

Nutritional Benefits of Fish Consumption

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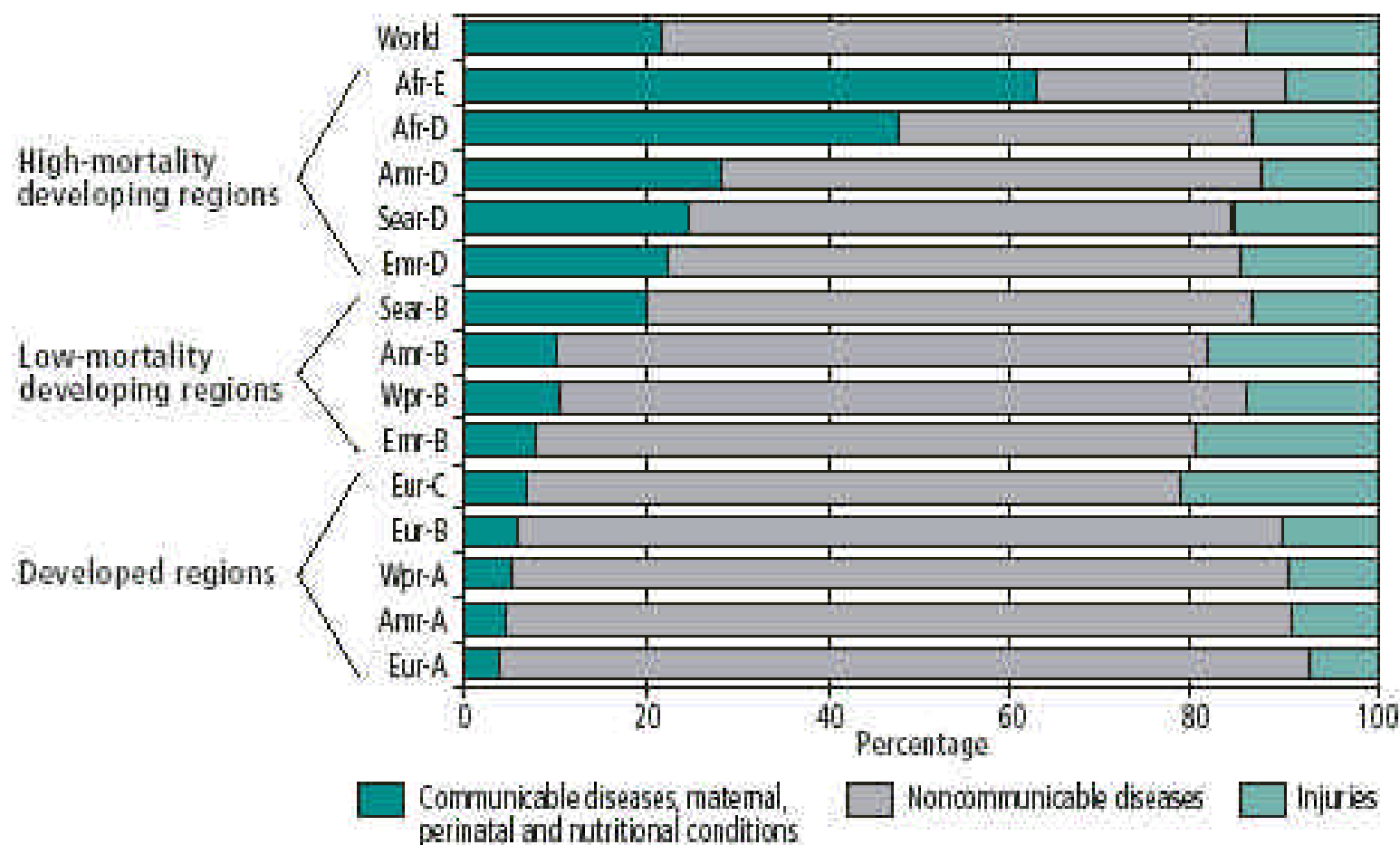
Harvard Medical School

Disclaimer

- Research on fish is funded by the National Institutes of Health of the United States Government
- I like fish !
- I like to fish !

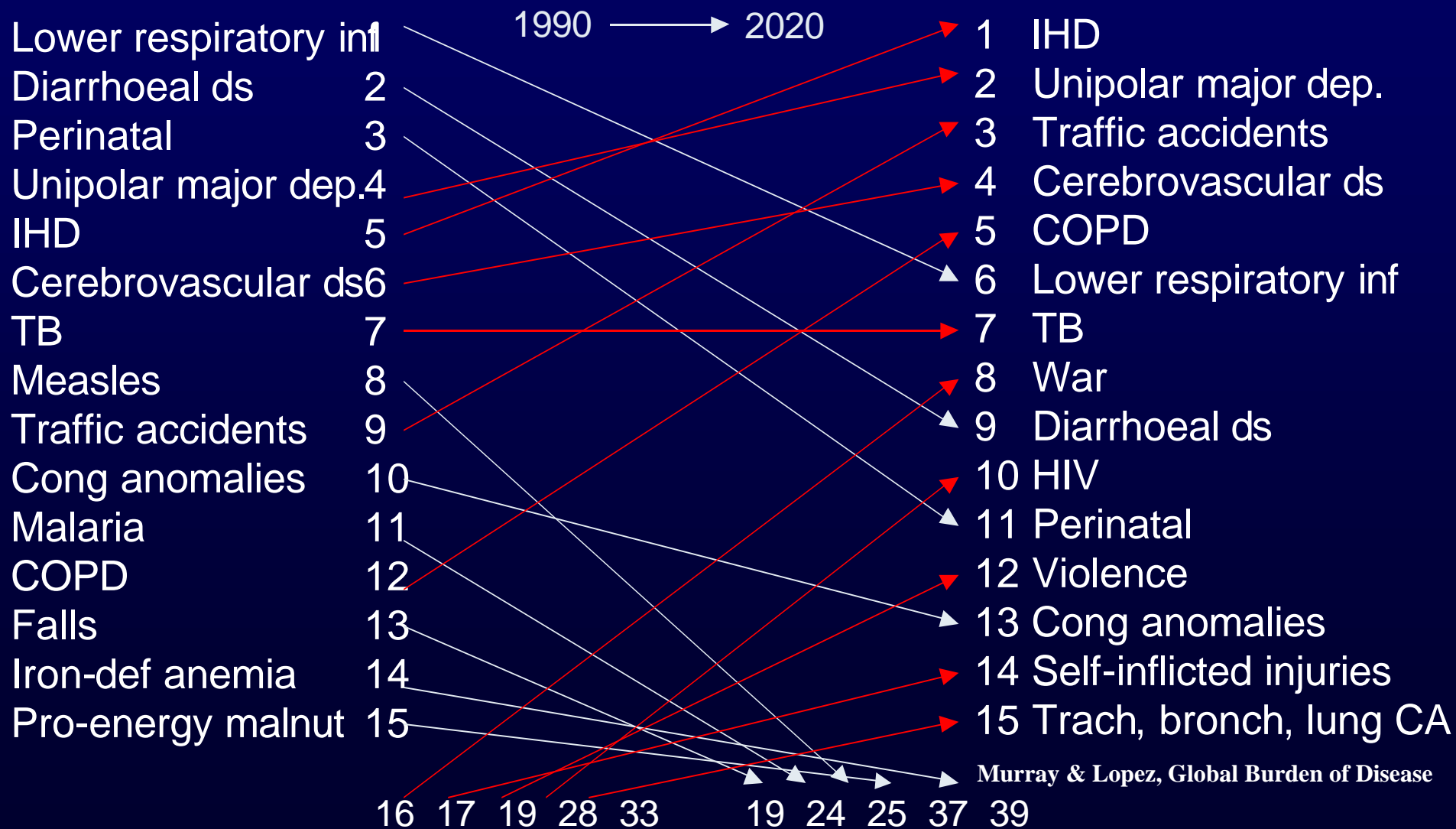


Figure 1.8 Disease burden (DALYs) among adults (aged 15 years and over) by broad cause, selected epidemiological subregions, 2002



See List of Member States for an explanation of subregions.

CHANGE IN THE RANK ORDER OF DISEASE BURDEN FOR 15 LEADING CAUSES

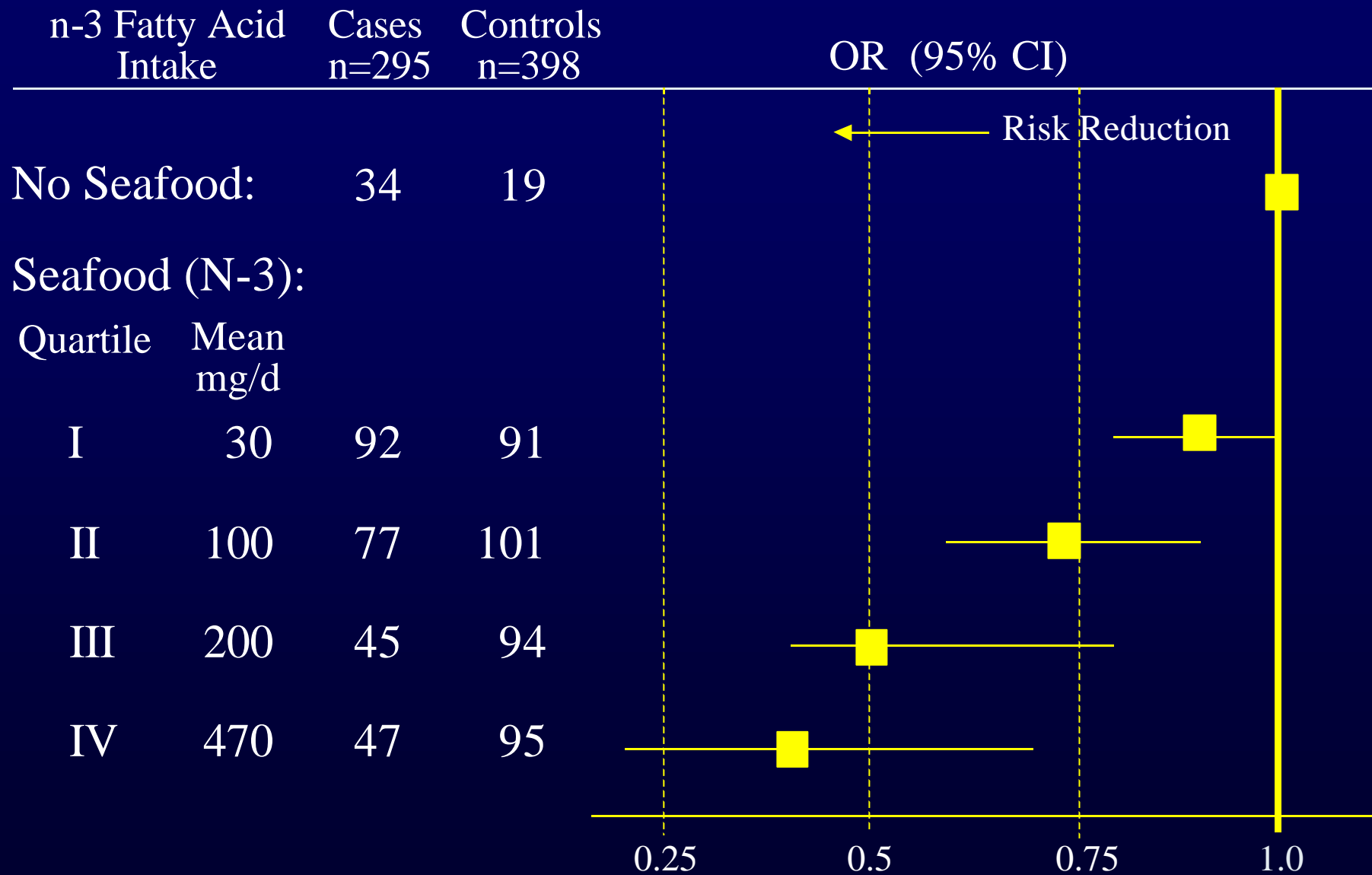


Background

- In 1976 the composition of Eskimo food was examined in Greenland
- The results were compared with Danish diets and marked differences were found
- The Eskimo diets (seal and fish) were richer in polyunsaturated fatty acids predominantly of the n-3 class
- The rarity of heart disease in Greenland Eskimos may partly be explained by the n-3 polyunsaturated fatty acids.

Bang, Dyerberg, Sinclair. Lancet 1978, AJCN 1980

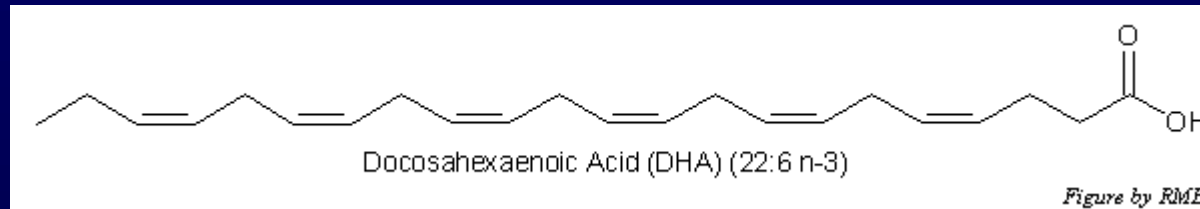
Dietary n-3 Fatty Acids and Sudden Death



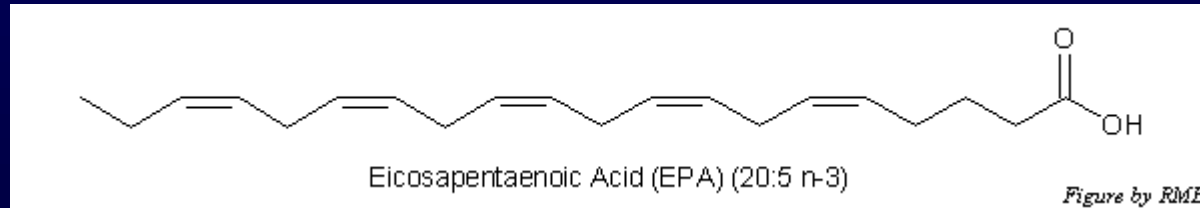
Siscovick DS. JAMA 1995

Structure of DHA and EPA

DHA



EPA



Dietary Guidance On Fish

DIET, NUTRITION AND THE PREVENTION OF CHRONIC DISEASES

Report of a
Joint WHO/FAO Expert Consultation



WHO Guidelines

Regular fish consumption:

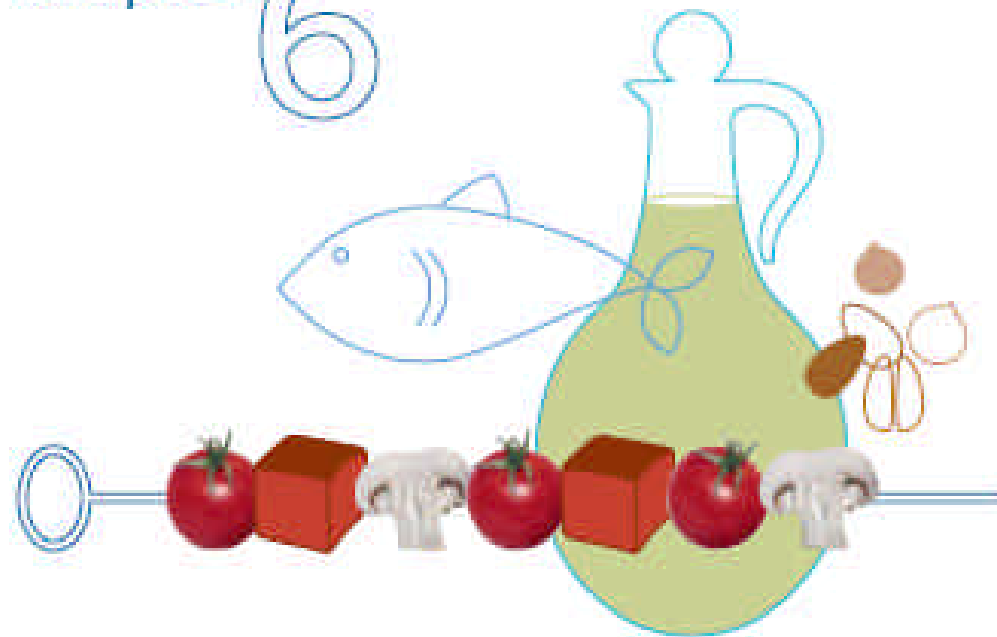
“(1-2 servings per week) is protective against coronary heart disease and ischaemic stroke and is recommended. The serving should provide an equivalent of 200-500 mg of eicosapentaenoic and docosahexaenoic acid.”



Dietary Guidelines for Americans 2005

U.S. Department of Health and Human Services
U.S. Department of Agriculture
www.healthonus.gov/dietaryguidelines

chapter 6



Fats

- Keep total fat intake between 20 to 35 percent of calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.

FDA/EPA Fish Advisory



U.S. Department of Health and Human Services
and
U.S. Environmental Protection Agency



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March 2004

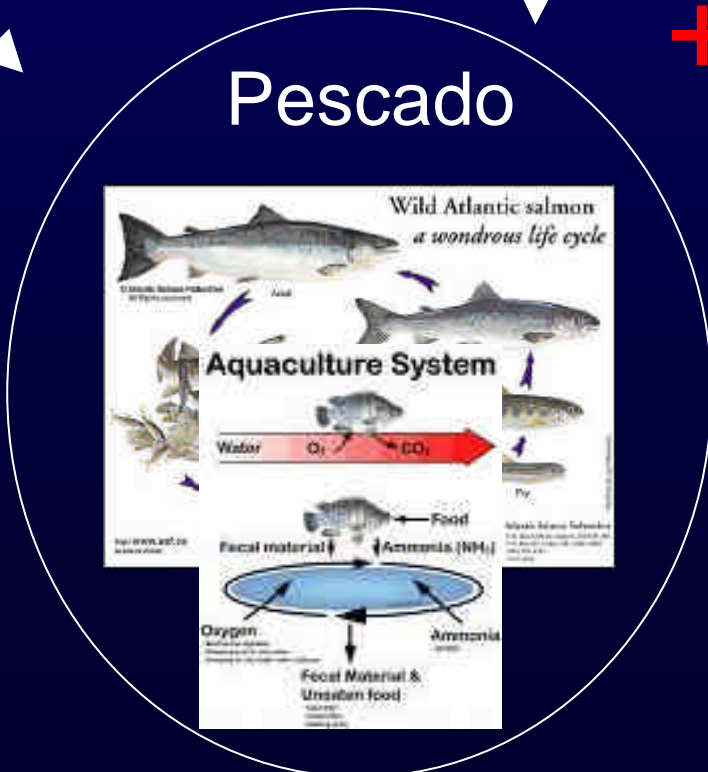
EPA-823-R-04-005

What You Need to Know About Mercury in Fish and Shellfish

**2004 EPA and FDA Advice For:
Women Who Might Become Pregnant
Women Who are Pregnant
Nursing Mothers
Young Children**

Where are we now?

Depends on your Perspective?



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+ -

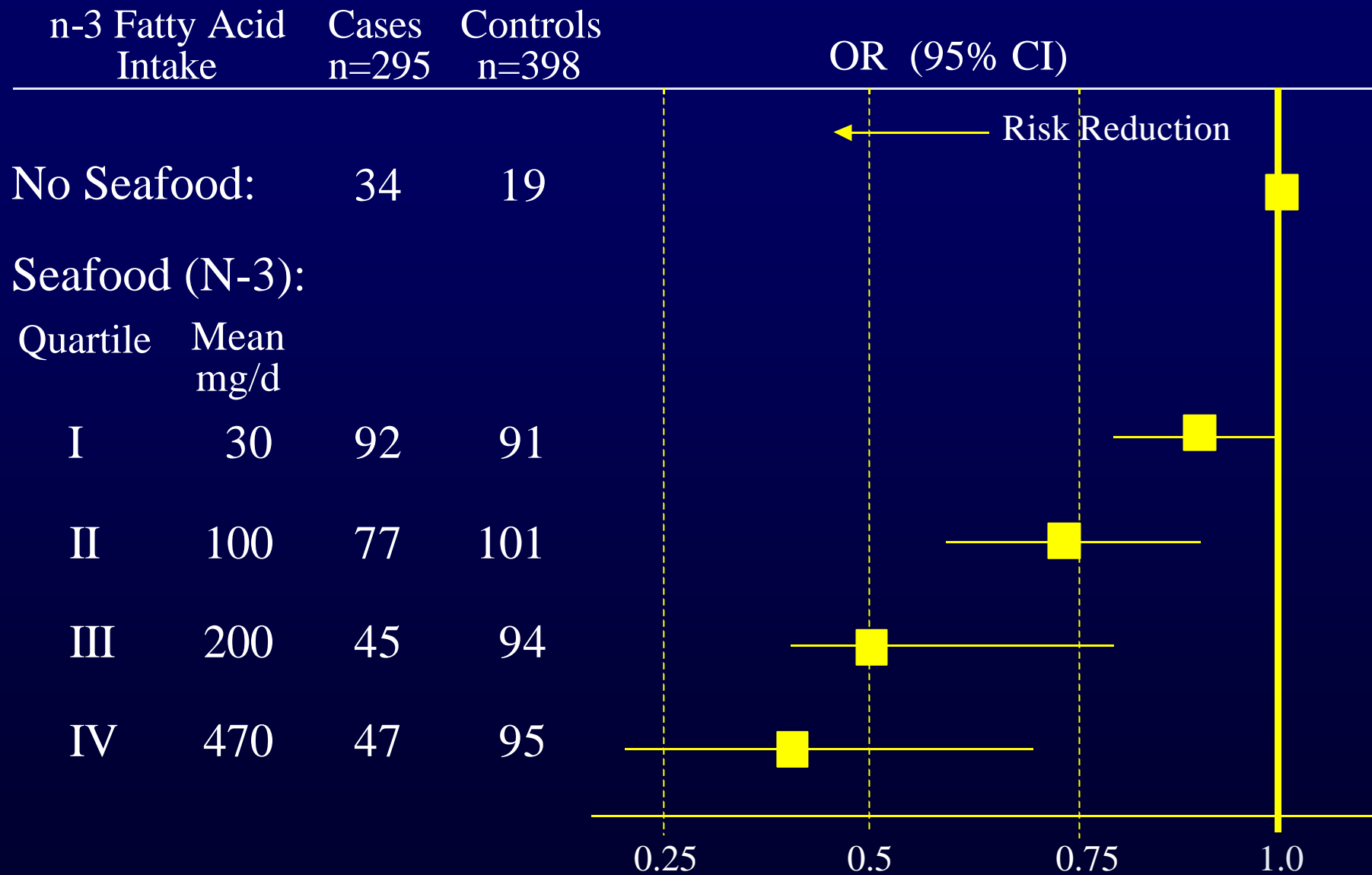
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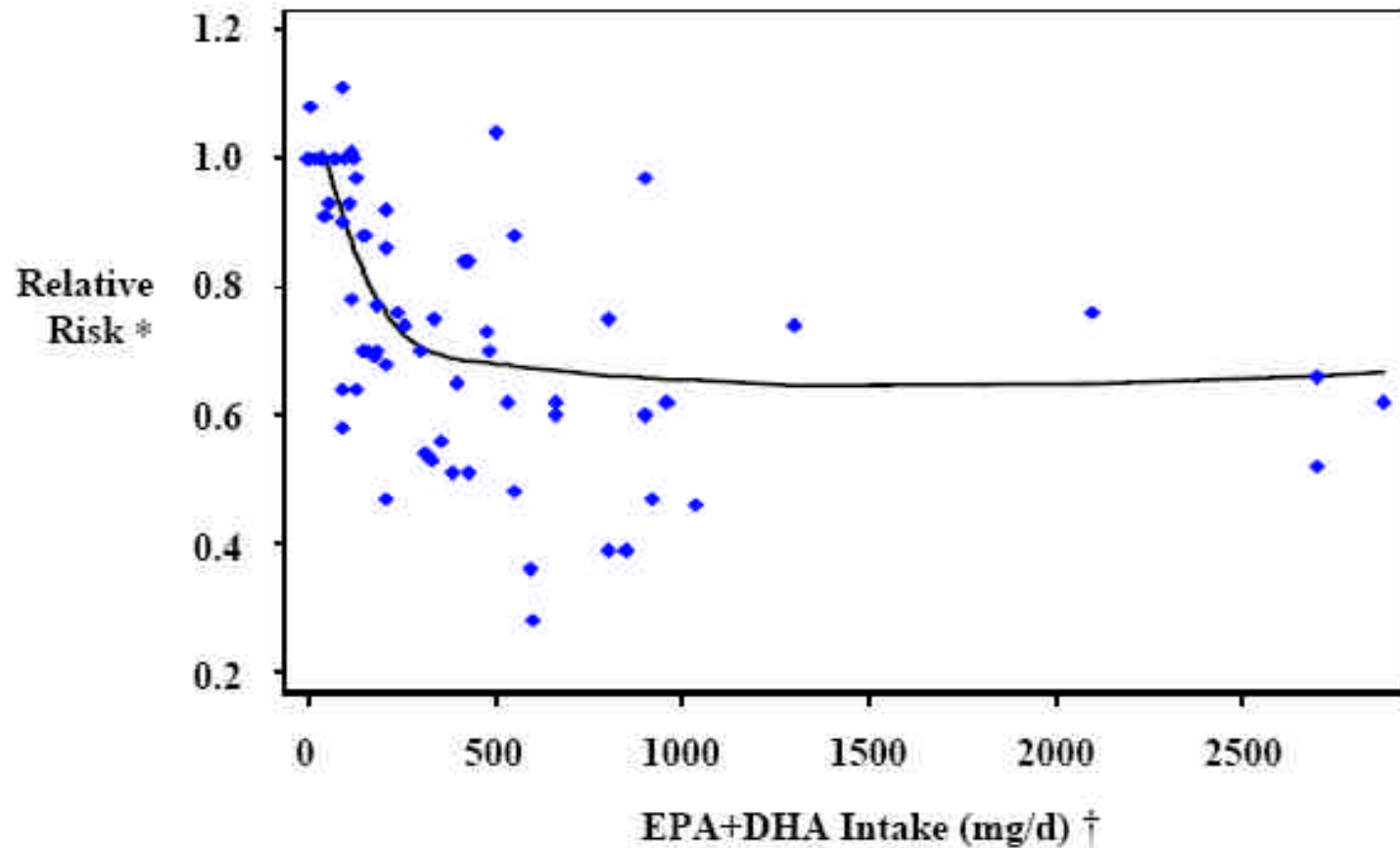
Health Benefits

Dietary n-3 Fatty Acids and Sudden Death

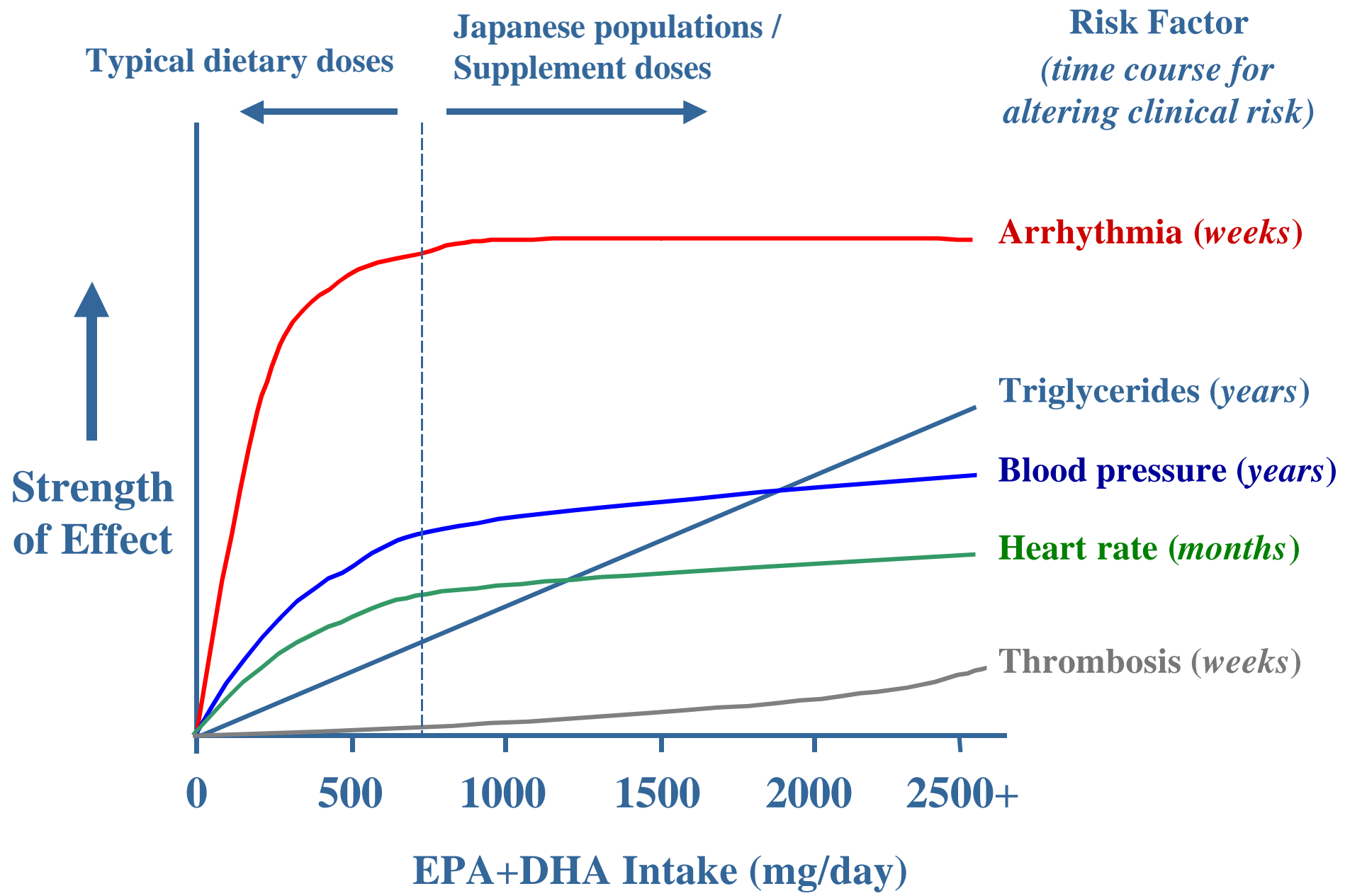


Siscovick DS. JAMA 1995

Relative Risk of Coronary Heart Disease Death by Dose of EPA+DHA



Mozaffarian and Rimm, JAMA 2006;296:1885-1899

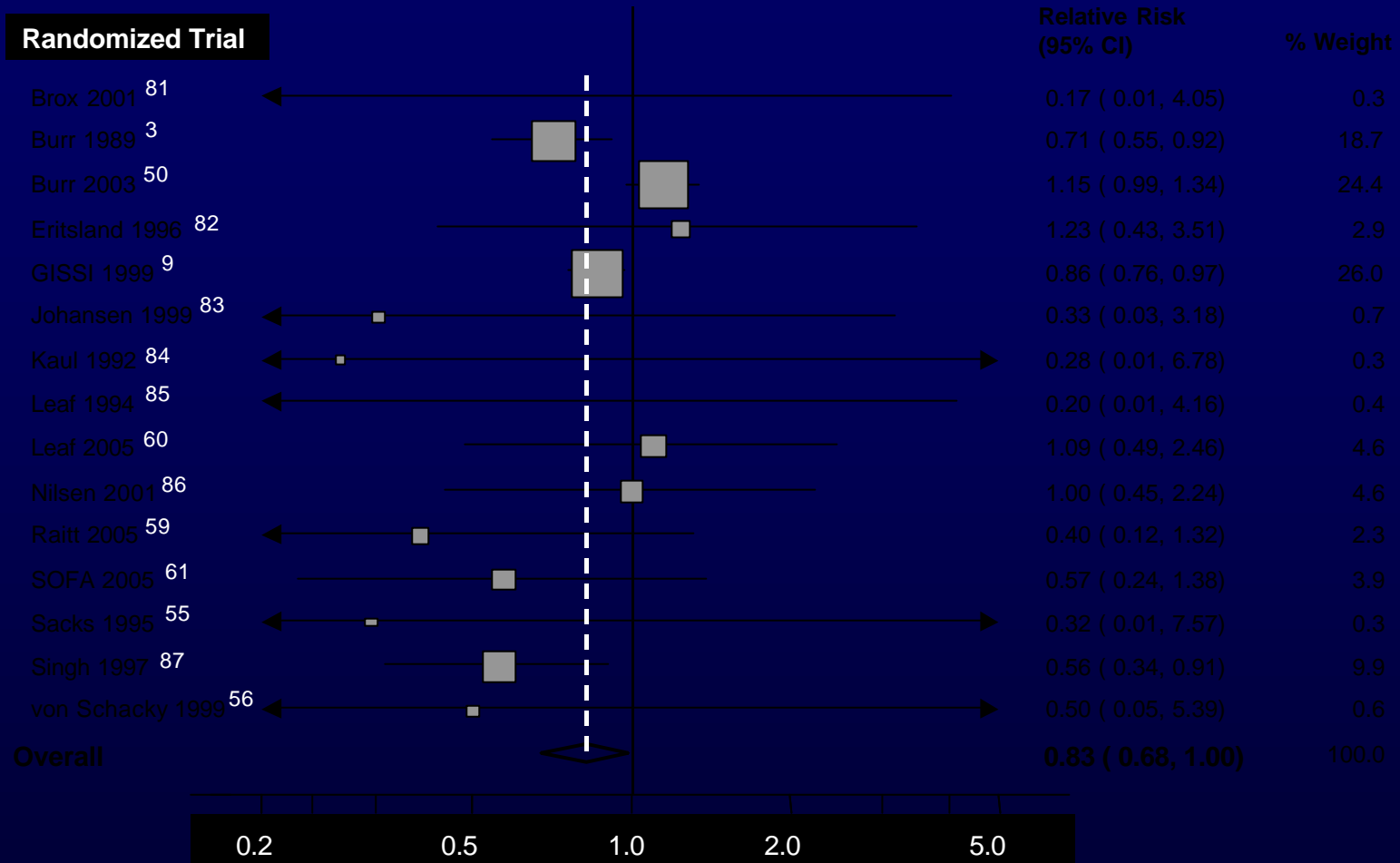


Mozaffarian and Rimm, JAMA. 2006;296:1885-1899

Other Health Benefits

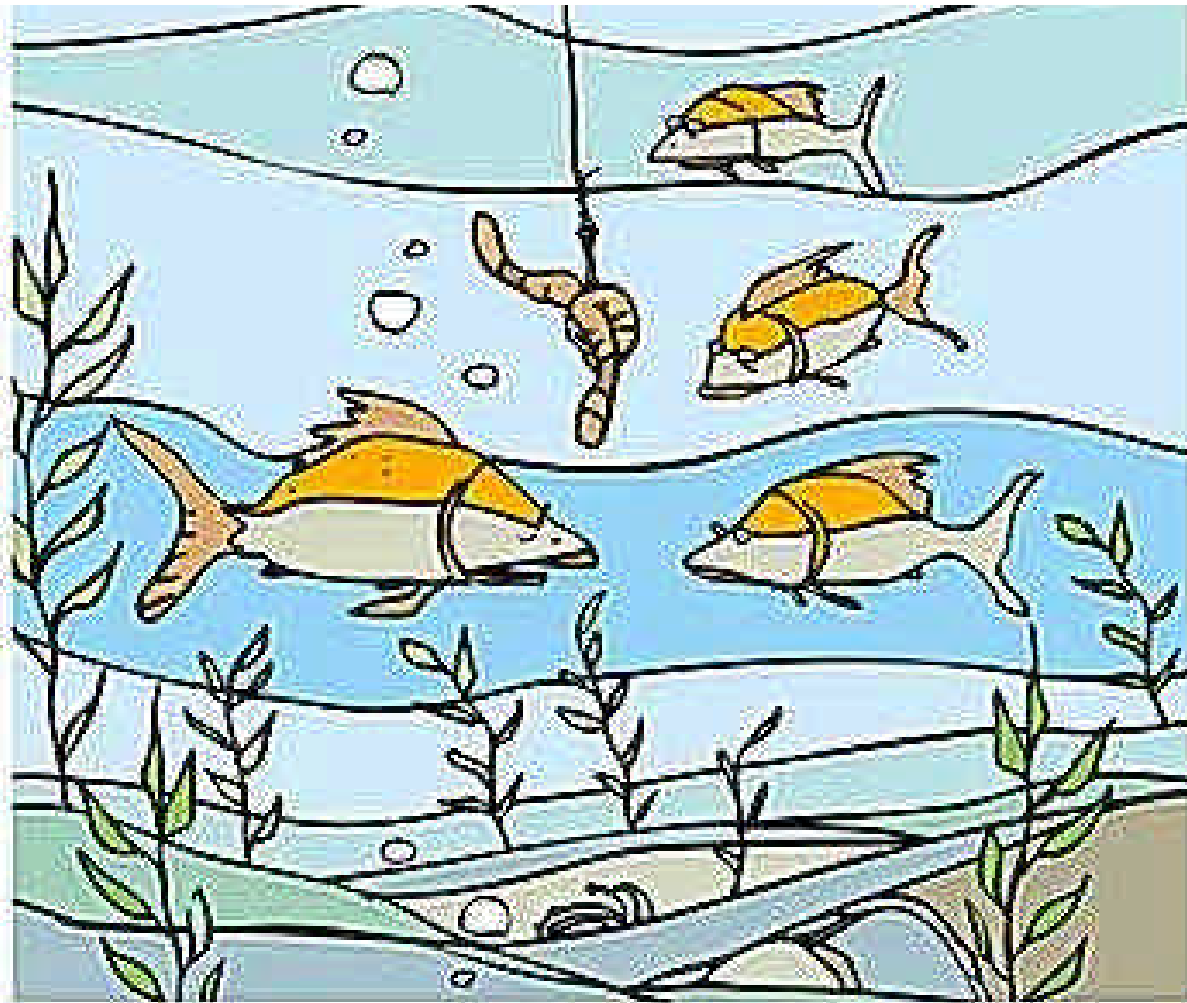
- Asthma
 - Rheumatoid Arthritis
 - Depression
 - Diabetes
 - Prostate Cancer
 - Cognitive function
-
- Preeclampsia and gestational diabetes
 - Gestation length
 - Fetal growth
 - Offspring cognition

Total Mortality



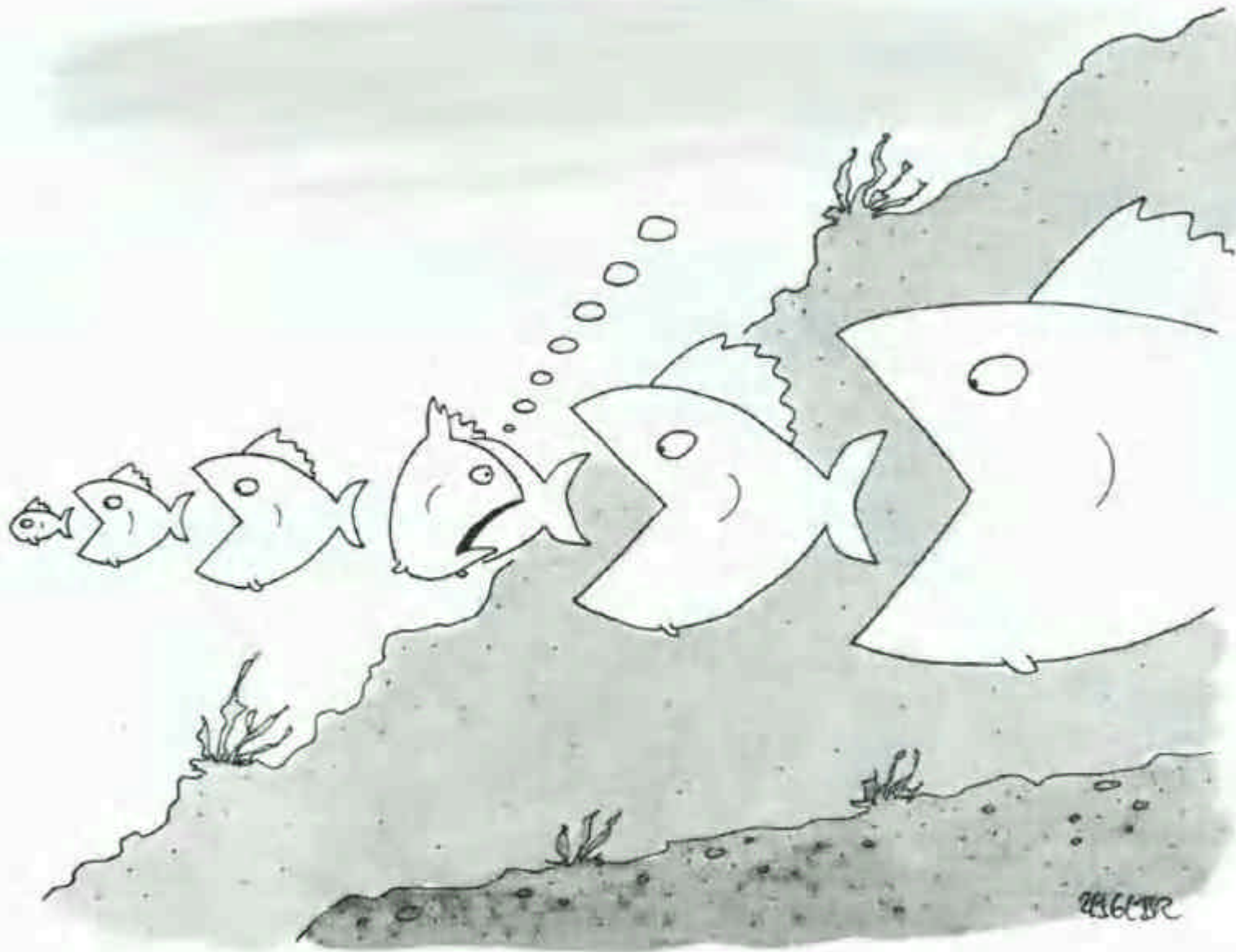
Relative Risk of Total Mortality Due to Fish or Fish Oil Intake in Randomized Trials

Mozaffarian and Rimm, JAMA 2006



“Sure, it looks good. Too good.
Trust me, there’s always a catch.”

Contaminants in Fish



"If you ask me, we're all the problem."

• •

Aquaculture



Aquaculture



Aquaculture



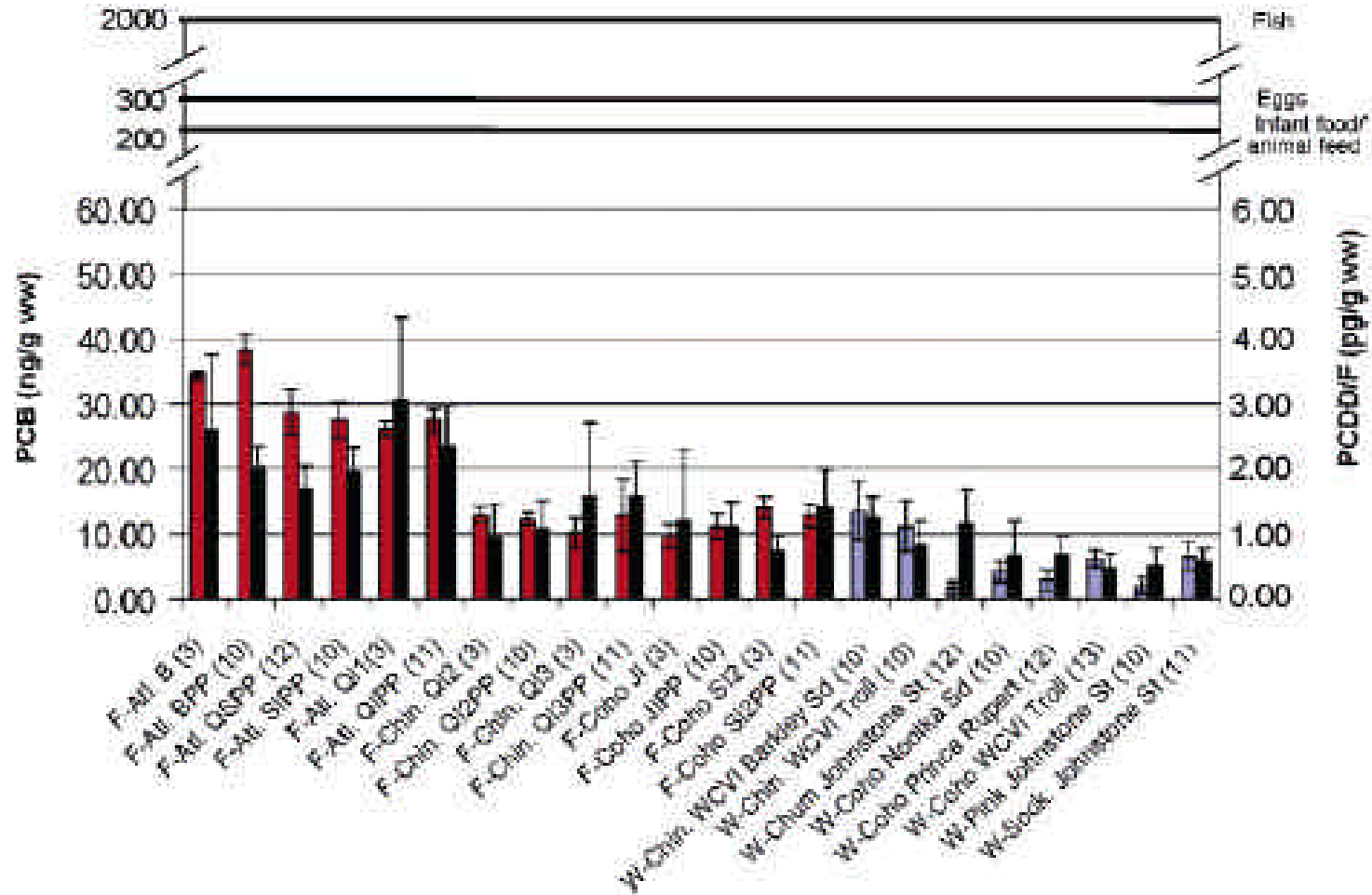
Food Composition and Contaminants

	N-3/serving (mg)	Mercury (ppm)	PCB's (ppb)	Dioxin (ppt)
Salmon (Farmed)	4504	<.05	15-51 (1999-2003)	0.3-0.8 (1997-2003)
Salmon (Wild)	1774	<.05	0.5-5 (2000-2002)	0.03-.34 (2002)

Food Composition and Contaminants

	N-3/serving (mg)	Mercury (ppm)	PCB's (ppb)	Dioxin (ppt)
Beef	0	0	22 (2001)	0.13-0.27 (1995-2001)
Eggs	22	0	19 (2001)	0.05-0.52 (1995-2001)
Chicken	0	0	32 (2001)	0.02-0.20 (1995-2001)
Milk	0	0	-	0.01-0.13 (1995-2001)

Contaminants



Ikonomou MG et al, Environ Sci Technol. 2007.

Mercury Content of Commonly Consumed Fish

Species	Methylmercury Concentration (ppm)	
	MEAN	RANGE
Tilefish	1.45	0.65–3.73
Swordfish	1.00	0.65–3.73
King mackerel	1.00	0.10–1.67
Shark	0.96	0.05–4.54
Tuna (fresh and frozen)	0.32	ND–1.3
Pollack	0.20	ND–0.78
Tuna (canned)	0.17	ND–0.75
Catfish	0.07	ND–0.31
Salmon (fresh and canned)	ND	ND–0.18
Shrimp	ND	ND

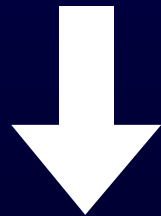
Source: FDA

Contaminants

- Mercury
- Dioxin
- Polychlorinated biphenyls (PCBs)
- Other Pesticides

Fish Intake

CV Risk

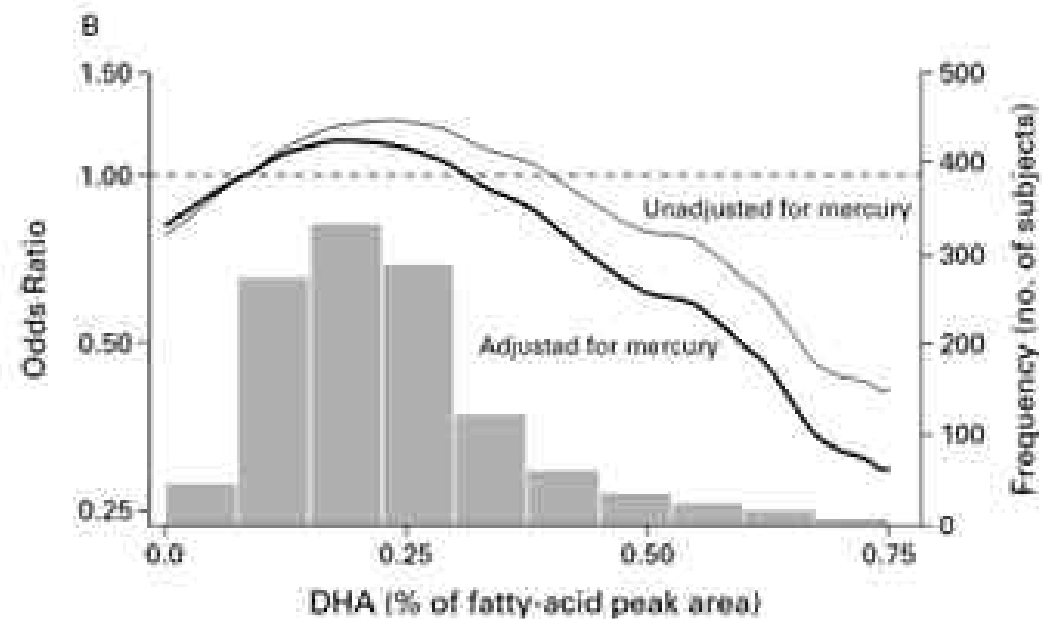
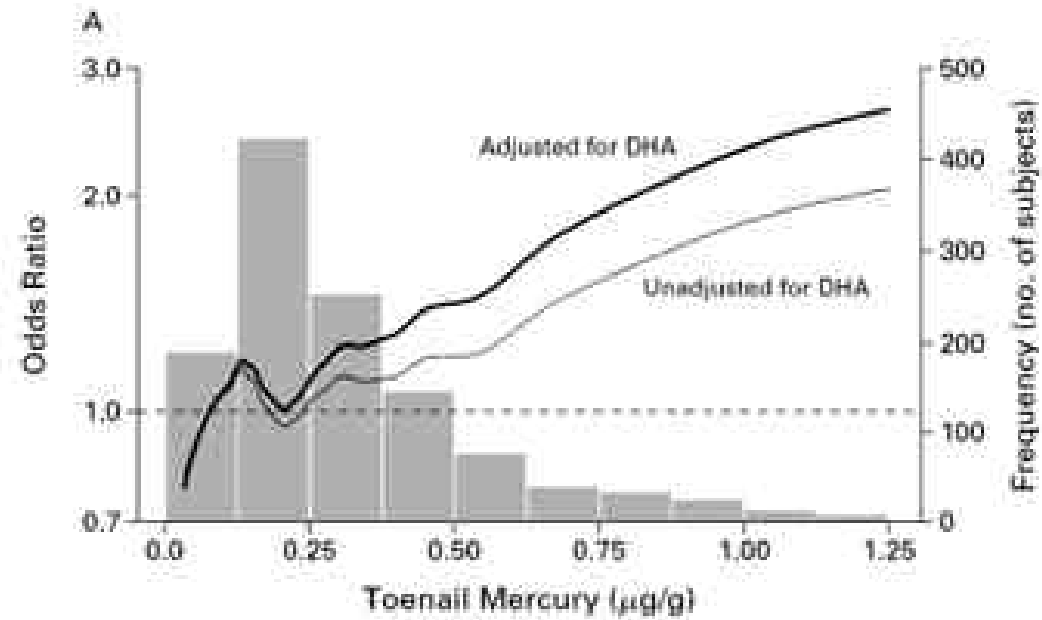


CV Risk



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EURAMIC Study – Non-parametric odds ratios of MI by level of toenail mercury and tissue DHA

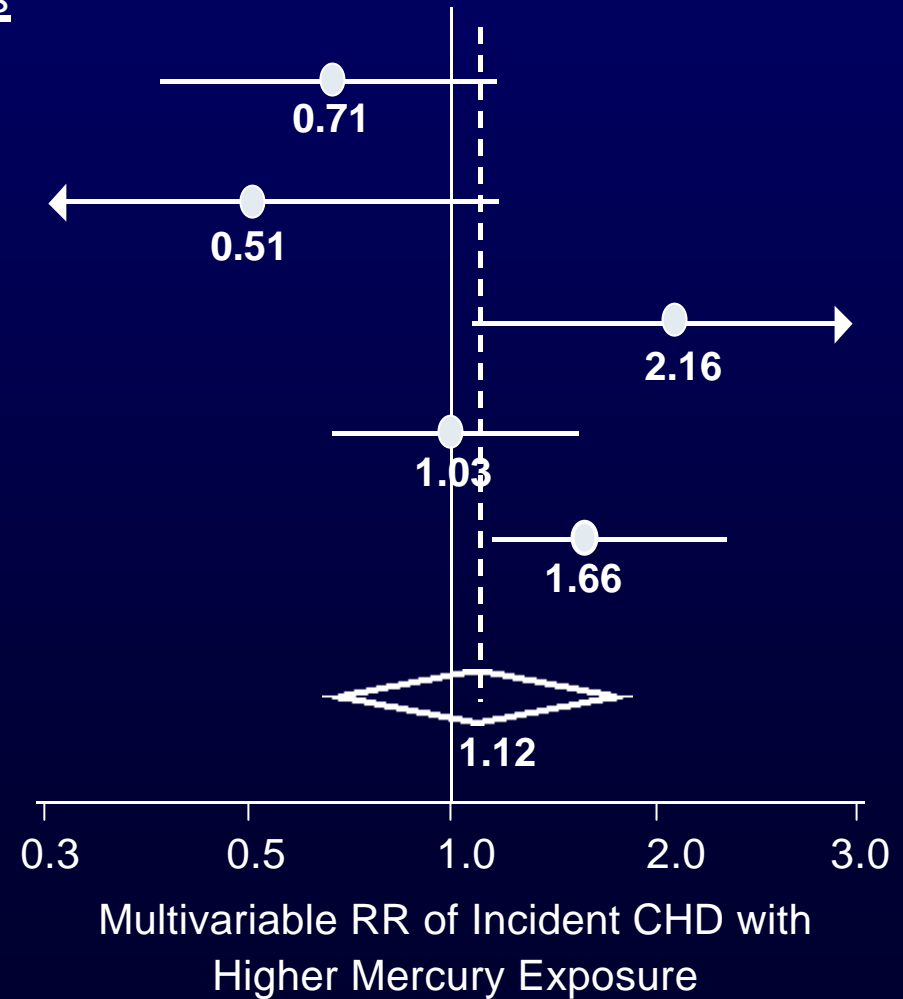


Mercury and Coronary Heart Disease

<u>Study</u>	<u>Design</u>	<u>No. Events</u>
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Sweden, 1999 ¹⁰⁸	Prospective	87
Sweden, 2001 ¹⁰⁹	Prospective	78
Europe, 2002 ¹¹⁰	Retrospective	684
United States, 2002 ¹¹¹	Prospective	470
Finland, 2005 ¹¹²	Prospective	282

Overall



Fetal Development

- Benefit from n-3 fatty acids
 - *In utero*
 - Infant feeding
- Harm from mercury exposure
 - Faroe Islands (+)
 - New Zealand (+)
 - Seychelles (null)
 - US Project Viva (+/-)

Risks and Benefits of Fish Consumption among Pregnant Mothers

Mean cognitive scores among offspring by mother's hair mercury at delivery

Weekly fish intake	Mother's Hair Mercury	
	1.2 ppm	>1.2 ppm
> 2 servings/wk	72 (n=7)	55(n=2)
2 servings/wk	60 (n=114)	53 (n=12)

FDA/EPA Fish Advisory



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U.S. Environmental Protection Agency



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March 2004

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What You Need to Know About Mercury in Fish and Shellfish

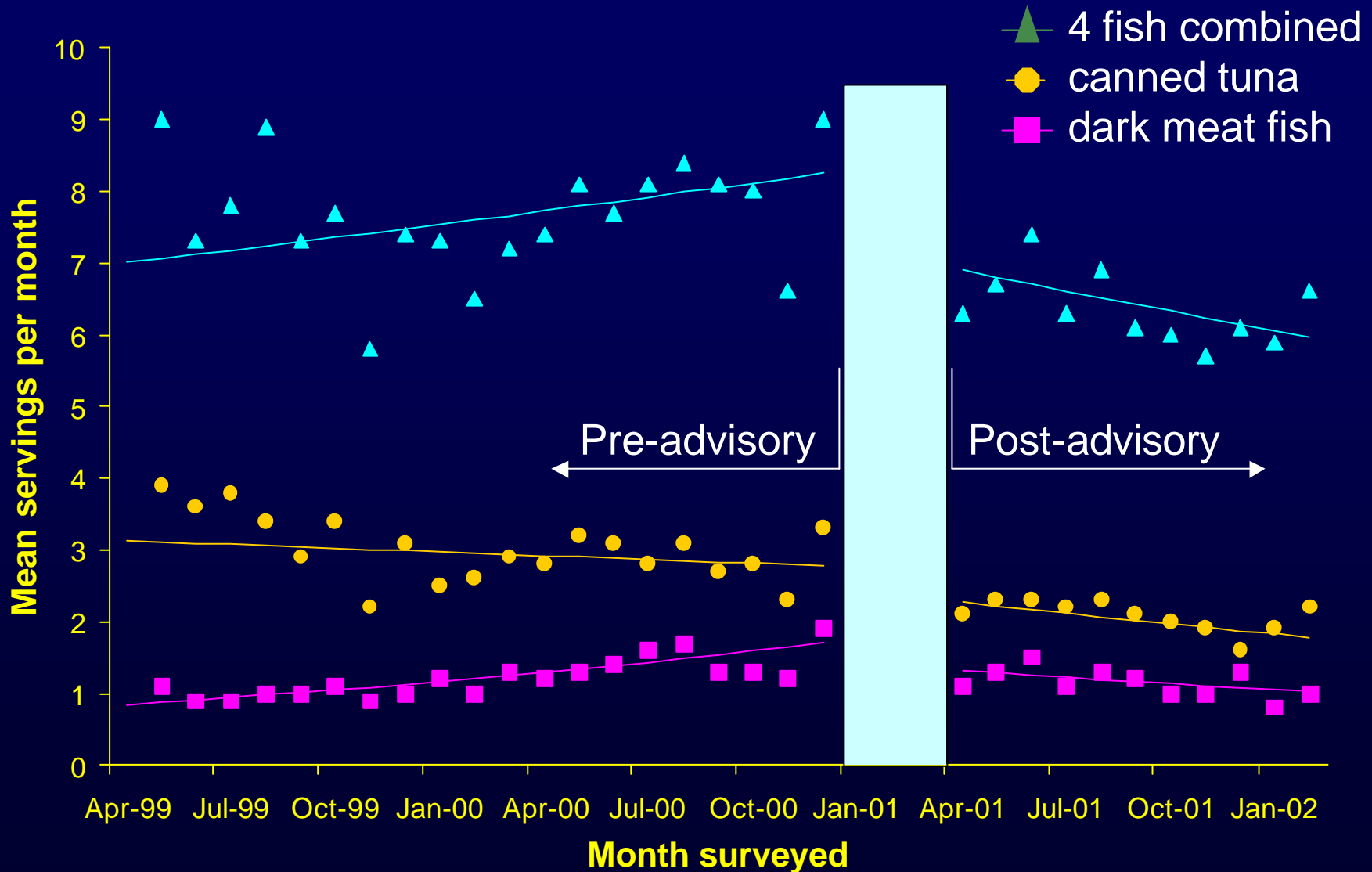
**2004 EPA and FDA Advice For:
Women Who Might Become Pregnant
Women Who are Pregnant
Nursing Mothers
Young Children**

FDA Advisory

- Do not eat **Shark, Swordfish, King Mackerel, or Tilefish** because they contain high levels of mercury.
- Eat up to 12 ounces (2 average meals) a week of a variety of fish and shellfish that are lower in mercury.
 - Commonly eaten fish that are low in mercury are **shrimp, canned light tuna, salmon, pollock, and catfish.**
 - Another commonly eaten fish, **albacore ("white") tuna** has more mercury than **canned light tuna**. So, when choosing your two meals of fish and shellfish, you may eat up to 6 ounces (one average meal) of albacore tuna per week.
- Check local advisories about the safety of fish caught by family and friends

Decline in fish consumption

After federal mercury advisory 1/01 (US Project Viva n=2,235)



Conclusions

- Several fish meals a week lowers risk of cardiovascular disease.
- n-3 fatty acids have additional therapeutic benefits at higher levels (doses)
- n-3 fatty acid intake among pregnant women is associated with better outcomes, but higher mercury intake impacts the neurodevelopment of the infant

Conclusions

- The benefits of fish consumption far outweigh the risks

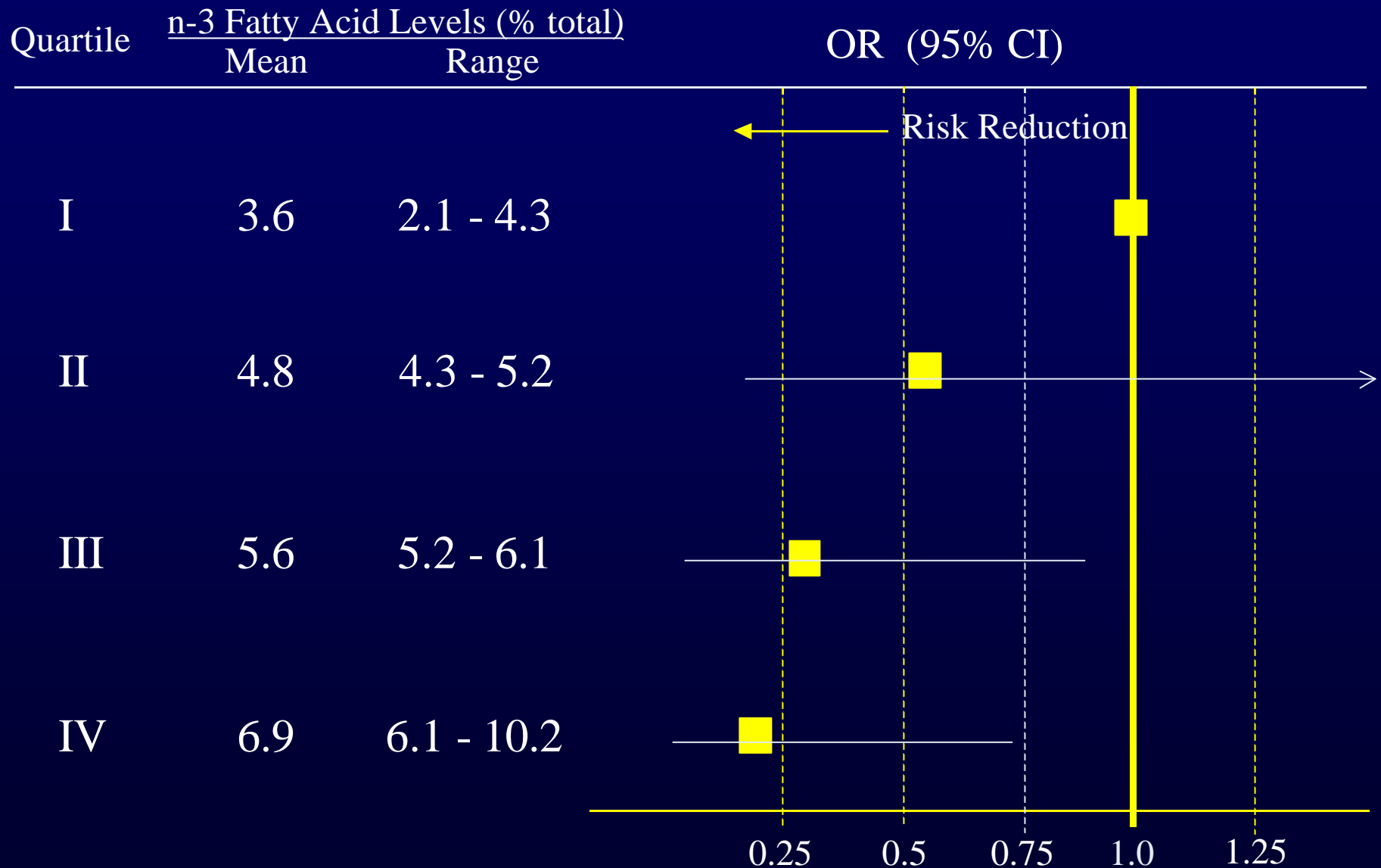
Thank you

More Information.....

<http://www.hsph.harvard.edu/nutritionsource/>

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Blood n-3 Fatty Acids and Sudden Death



Albert CM. NEJM 2002