



# Health Properties of the Fatty Acids in Canola Oil



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# Outline

- **What is Canola**
- **Composition of canola**
- **Regulatory claims**
- **Buying decisions, consumption trends**
- **Low in saturated fatty acids (SFA)**
- **High in monounsaturated fats (MUFA)**
- **High in omega-3 fatty acids (PUFA)**
- **High in plant sterols**
- **High in vitamin E**



# Canola Oil: what is it; Composition



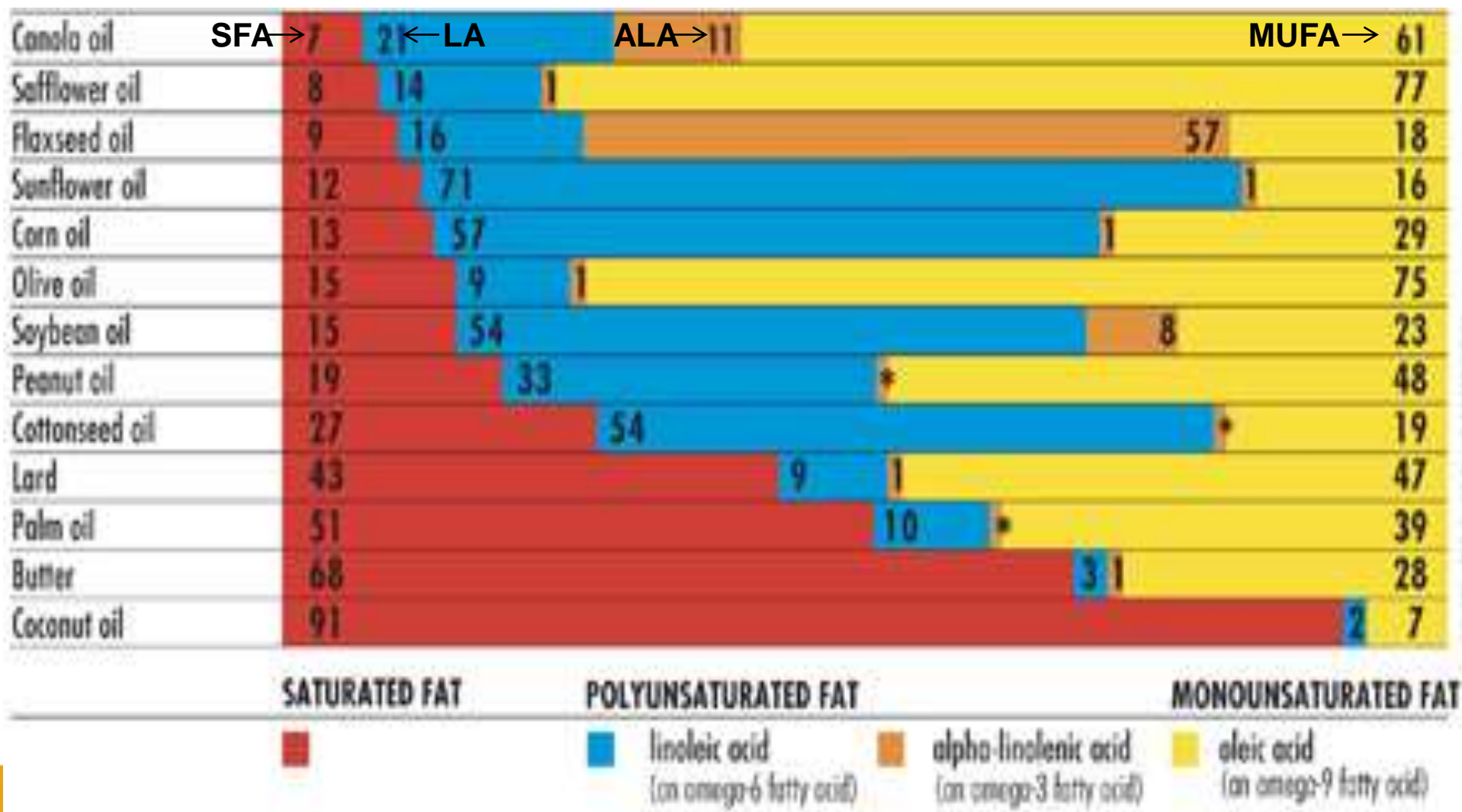
# Canola Oil: what is it

- Variety of rapeseed plant (*Brassica napus*, *B. campestris*)
- Important economic cultivar in Canada (world's largest producer)
- World's 3rd leading source of vegetable oil
  - #1 consumed oil in Canada
  - #2 vegetable oil in USA
- Developed by traditional plant breeding methods in 1970s
- Erucic acid: Traditional rapeseed-(20-55%) vs. modern canola oil (<2 %)
- Sold in Canada (1974) and USA (1985)
- FDA GRAS status

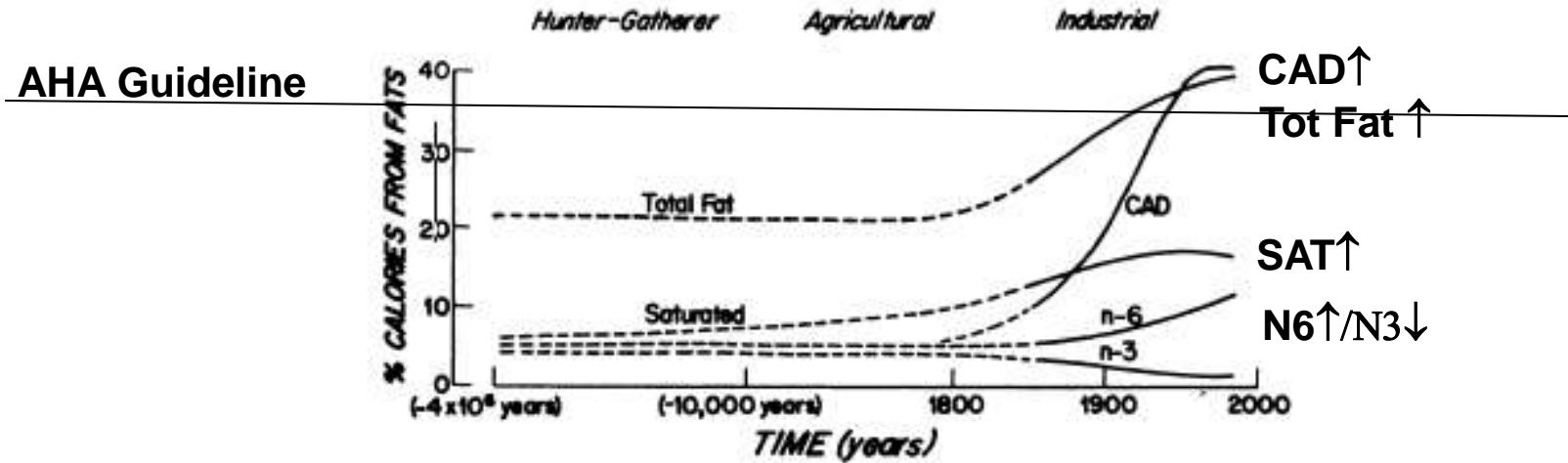




# Canola: FA composition vs other oils



# Ancestral fat intakes



# Recent SFA debates: Replacement of SFA

- Lipids, Oct 2010
  - 7 articles debating evidence against SFA
  - Recommendations to replace SFA based largely on ecologic /animal studies. Newer studies now available
  -
- Mozaffarian et al. 2011. Effects on CHD of increasing PUFA in place of SFA: systematic review/meta-analysis of randomized controlled trials. PLoS Med. 2010 Mar
  - Advantage replacing SFA with PUFA; no major advantage replacing SFA with CHO or MUFA, when considering CHD relative risk. If considering only TC:HDL, then PUFA and MUFA replacement of SFA is of benefit
- Health Effects of Dietary Saturated Fatty Acids Symposia, Wayne State Univ, October 14, 2010
  - 10 presentations debating evidence against SFA; one presentation from DGAC justifying decisions of why SFA should be limited (Sponsored by American Palm Oil Council)
- Hite AH et al. 2010. In the face of contradictory evidence: report of the Dietary Guidelines for Americans Committee. Nutrition 26: 915

# Dietary MUFAs

Improve Blood Lipids

↑HDL-C  
↑RCT  
↓LDL-C  
↓Total-C

Weight Maintenance

↑Fat oxidation  
↑Energy Expenditure  
↑OEA  
↑Satiety

Prevent & treat Diabetes Mellitus

↑GLP-1  
↑β-cells  
↓Insulin resistance  
↓Plasma glucose

Reduce Blood Pressure

↑2-OHOA  
↑G-proteins  
↑Oleamide  
↑NO  
↑Vasodilation  
↑Hypotension

↓LDL-C PUFA/MUFA level  
↑Antioxidant status

Reduce LDL-C oxidation

Reduce vascular inflammation  
Reduce monocyte chemotaxis & adhesion

Reduce coagulation, fibrinolysis & thrombogenesis

Reduce Endothelial Dysfunction

↓ROS  
↓NFκB  
↓TNFα, IL-1β  
↓VCAM, ICAM  
↓P- & E-selectin

↓Factor VII  
↓PAI-1, vWF, TFPI




# Composition of other MUFA-rich oils


Food Source	SFA (g)	MUFA (g)	n-6 PUFA (g)	n-3 PUFA (g)	n-6:n-3 ratio
<b>Canola oil</b>	<b>7.4</b>	<b>63.3</b>	<b>19.0</b>	<b>9.1</b>	<b>2:1</b>
High-oleic canola oil	6.5	72.0	14.5	2.6	5:1
High-oleic sunflower oil	9.7	83.6	3.6	0.2	18:1
High-oleic safflower oil	6.2	74.6	14.4	0.0	—
Olive oil	13.8	73.0	9.8	0.7	14:1

# Detailed list of fatty acids in canola (%)

C<14	0.1
C16:0	3
C16:1	0.3
C18:0	1.5
C18:1	58
C18:2	23
C18:3	11
C20:0	0.5
C20:1	2
C22:0	0.2
C22:1	0.4


**Stimulated muscle insulin action and decreased fatty liver in rodents (Watkins)**


**Major FA in sphingomyelin**


**Erucic acid**



# **Regulatory claims USCA Statements to 2010 DGAC**



# FDA-authorized claim: Qualified Health Claim for Canola Oil

Limited and not conclusive scientific evidence suggests eating about 1.5 tbsp (19 g) of canola oil daily may reduce CHD risk due to unsaturated fat content in canola oil

To achieve this possible benefit, canola oil is to replace a similar amount of saturated fat and not increase total # calories/d

# USCA Statement to 2010 DGAC

- **USCA supports DGAC's recommendations for all Americans to:**
  - Reduce solid fats and foods containing them in consumer food choices, restaurants, food products
  - Reduce intake of SFA from 10 to 7% en%, replacing calories with unsaturated fatty acids
  - Limit cholesterol raising fats (SFA exclusive of stearic acid and TFA) to <5-7 en%
  - Consume <300 mg cholesterol/d
  - Avoid artificial TFA



# USCA Statement to 2010 DGAC

- **DGAC recommends 20-35 en% total fat intake**
  - USCA suggests 20-30 en%, due to DGAC's conclusion that “consuming recommended intake of SFA more likely when total fat intake is <30 en%.
  - Reduction should not come from increased simple CHO intake

# USCA Statement to 2010 DGAC

- **Composition of Canola**

- Canola oil has 61% MUFA, 32% PUFA, including LA (n6) and ALA (n3) and at ideal n6/n3 ratio of 2:1
- Contains most ALA of all cooking oils with 1.3 g /serving (1 tbsp)
- Meets 118 % of adequate intake-women (1.1 g), 81%- men (1.6 g)

# USCA Statement to 2010 DGAC

- **MUFA**

- “Strong evidence indicates dietary MUFA associated with improved blood lipids related to CVD and T2D, when MUFA replace SFA.
- Evidence shows 5 en% replacement of SFA with MUFA decreases intermediate markers and risk of CVD and T2D in healthy adults and improves insulin responsiveness in insulin resistant and T2D individuals
- Moderate evidence indicates increased MUFA intake, rather than high CHO intake, may benefit T2D
- High MUFA intake, when replacing high CHO, results in improved biomarkers of glucose tolerance and diabetic control

# USCA Statement to 2010 DGAC

- **PUFA**

- “Strong and consistent evidence indicates dietary PUFA are associated with improved blood lipids related to CVD, in particular when PUFA replace dietary SFA or TFA
- Energy replacement of SFA with PUFA decreases TC, LDL-C, TAG and inflammatory markers
- PUFA intake significantly decreases CVD and T2D risk”. 0.6-1.2 en% ALA meets current recommendations and may lower CVD risk
- Limited but supportive evidence suggests higher intake of omega-3 FAs from plant sources may reduce mortality among persons with existing CVD

# USCA Statement to 2010 DGAC

- **Vitamins E and K**

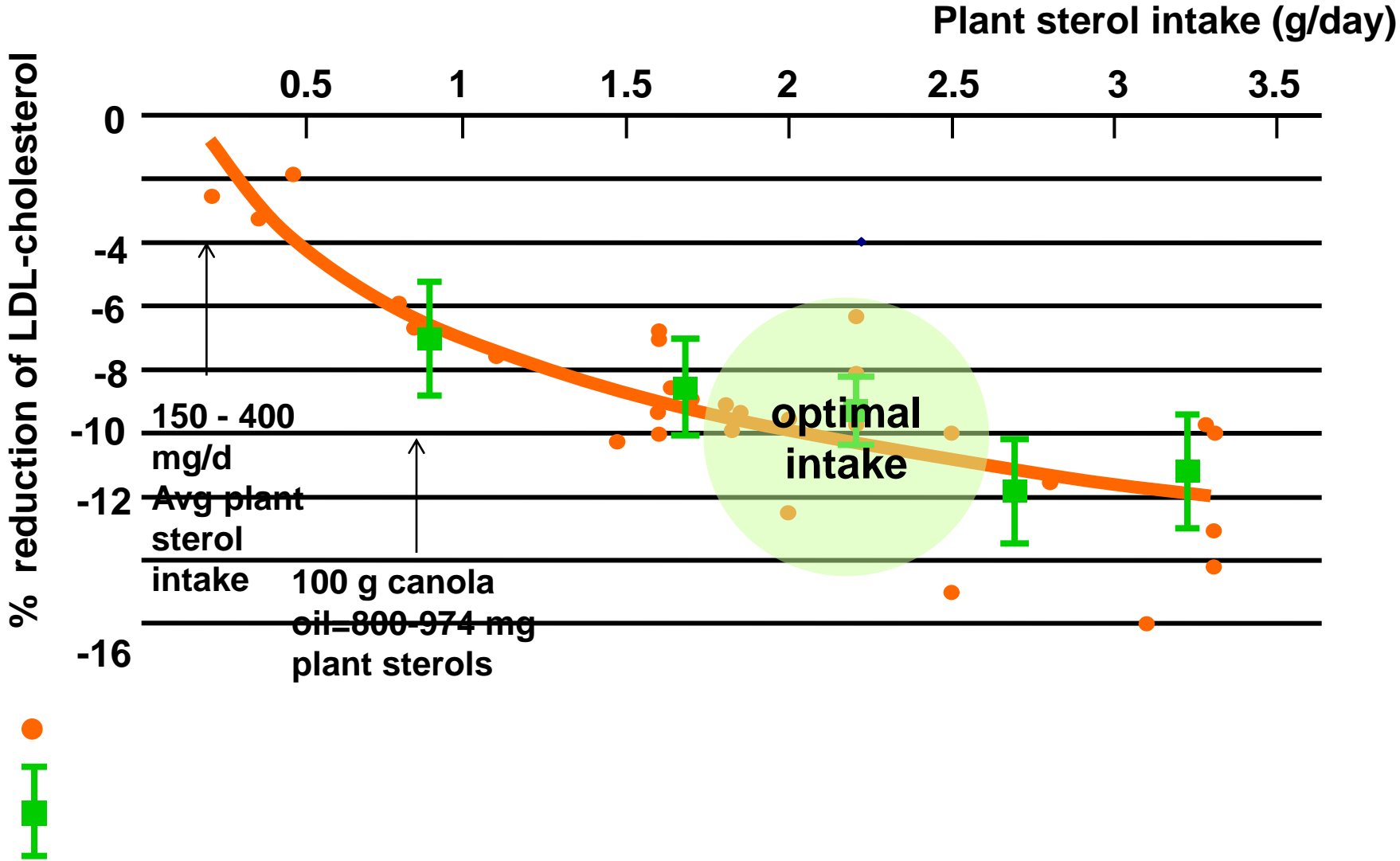
- Vitamins E and K are shortfall nutrients, according to DGAC, with only 7 and 37% Americans getting enough
- Recommended Dietary Allowance for vitamin E is 15 mg and Adequate Intake for vitamin K is 90 mcg for women and 120 mcg for men
- Canola oil is a good source of vitamins E and K, providing 2.4 mg and 20 mcg, per 1 tbsp serving

- **Plant sterols**

- Plant sterols reduce cholesterol absorption. Canola oil is one of richest source of plant sterols (800+ mg/100 g) of all vegetable oils



# Cholesterol lowering with plant sterols in fat-based foods: Dose-response



# Dietary modeling: substitution of canola oil for fats used in USA increase compliance with dietary FA recommendations

## 100% replacement of dietary fat sources in US with canola oil

SFA ↓ 9.4% of energy

MUFA ↑ 27.6% intakes

PUFA ↓ 32.4% intakes

ALA ↑ 73.0% intakes

LA ↓ 44.9% intakes

n-6:n-3 ↓ to 3.1:1

- **CONCLUSIONS:**  
Substitution of canola oil and canola oil-based margarine for most other vegetable oils and spreads increases compliance with dietary recommendations for saturated fatty acid, monounsaturated fatty acid, and ALA, but not for LA, among US adults

# Canola Oil Talking Points [www.uscanola.com](http://www.uscanola.com))

- **Canola oil is one of the healthiest oils in the marketplace.** Least SFA of any common culinary oil – half that of olive oil – and is free of TFA and cholesterol. Canola oil has most omega-3 fat of any cooking oil and is a good source of vitamin E
- **Canola oil can help protect the heart for just pennies a day.** FDA authorized a qualified health claim for canola oil on its potential to reduce CHD risk. 1.5 tbsp of canola oil/d is enough to help protect the heart when replacing SFA

# Canola Oil Talking Points [www.uscanola.com](http://www.uscanola.com))

- **Canola oil is extremely versatile.** Its neutral taste, light texture and high heat tolerance make it ideal for everyday use in culinary applications
- **Canola seeds contain 42% oil – double the oil content of soybeans.** In 2009: 44% in USA
- **When grown in rotation with wheat or small grain crops, canola can increase yield quality and profitability of those crops**



# **Buying decisions, consumption trends**

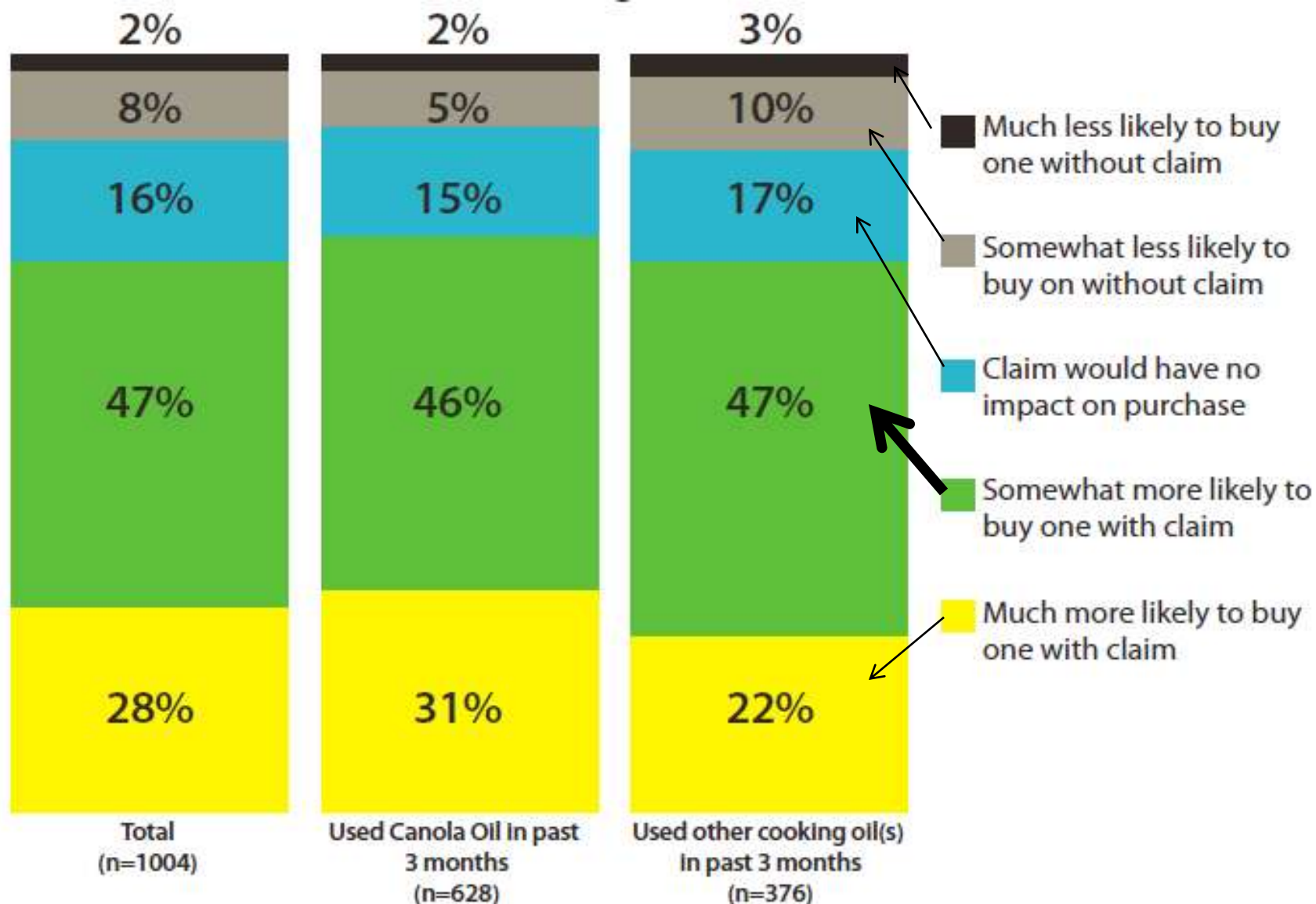




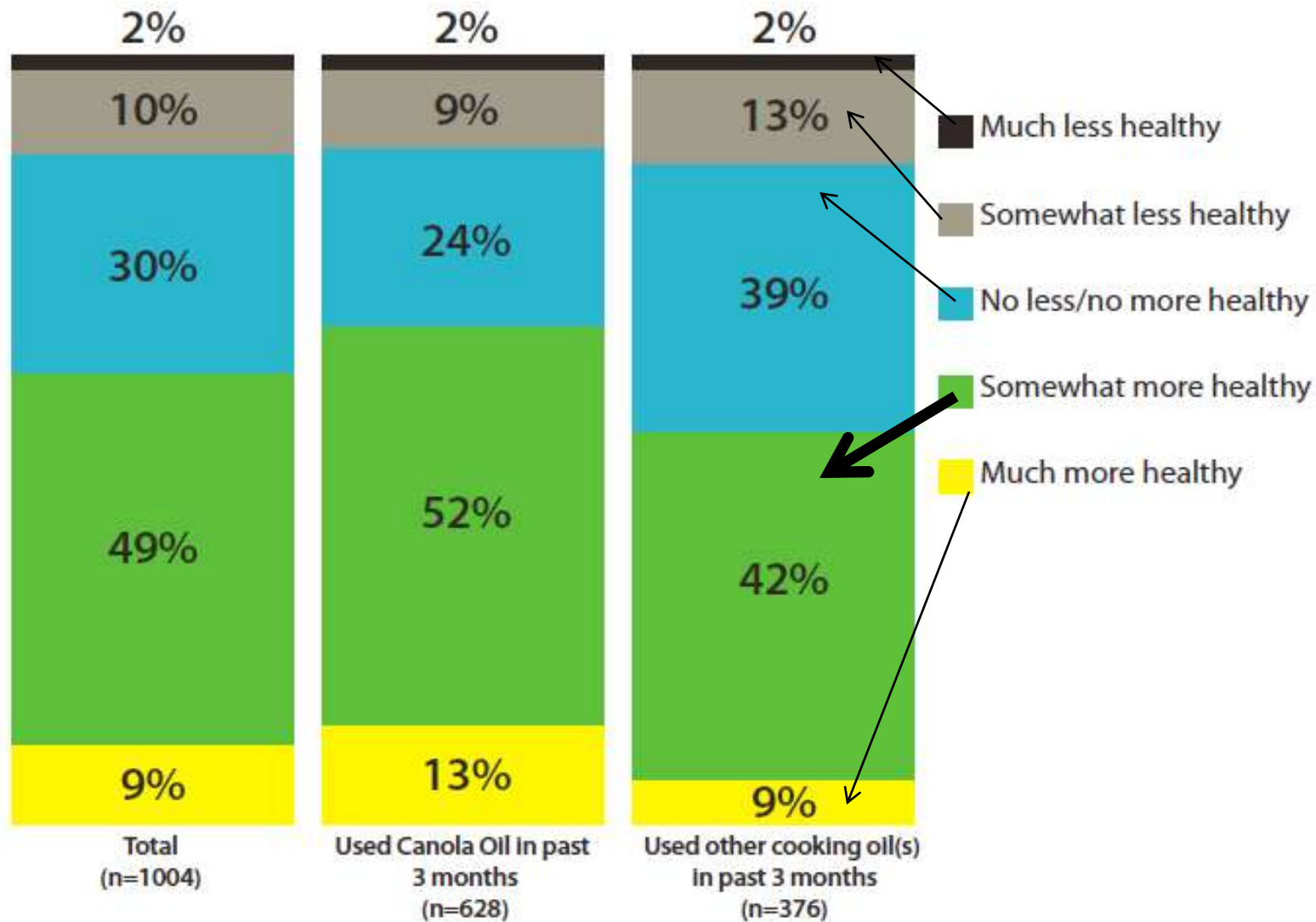
# Most important drivers for consumers when purchasing cooking oil

- Low saturated fat content (92%)
- Endorsement by health associations like AHA (92%)
- *Trans fat free (90%)*
- Contains omega-3 fatty acids (88%)
- Bears statements endorsed by FDA (77%)
- Good source of vitamin E (70%)
- Has a “healthy choice” logo on label (66%)
- High in monounsaturated fat (50%)

# Impact of canola health claim on food product purchasing decisions



# Healthfulness of canola- vs non-canola products



# Anti-trans pressure: California Trans Law

- California on Friday became the first state to ban trans fats from restaurant food, following several cities and major fast-food chains in erasing the notorious artery-clogger from menus.
- Schwarzenegger signed legislation banning restaurants and other retail food establishments from using oil, margarine and shortening containing trans
- Schwarzenegger: consuming trans fat is linked to coronary heart disease.
- "Today we are taking a strong step toward creating a healthier future for California"
- Violations could result in fines of \$25 to \$1,000. Food items sold in their manufacturers' sealed packaging would be exempt.
- New York City, Philadelphia, Seattle and Montgomery County, Md., have ordinances banning trans fats, but California is first state to adopt such a law covering restaurants
- California and Oregon already had laws banning trans fats in meals served at schools
- Legislation takes effect **Jan. 1, 2010**, for oil, shortening and margarine used in spreads or for frying. Restaurants could continue using trans fats to deep-fry yeast dough and in cake batter until **Jan. 1, 2011**.
  
- **Trans fats occur naturally in small amounts in meat and dairy products. Most trans fats are created when vegetable oil is treated with hydrogen to create baked and fried goods with a longer shelf life.**