sup>2</sup>	No Upper limit*
Saturated Fat	Avoid too much	Avoid too much	≤10%	≤10%	≤10%	≤10%	≤10%; replace SFA with MUFA/ PUFA	≤10%; replace SFA with <b>PUFA/ MUFA</b>
Cholesterol	Avoid too much	Avoid too much	Low	≤300mg	≤300mg	≤300mg	≤300mg	No upper limit*

Note: <sup>1</sup>30-35% for ages 2-3 years; 25-35% for ages 4-18 years.

Source: DGA 1980-2005.

Note: <sup>2</sup>30-40% for children ages 1 to 3 years; 25-35% for ages 4-18 years

Note: \*No longer considered nutrient of concern

# Key Recommendations DGA 2010: Foods and food components *to reduce*

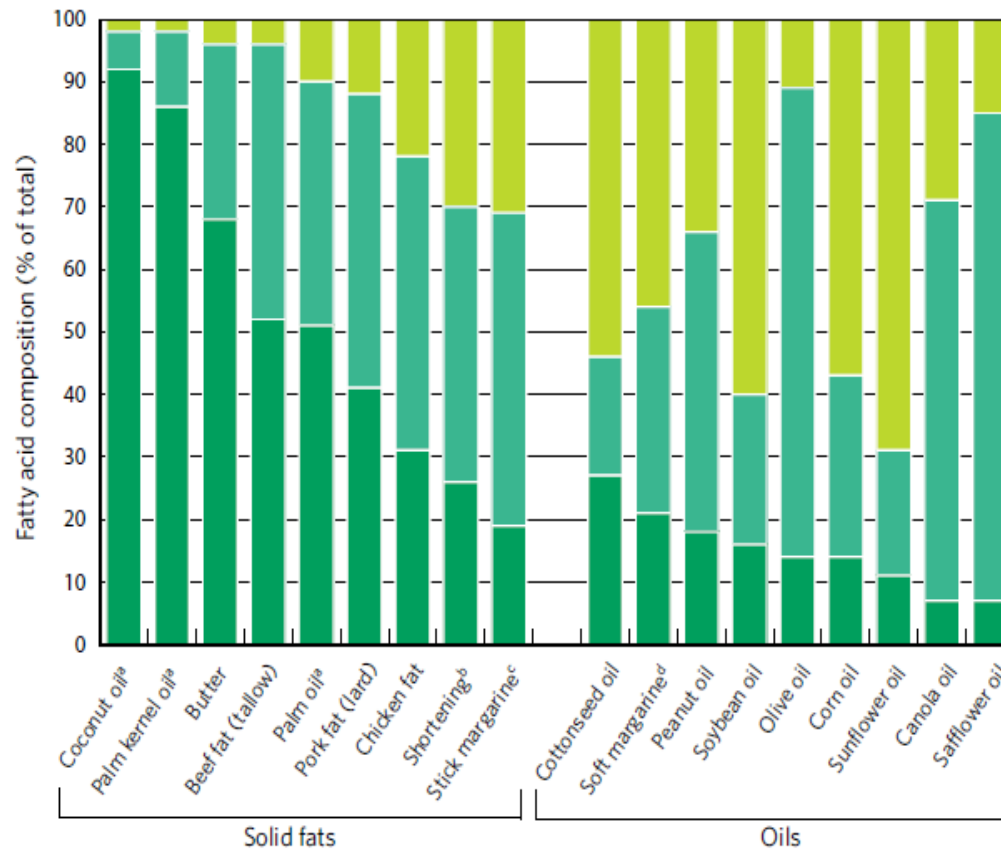
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- Reduce daily sodium intake to < 2,300 milligrams (mg) and further reduce intake to 1,500 mg among persons who are 51 and older and those of any age who are African American or have hypertension, diabetes, or chronic kidney disease.
- **Consume < 10 percent of calories from saturated fatty acids by replacing them with monounsaturated and polyunsaturated fatty acids.**
- **Consume  $\leq$  300 mg per day of dietary cholesterol.**
- **Keep trans fatty acid as low as possible by limiting foods that contain synthetic sources of trans fats, such as partially hydrogenated oils, and by limiting other solid fats.**
- **Reduce the intake of solid fats and added sugars.**
- Limit the consumption of foods that contain refined grains, especially refined grain foods that contain solid fats, added sugars, and sodium.
- If alcohol is consumed, it should be consumed in moderation—up to 1 drink/day for women and 2 drinks/day for men.





# 2010 Dietary Guidelines: Fatty Acid Profiles of Solid Fats (*to Limit*) and Liquid Vegetable Oils (*to Consume*)



# Dietary Guidelines Advisory Committee (DGAC) 2015 Key Recommendations

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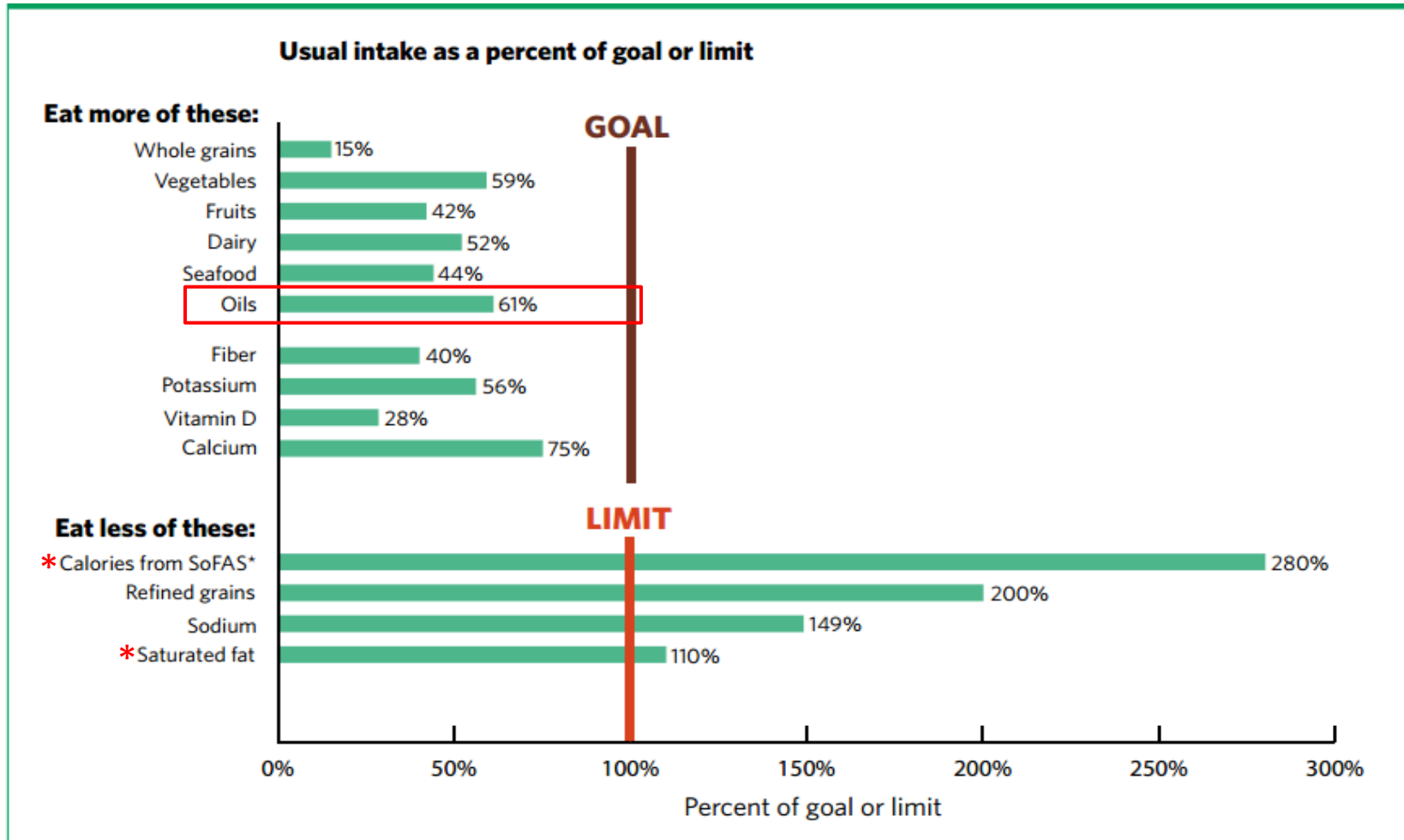
- The overall body of evidence examined by the 2015 DGAC identifies that a **healthy dietary pattern** is higher in vegetables, fruits, whole grains, low- or non-fat dairy, seafood, legumes, and nuts; moderate in alcohol (among adults); lower in red and processed meats; and low in sugar-sweetened foods and drinks and refined grains.
- The goals for the general population are: < 2,300 mg dietary sodium per day (or age-appropriate Dietary Reference Intake amount), **< 10 percent of total calories from saturated fat/day**, and a maximum of 10 percent of total calories from added sugars/day.
- **Sources of saturated fat should be replaced with unsaturated fat, particularly polyunsaturated fatty acids.**

# Relationship Between Intake of SFA and Risk of Cardiovascular Disease

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- **Strong and consistent evidence** from RCTs shows that **replacing SFA with unsaturated fats, especially PUFA, significantly reduces total and LDL-C.**
  - Replacing SFA with carbohydrates (sources not defined) also reduces total and LDL-C, but significantly increases TG and reduces HDL-C.
- **Strong and consistent evidence** from RCTs and statistical modeling in prospective cohort studies shows that **replacing SFA with PUFA reduces the risk of CVD events and coronary mortality.**
  - For every 1% of energy intake from SFA replaced with PUFA, incidence of CHD is reduced by 2 to 3%. However, reducing total fat (replacing total fat with overall carbohydrates) does not lower CVD risk.
- **Consistent evidence** from prospective cohort studies shows that higher SFA intake as compared to total carbohydrates is not associated with CVD risk.
- **DGAC 2015 Grade: Strong**

# DGAC 2015 Recommends Replacement of Solid Fats with Unsaturated Oils





# The 2015 US Dietary Guidelines Lifting the Ban on Total Dietary Fat

**Dariusz Mozaffarian, MD, DrPH**  
Friedman School of  
Nutrition Science and  
Policy, Tufts University,  
Boston, Massachusetts.

The 2015 DGAC report did not list total fat as a nutrient of concern nor did they place an upper limit on total fat consumption.

**David S. Ludwig, MD, PhD**  
New Balance  
Foundation Obesity  
Prevention Center,  
Boston Children's  
Hospital, Boston,  
Massachusetts.

“Reducing total fat (replacing total fat with overall carbohydrates) does not lower CVD [cardiovascular disease] risk.... **Dietary advice should emphasize optimizing types of dietary fat and not reducing total fat.**”

Limiting total fat was also not recommended for obesity prevention; the focus was on healthful food-based diet patterns that include more vegetables, fruits, whole grains, seafood, legumes, and dairy products and include less meats, sugar-sweetened foods and drinks, and refined grains.

# Evidence in Support of DGAC 2015 Recommendations for Total Fat and Dietary Cholesterol

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## ■ Total fat

- In a Cochrane meta-analysis of trials with 24 comparisons and 65,508 participants of whom 7% had a cardiovascular event, Hooper et al. (Cochrane Database Syst Rev. 2012 May 16;5:CD002137) found no significant association of total fat reduction with cardiovascular events or mortality.

## ■ Dietary cholesterol

- The 2015 DGAC will not bring forward this recommendation ( $\leq 300$  mg/d) because available evidence shows no appreciable relationship between consumption of dietary cholesterol and serum cholesterol, consistent with the conclusions of the American Heart Association (AHA) and American College of Cardiology (ACC). Thus, cholesterol is not a nutrient of concern for overconsumption.

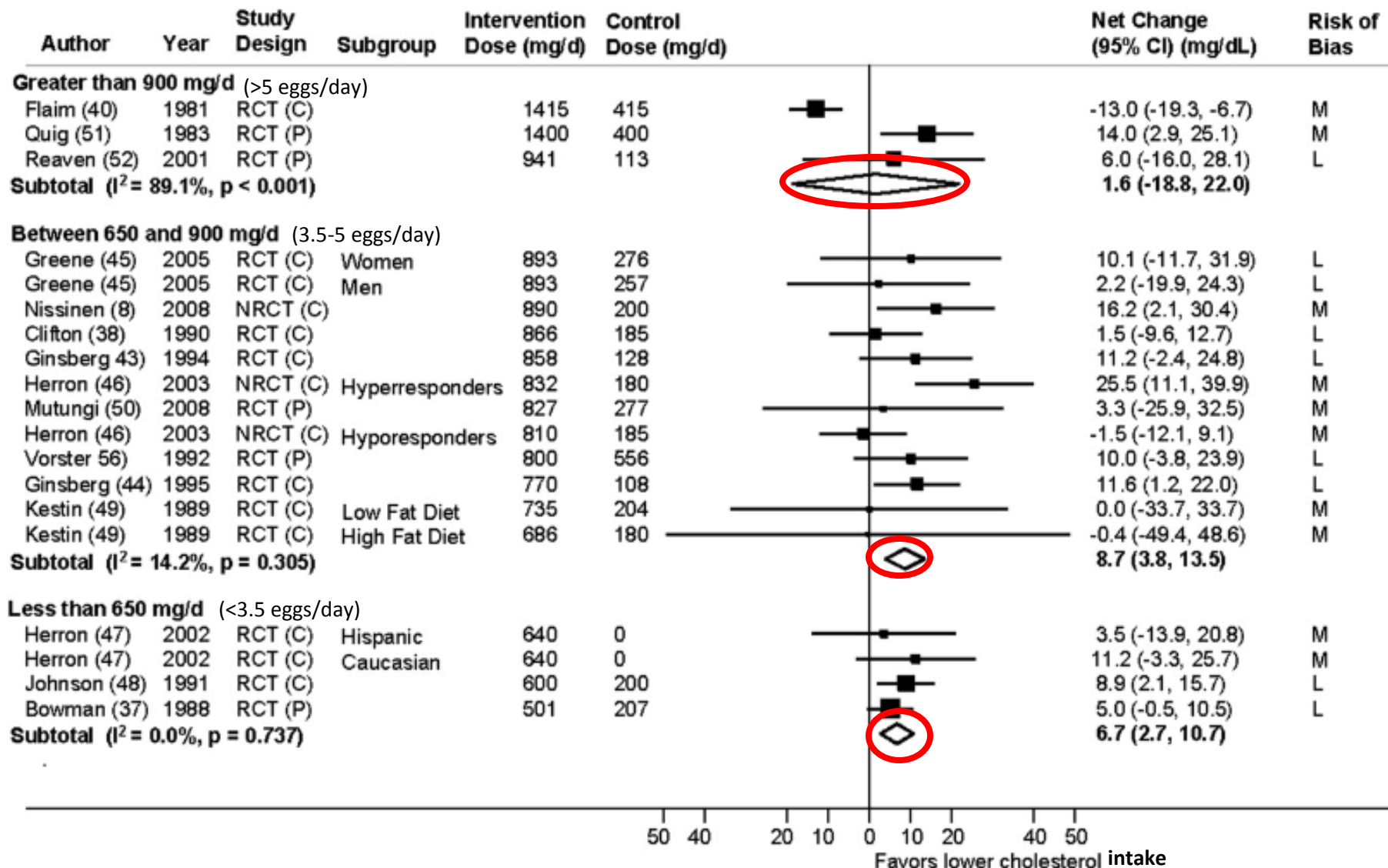
# Dietary cholesterol and cardiovascular disease: a systematic review and meta-analysis<sup>1-3</sup>

*Samantha Berger,<sup>4</sup> Gowri Raman,<sup>4</sup> Rohini Vishwanathan,<sup>5</sup> Paul F Jacques,<sup>5</sup> and Elizabeth J Johnson<sup>5\*</sup>*

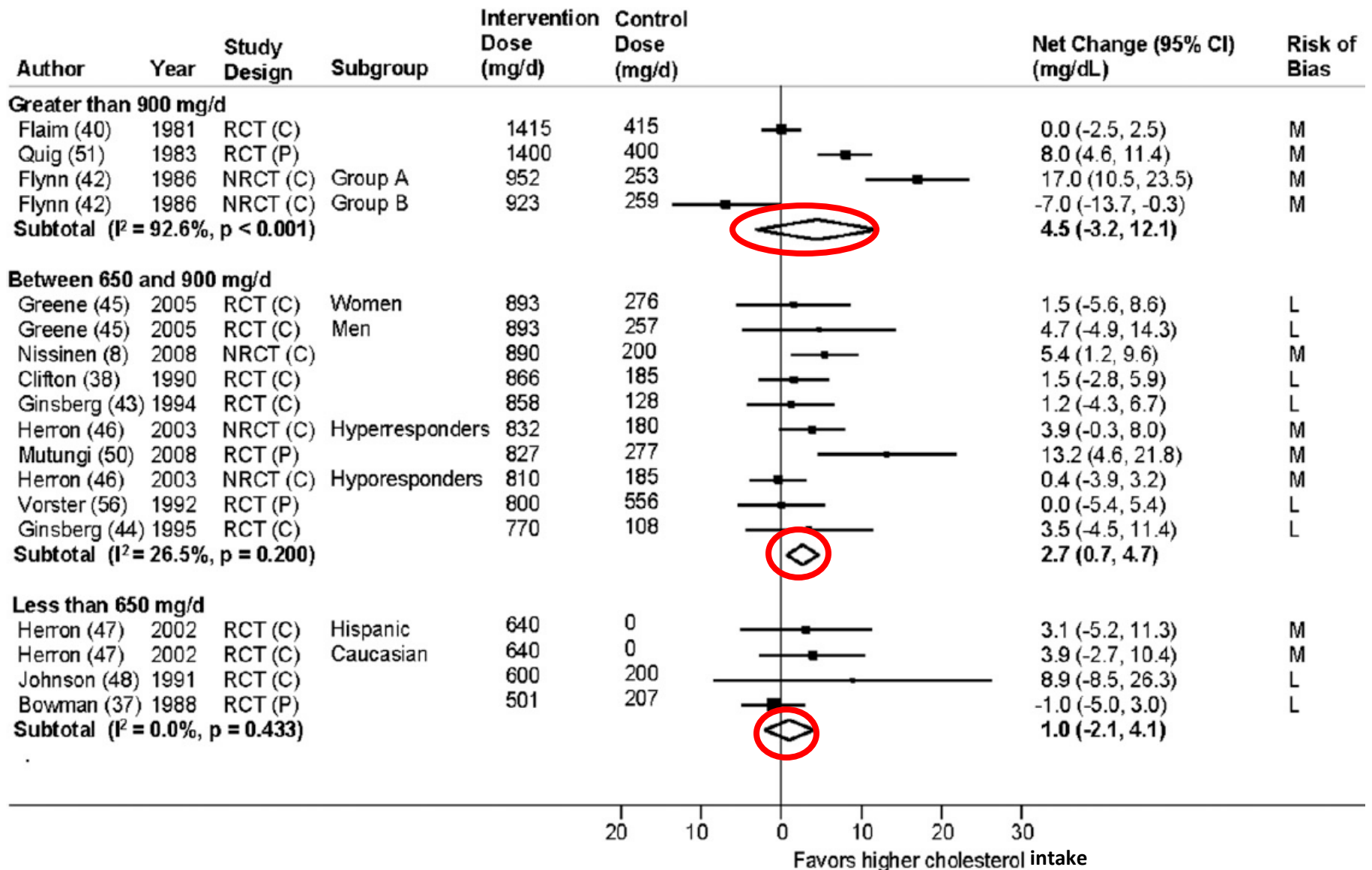
<sup>4</sup>Tufts Clinical Evidence Synthesis Center, Tufts Medical Center, Boston, MA, and <sup>5</sup>Jean Mayer USDA Human Nutrition, Research Center on Aging at Tufts University, Boston, MA

- Forty studies (17 cohorts in 19 publications with 361,923 subjects and 19 trials in 21 publications with 632 subjects) published between 1979 and 2013 were included.
- Dietary cholesterol was not significantly associated with coronary artery disease, ischemic stroke or hemorrhagic stroke.
- Dietary cholesterol significantly increased both serum total cholesterol and LDL-C.
- Dietary cholesterol also significantly increased HDL-C and the LDL-C:HDL-C ratio.

# Dietary Cholesterol – LDL-C



# Dietary Cholesterol – HDL-C



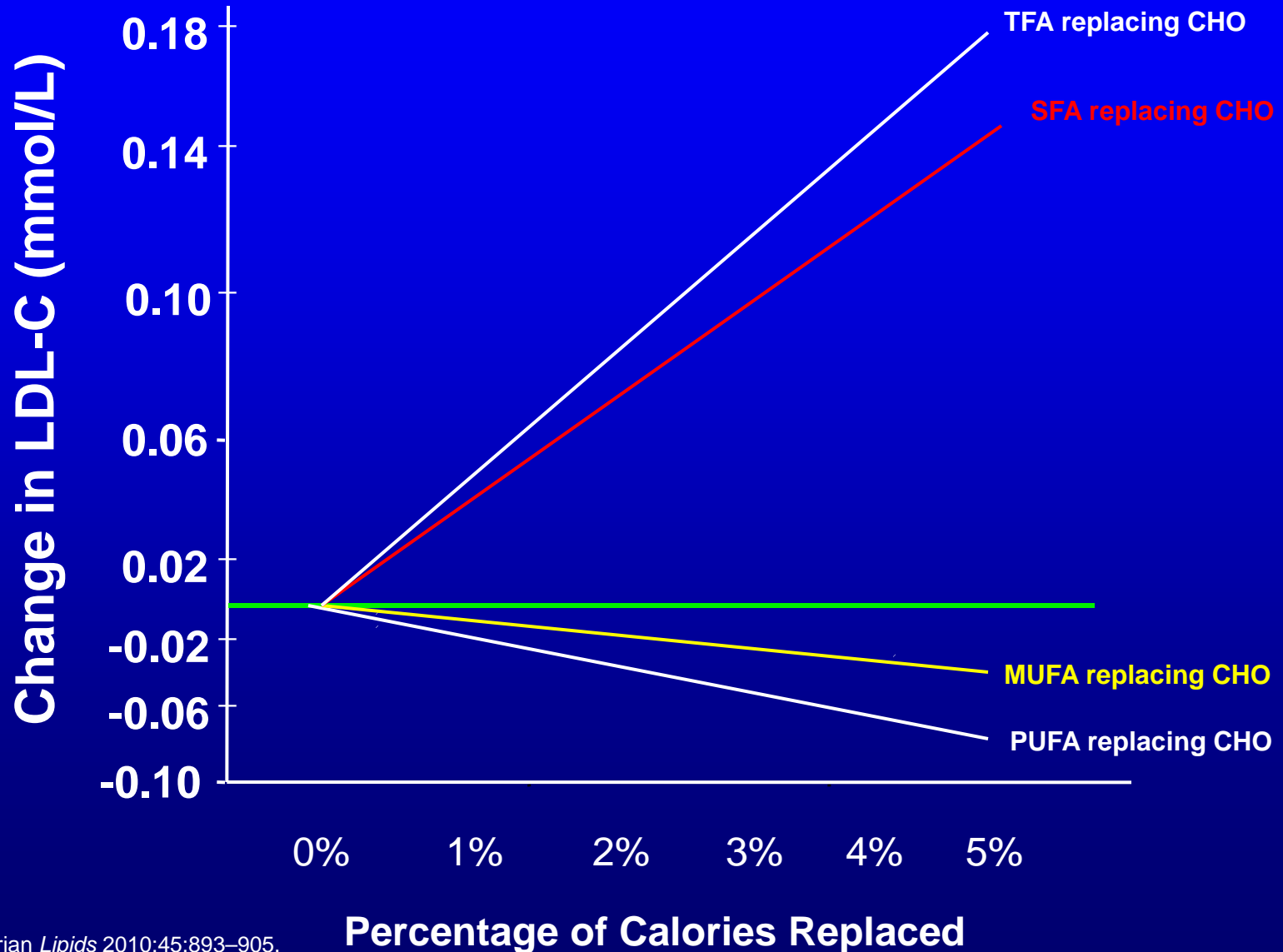
# Evidence in Support of DGAC 2015 Recommendations for Total Fat (and other Macronutrients) and Body Weight

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- 1. There is strong and consistent evidence that when calorie intake is controlled, macronutrient proportion of the diet is not related to losing weight.
- 2. A moderate body of evidence provides no data to suggest that any one macronutrient is more effective than any other for avoiding weight re-gain in weight reduced persons.
- 3. A moderate body of evidence demonstrates that diets with less than 45% of calories as carbohydrates are not more successful for long-term weight loss (12 months). There is also some evidence that they may be less safe. In shorter-term studies, low-calorie, high-protein diets may result in greater weight loss, but these differences are not sustained over time.
- 4. A moderate amount of evidence demonstrates that dietary patterns with less than 45% calories from carbohydrate or more than 35% calories from protein are not more effective than other diets for weight loss or weight maintenance, are difficult to maintain over the long term, and may be less safe.”

**Evidence to Support Current  
Dietary Recommendations for  
Fatty Acids**

# Change in LDL-C with Different Dietary Fats Substituted for CHO





# Reduction in saturated fat intake for cardiovascular disease (Review)

Hooper L, Martin N, Abdelhamid A, Davey Smith G



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“Together the studies provide moderate-quality evidence that reducing saturated fat and replacing it with polyunsaturated fats reduces our risk of cardiovascular disease.”

# Effect of Reduced Intake from SFA Relative to Higher Intake for Reduction in Disease Risk?

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- Reducing saturated fat for at least two years suggested no clear effects on all-cause or cardiovascular mortality, but a 17% reduction in combined cardiovascular events.
  - Moderate quality evidence
- There were greater reductions (27%) in cardiovascular events in studies that replaced saturated fats by PUFAs than in studies with replacement with MUFAs, CHO or protein, where there was little evidence of any effect.
  - Moderate-quality evidence of effects of replacing saturated fat with PUFA
  - Low-quality evidence of effects of replacing saturated fat with MUFA
  - Moderate-quality evidence of effects of replacing saturated fat with CHO
  - Moderate- or low-quality evidence suggested no clear effects of replacing saturated fat with protein on any health outcomes

# Conclusion of Cochrane Review 2015

- Results from 15 RCTs (59,000 participants) indicate a small, but potentially important decrease in CVD risk with a reduction in dietary SFA. Replacing SFA with PUFA “appears to be a useful strategy, and replacing with CHO appears less useful”.
- Effects of replacement with MUFA were unclear due to only 1 small trial.
- “Lifestyle advice to all those at risk of CVD should continue to include permanent reduction of dietary SFA and partial replacement by unsaturated fats. The ideal type of unsaturated fat is unclear.”

# Limitations of the Current Research that Challenges SFA Recommendations



THE SATURDAY ESSAY – Wall Street Journal, May 3, 2014

## The Questionable Link Between Saturated Fat and Heart Disease

Are butter, cheese and steak really bad for you? The dubious science behind the anti-fat crusade.

By Nina Teicholz.



“Our half-century effort to cut back on the consumption of meat, eggs and whole-fat dairy has a tragic quality. More than a billion dollars have been spent trying to prove Ancel Keys's hypothesis, but evidence of its benefits has never been produced. It is time to put the saturated-fat hypothesis to bed and to move on to test other possible culprits for our nation's health woes.”

JUNE 23, 2014

# TIME

## Eat Butter.

Scientists labeled fat the enemy. Why they were wrong

BY BRYAN WALSH



time.com

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Promotes Strong Bones

- IMPROVES  
IMMUNE SYSTEM



Reviews | 18 March 2014

## Association of Dietary, Circulating, and Supplement Fatty Acids With Coronary Risk: A Systematic Review and Meta-analysis

Rajiv Chowdhury, MD, PhD; Samantha Warnakula, MPhil\*; Setor Kunutsor, MD, MSt\*; Francesca Crowe, PhD; Heather A. Ward, PhD; Laura Johnson, PhD; Oscar H. Franco, MD, PhD; Adam S. Butterworth, PhD; Nita G. Forouhi, MRCP, PhD; Simon G. Thompson, FMedSci; Kay-Tee Khaw, FMedSci; Dariush Mozaffarian, MD, DrPH; John Danesh, FRCP\*; and Emanuele Di Angelantonio, MD, PhD\*

[\[+\] Article and Author Information](#)

*Ann Intern Med.* 2014;160(6):398-406. doi:10.7326/M13-1788

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**Conclusion:** Current evidence does not clearly support cardiovascular guidelines that encourage high consumption of polyunsaturated fatty acids and low consumption of total saturated fats.

# OBSERVATIONS

FROM THE HEART

## Saturated fat is not the major issue

Let's bust the myth of its role in heart disease

Aseem Malhotra *interventional cardiology specialist registrar, Croydon University Hospital, London*

**Re: Saturated fat is not the major issue**

30 October 2013

Bravo Dr. Malhotra for an astute, erudite and extremely elegant article. May the this be part of the beginning of the end for all the misinformation, propaganda and incorrect "science" promulgated by so-called " nutritionists" and their useful idiot fellow professionals, many of us in the medical profession included, that plays into the hands of the food industry.

Click to like:

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Written by:  
Obstetrician-  
Gynecologist

**Re: Saturated fat is a major issue.**

29 October 2013

Saturated fat is very bad news. The energy content of one gram of fat at 9 Calories is twice that of a gram of carbohydrate at 4 Calories so limiting fat and sugar intake to avoid visceral obesity and dyslipidaemia is essential. Fat is more energy dense than carbohydrate.

Click to like:

34



Written by:  
Consultant Lipidologist



## Don't reach for the butter and bacon just yet Study on saturated fat is flawed, Consumer Reports experts say

Published: April 11, 2014 11:00 AM



*"They have done a huge amount of damage," says Walter Willett, chair of the nutrition department at the Harvard School of Public Health in Boston. "I think a retraction with similar press promotion should be considered."*

*The errors [in this study] "demonstrate shoddy research and make one wonder whether there are more that haven't been detected," writes Jim Mann, a researcher at the University of Otago, Dunedin, in New Zealand, writes in an e-mail. "If I had been the referee I would have recommended rejection."*

## Scientists Fix Errors in Controversial Paper About Saturated Fats

24 March 2014 3:15 pm | [111 Comments](#)



Wikimedia Commons/Sage Ross

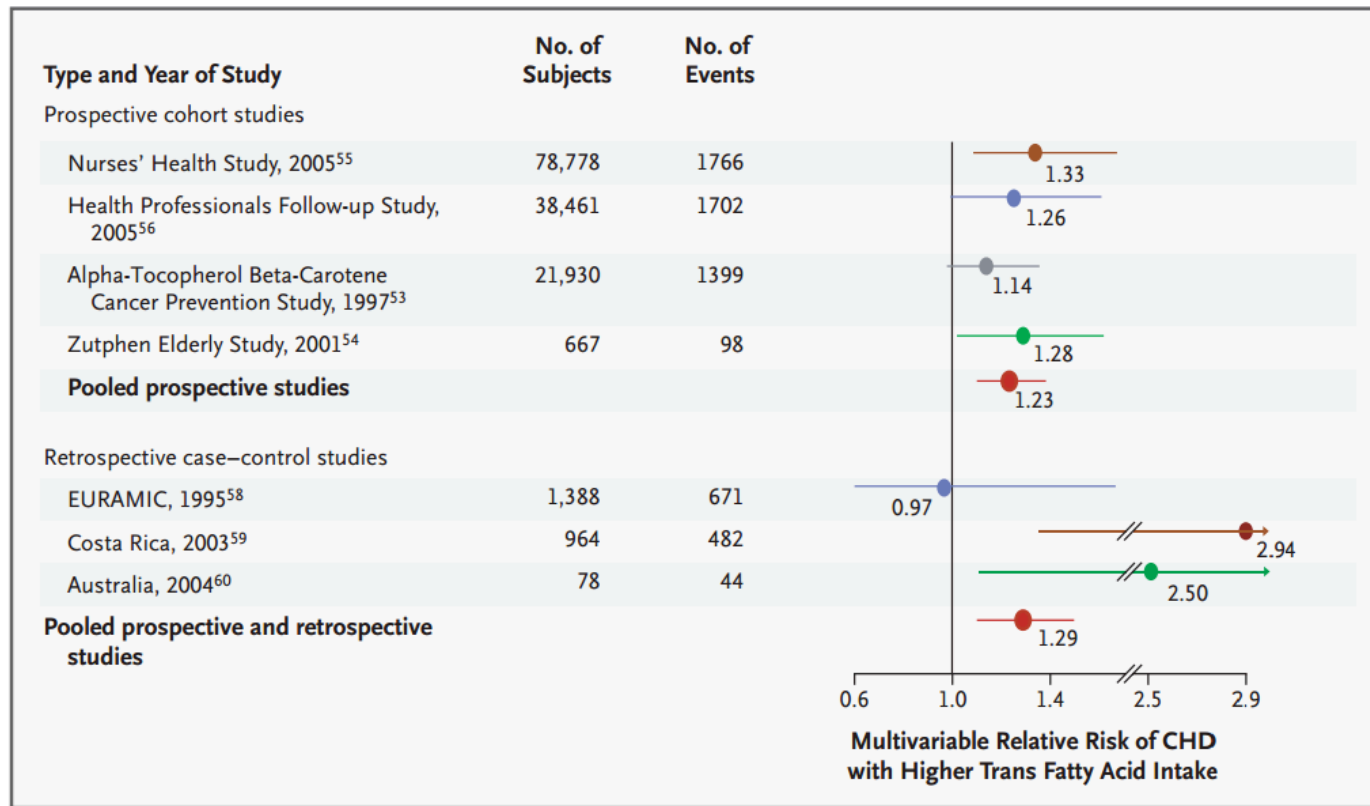
# Problems with Chowdhury et al. 2014

See comments on *Ann Intern Med* website:

<http://annals.org.ezp-prod1.hul.harvard.edu/article.aspx?articleid=1846638>

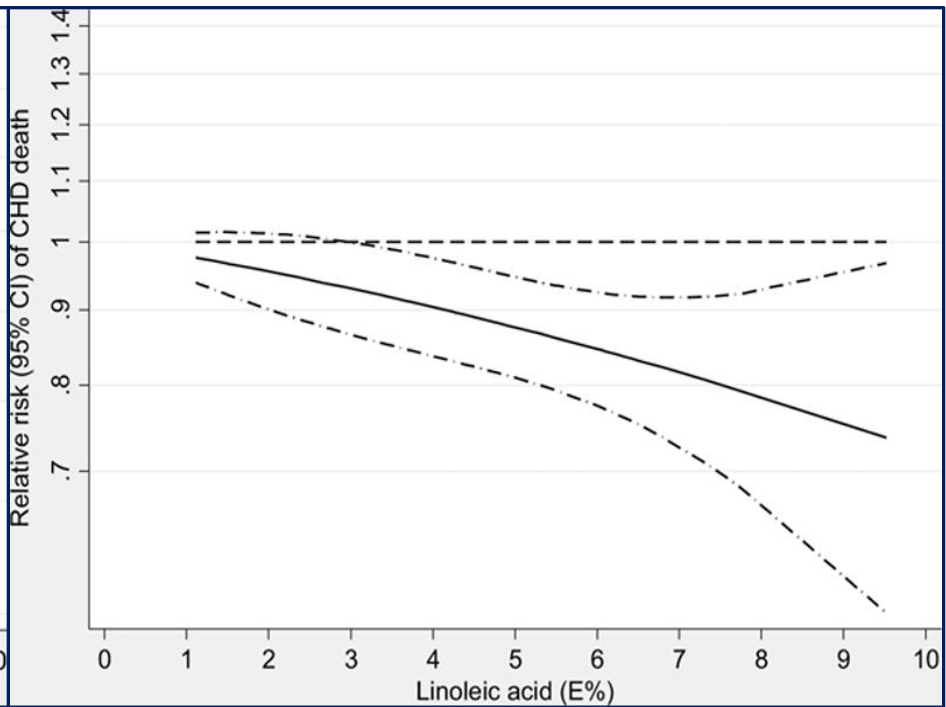
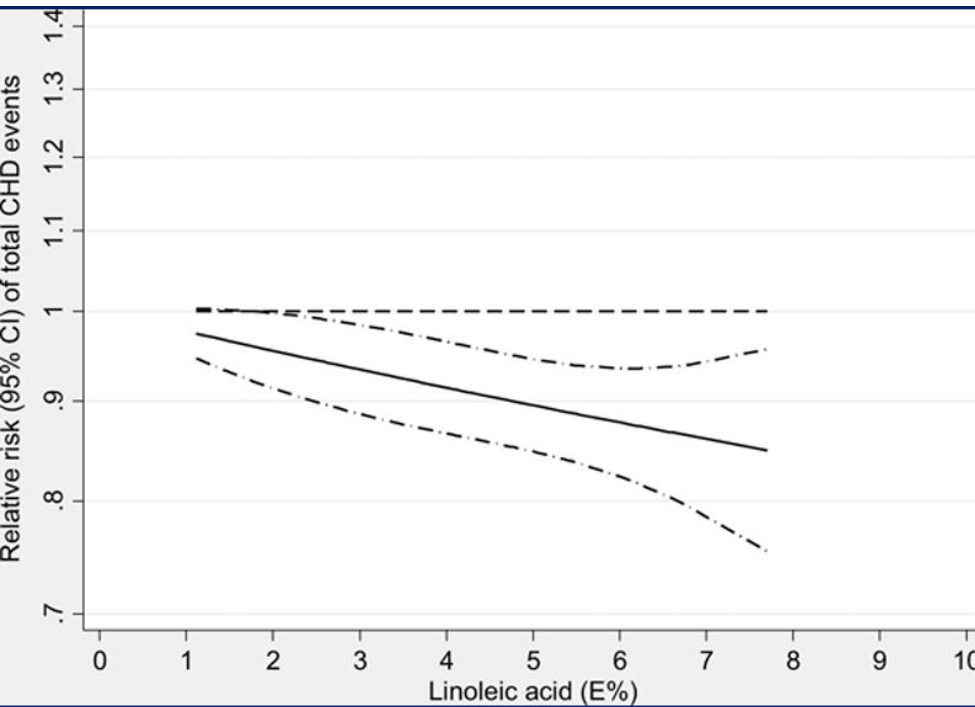
- Gross errors in data abstraction from original papers
- Omitted important studies, especially on PUFA
- Omitted important evidence (e.g., feeding studies)
- Lack of specific comparisons, and failure to acknowledge this
- Misrepresented findings (especially for long-chain N-3 PUFA)
- Failed to acknowledge other summaries based on primary data that had different conclusions

# Trans Fatty Acids - Multivariable Adjusted Relative Risk of CHD Associated with Trans Fatty Acid Intake

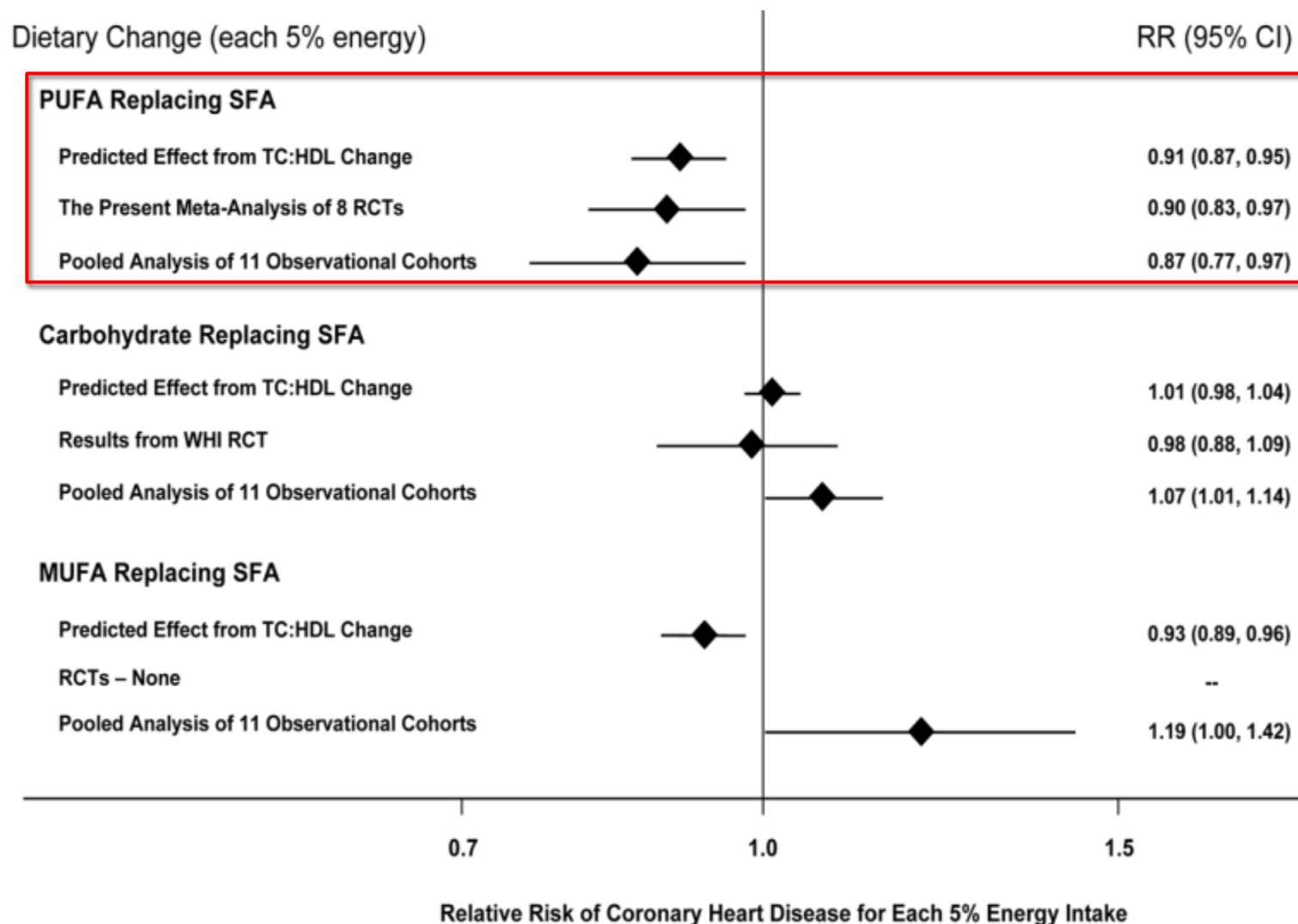


# Cardioprotective Benefits of Linoleic Acid

*Dietary LA was associated with a 15% lower risk of CHD events and 21% lower risk of CHD deaths*

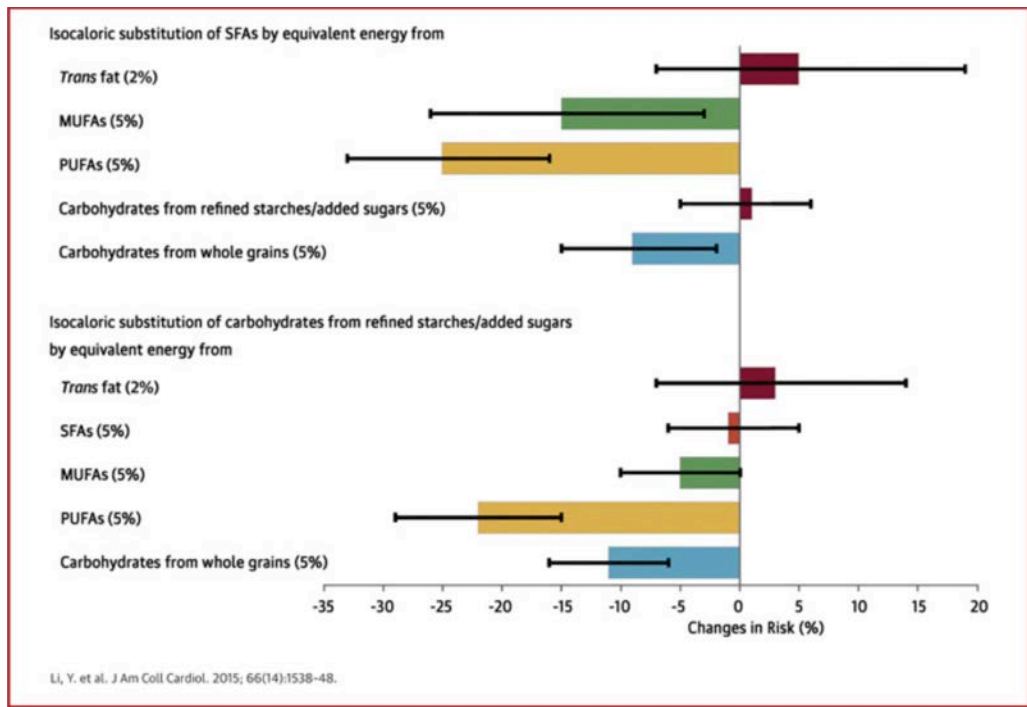


# Effects on CHD Risk of Consuming PUFA, CHO, or MUFA in Place of SFA



## From: Saturated Fats Compared With Unsaturated Fats and Sources of Carbohydrates in Relation to Risk of Coronary Heart Disease: A Prospective Cohort Study

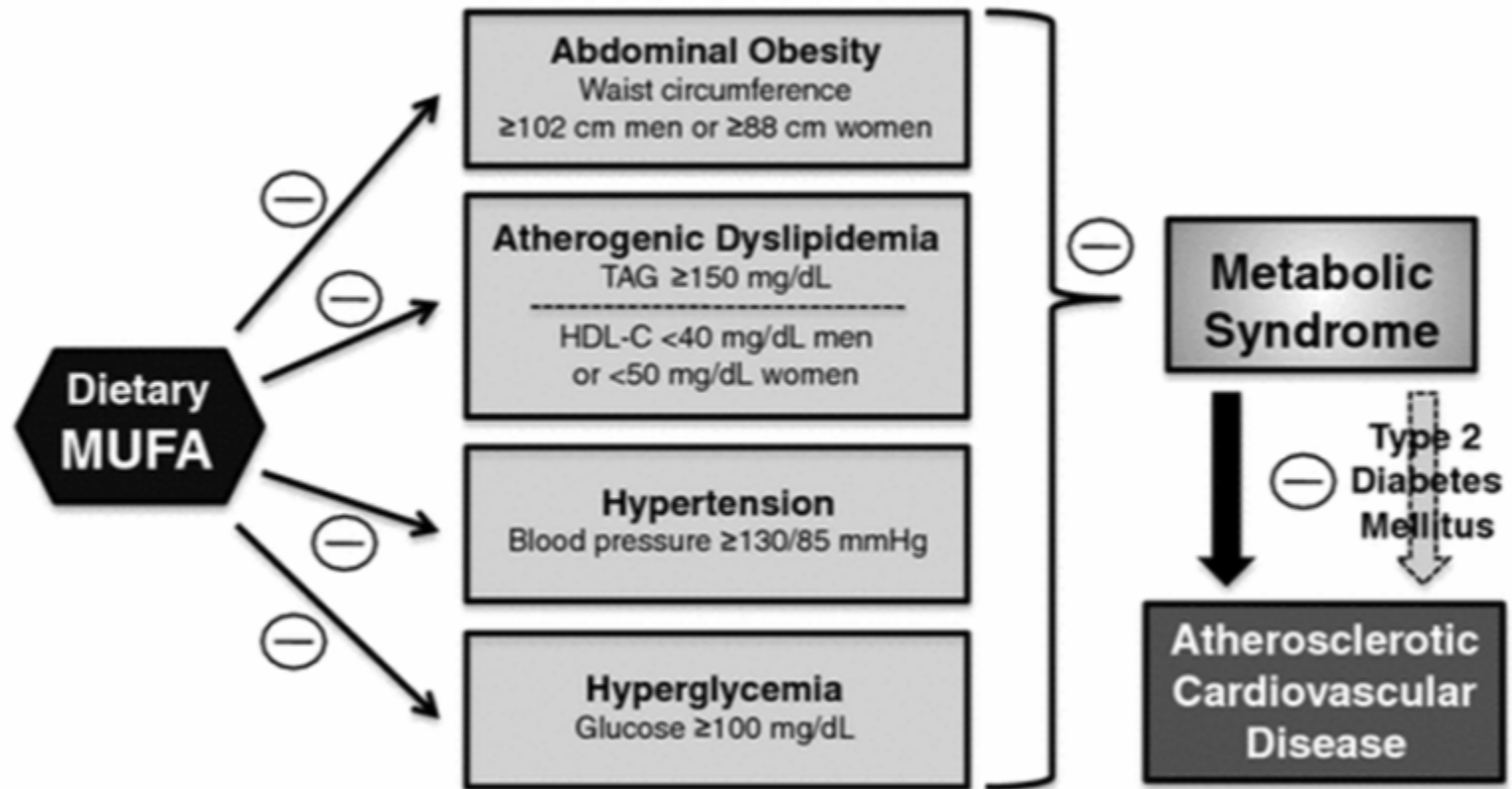
*J Am Coll Cardiol.* 2015;66(14):1538-1548. doi:10.1016/j.jacc.2015.07.055



### Figure Legend:

**Fat, Carbohydrates, and Heart Disease: Estimated Percentage of Changes in the Risk of Coronary Heart Disease Associated With Isocaloric Substitutions of 1 Dietary Component for Another**

# Dietary monounsaturated fats for the prevention of metabolic syndrome and atherosclerotic cardiovascular disease risk



# Summary

- Dietary Guidelines advise decreasing SFA and TFA. DGAC 2015 recommends replacing them with unsaturated fat, particularly PUFA.
- New research is showing that MUFA and carbohydrates from whole grains when substituted for SFA, decreases CHD risk.



*Thank You*

