Low Seafood Intake and Adverse Mental Health Outcomes

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Parliamentary Inquiry, London, UK

This communication does not represent any policy or position of the US Federal Government.

Hierarchy for Clinical Efficacy in Evidence Based Medicine

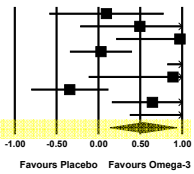
- Hypothesis
- Epidemiological association (Ecological)
- Direct case based observational associations
- Plausible biological mechanism
- Open (non-blinded) intervention trials
- Randomized masked placebo controlled trials
- Large scale, multi-center placebo controlled trials
- Meta-analysis, weighted analysis of efficacy

- Treatment recommendations

Meta-analysis of omega-3's on depressive symptoms, randomized placebo controlled trials, effect size = 0.54, p<0.008

Omega-3 EFA in Affective Disorders

Study name	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
Marangell	0.096	0.346	0.120	-0.582	0.774	0.277	0.782
Peet	0.496	0.362	0.131	-0.214	1.205	1.370	0.171
stoll	0.974	0.386	0.149	0.217	1.730	2.523	0.012
Keck	0.030	0.187	0.035	-0.337	0.396	0.159	0.873
Su	1.887	0.542	0.293	0.826	2.949	3.485	0.000
Nemets	0.892	0.512	0.263	-0.113	1.896	1.740	0.082
Silvers	-0.342	0.234	0.055	-0.799	0.116	-1.462	0.144
Frangou	0.645	0.245	0.060	0.165	1.126	2.630	0.009
Hallahan	1.020	0.327	0.107	0.379	1.660	3.120	0.002
	0.538	0.203	0.041	0.140	0.936	2.648	0.008



Eff ect Size g, SE, Variance 95% CI Z and P (Best Case)

Freeman M, Hibbeln JR, Davis JM et al.
American Psychiatric Associations treatment recommendations for omega-3 fatty acids in psychiatric disorders. J Clin Psychiatry Dec 2006

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

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 and Young Children

Fish and shellfish are an important part of a healthy diet. Fish and shellfish contain high-quality protein and other essential nutrients, are low in saturated fat, and contain omega-3 fatty acids. A well-balanced diet that includes a variety of fish and shellfish can contribute to heart health and children's proper growth and development. So, women and young children in particular should include fish or shellfish in their diets due to the many **nutritional benefits.**

However, nearly all fish and shellfish contain traces of mercury. For most people, the risk from mercury by eating fish and shellfish is not a health concern. Yet, some fish and shellfish contain higher levels of mercury that may harm an unborn baby or young child's developing nervous system. The **risks from mercury** in fish and shellfish depend on the amount of fish and shellfish eaten and the levels of mercury in the fish and shellfish.

March 2004 EPA-823-R-04-005

Avon Longitudinal Study of Parents and Children (ALSPAC)

Recruited 14,541 pregnant mothers, the largest and most complete longitudinal study in the world.

- **Enrollment included every pregnancy between April 1st 1991 and December 31st 1992 in Avon (Southwest of London, UK)**
- **Children are now between 11.5 and 15 years of age**
- **Participants mail in questionnaires every 6 months**
- **1,500 children have been seen in clinics every year since birth**
- **85% of children have been seen in clinics every year starting at age 7**

- **Collaboration with John M. Davis, M.D. Univ. of Illinois**
- **Jean Golding, Ph.D., Pauline Emmett, Ph.D.- ALSPAC study group**

28 Potential Confounding Variables were Uniformly Included in all Logistic Regression Analyses

Individual (categorical) variables

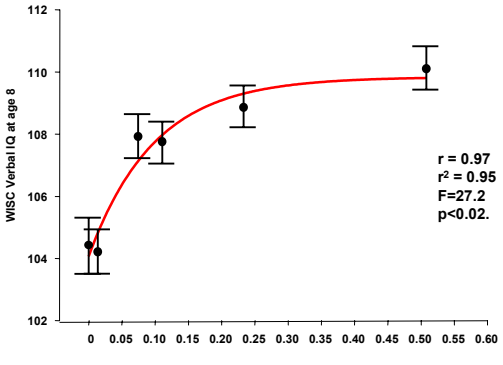
1. Sex of the child (m,f),
2. Age of the mother (<, ≥ 20 y),
3. Parity (primiparous, multiparous),
4. Maternal education (<completed O level, rest),
5. Housing status (subsidized public housing, rented, owned/mortgaged),
6. Crowding (≤, > 1 per/room),
7. Stressful life events at 18 w gestation (upper 10%, lower 90% of cohort), had partner at time of birth (no, yes),
8. Smoking status (never, smoked before but not at 18 w gestation, or still smoking at 18 w gestation),
9. Alcohol use during pregnancy (non-drinker, drank before mid-pregnancy, still drinking mid-pregnancy) and
10. Breastfeeding (none, some) and
11. Ethnicity (White, Black, Asian).
12. Obstetric variables: prematurity (<, > 3 w early) and birth weight (<,> 5 Lbs, 3 oz).

Composite (continuous) variables
13. HOME Score at 6 mo
14. ALSPAC Family Adversity Index (during pregnancy)

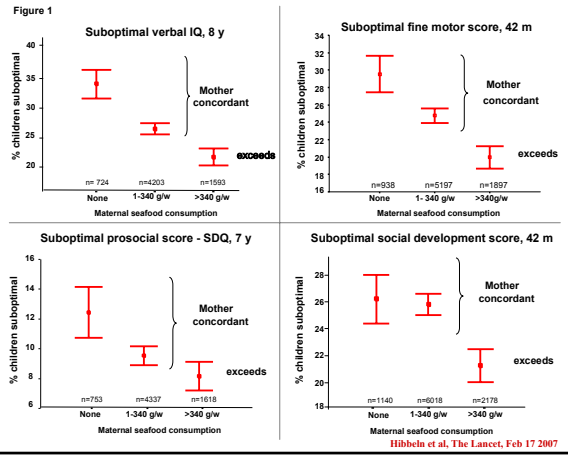
Nutritional variables **12 food groups**

Hibbeln et al, The Lancet, Feb 17, 2007

Verbal IQ at age 8 and maternal intake of omega-3 fatty acids from seafood (en%) at 32 weeks gestation



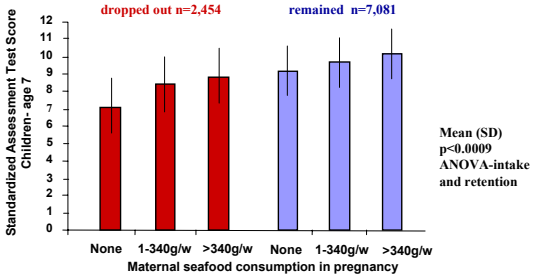
Hibbeln et al, The Lancet, 17 Feb 2007



Hibbeln et al, The Lancet, Feb 17 2007

Attrition bias?

Disproportionate attrition of low seafood/disadvantaged families
SATs tests for all British public schools students, regardless of cohort dropout



Attrition underestimates the effects of low seafood consumption on cognition.

Hibbeln et al, The Lancet 17 Feb 2007

ALSPAC Summary

1. Maternal limitation of seafood consumption to <340g/w during pregnancy did not protect children from adverse outcomes.

2. In contrast, this observational study showed beneficial effects on child development when maternal seafood intakes exceeded 340 g/w, with no upper limit of benefit.

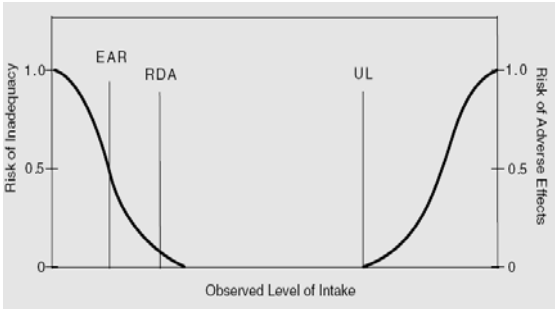
3. These findings were robust after adjustment for multiple potential confounders.

4. These data indicate that advice for mothers to limit seafood intake, during pregnancy is detrimental, e.g limiting intake at the FSA level of 280 gm/w.

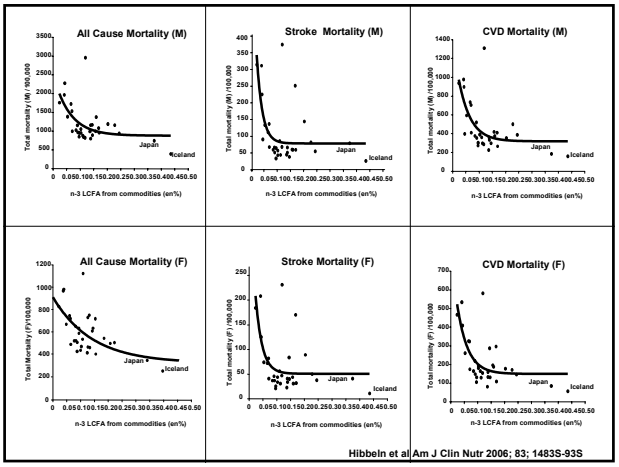
Hibbeln et al, The Lancet 17 Feb 2007

How much EPA and DHA should I eat each day?

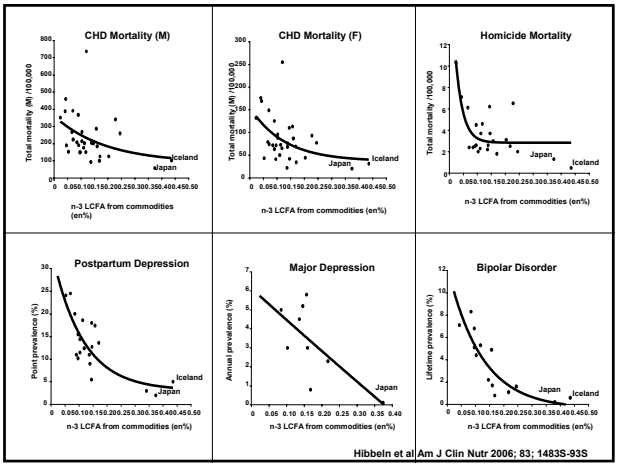
Calculation of daily intakes based on RDA criteria to prevent deficiencies.



Dietary Reference Intakes: Guiding Principles for Nutrition Labeling and Fortification Committee on Use of Dietary Reference Intakes in Nutrition Labeling. National Academies Press, 2003



Hibbeln et al Am J Clin Nutr 2006; 83; 1483S-93S



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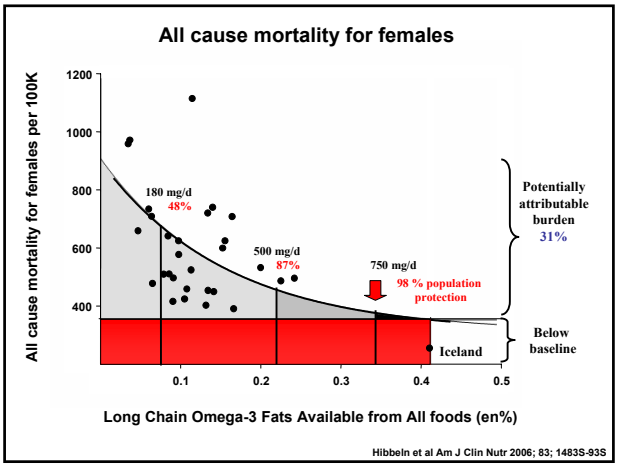

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Disease/Disorder Model	Disease burden potentially modifiable by n-3 HUFAs	Percent vulnerable population protected from illness (%)		
		Model Advice for n-3 HUFA Intake		
		0.08 en% (180 mg/d)	0.22 en% (500 mg/d)	0.34 en% (750 mg/d)
CHD mortality M	41.2%	45.2	85.4	97.9
CHD mortality F	42.5%	52.4	89.7	98.6
Stroke mortality M	32.9%	97.7	99.9	>99.9
Stroke mortality F	31.1%	96.4	99.9	>99.9
CVD mortality M	26.1%	83.4	99.3	>99.9
CVD mortality F	29.1%	86.9	99.6	>99.9
All Cause mortality M	20.8%	73.6	97.7	99.8
All Cause mortality F	31.5%	48.3	87.3	98.2
Homicide mortality	28.4%	95.6	>99.9	>99.9
Postpartum depression	65.5%	55.7	91.3	98.9
Major depression	98.5%	38.5	83.2	99.2
Bipolar disorder	99.9%	56.1	92.3	99.5

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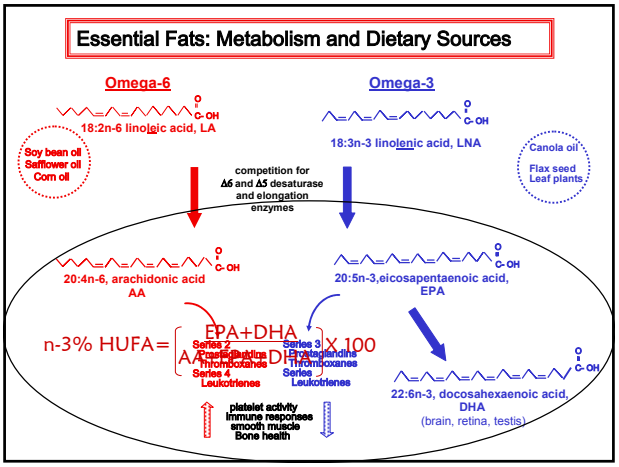


COUNTRY	Tissue target n-3 % HUFA	Concurrent dietary intake (en%) LA	α-LNA	AA	n-3 HUFA required to meet tissue target in each country (en%)	(mg/d)
Philippines	60%	**0.80**	0.08	0.06	0.125	**278**
Denmark	60%	**2.23**	0.33	0.09	0.45	**1000**
Iceland	60%	**2.48**	0.33	0.10	0.54	**1200**
Colombia	60%	**3.21**	0.24	0.04	0.51	**1133**
Ireland	60%	**3.57**	0.42	0.06	0.62	**1378**
UK	60%	**3.91**	0.77	0.07	0.72	**1600**
Netherlands	60%	**4.23**	0.28	0.08	0.88	**1956**
Australia	60%	**4.71**	0.49	0.07	0.90	**2000**
Italy	60%	**5.40**	0.51	0.06	0.95	**2111**
Germany	60%	**5.57**	0.62	0.06	1.00	**2222**
Bulgaria	60%	**7.02**	0.06	0.05	1.25	**2778**
Israel	60%	**7.79**	0.67	0.07	1.45	**3222**
USA	60%	**8.91**	1.06	0.08	1.65	**3667**

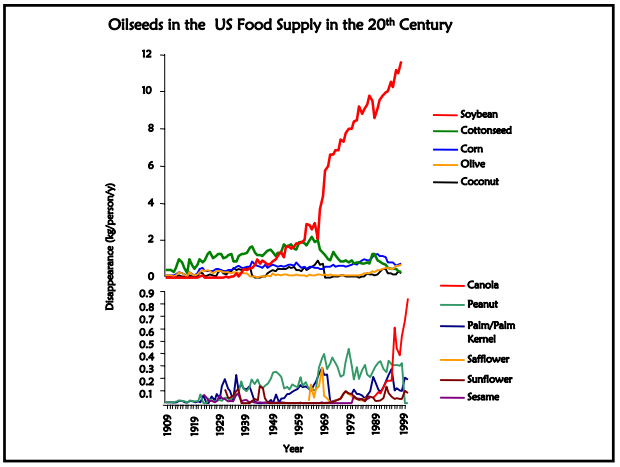
Hibbeln et al Am J Clin Nutr 2006; 83; 1483S-93S

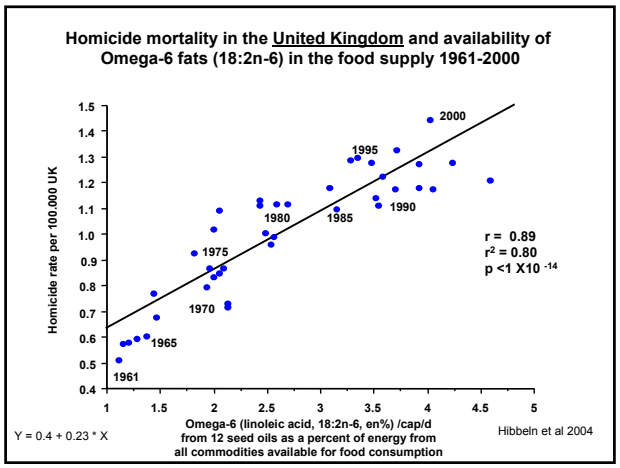
Dietary intakes of long chain omega-3 fats vary more than 10-fold necessary to achieve Japanese tissue levels (98% protection) of long chain omega-3 fatty acids

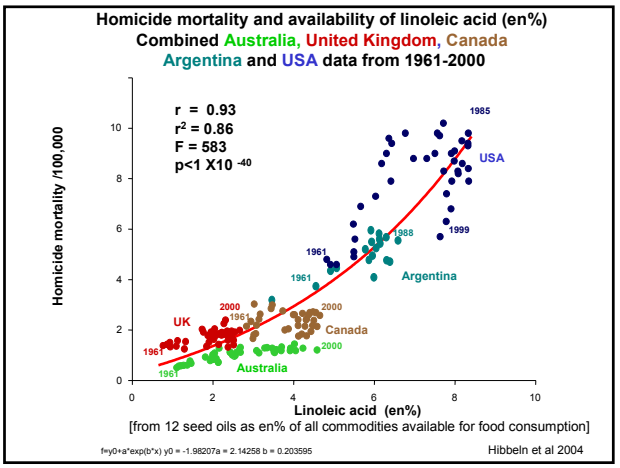
This variation is due to greater background intakes of linoleic acid (omega-6).

Lowering linoleic acid intakes from seed oils can reduce the burden on fisheries.

Hibbeln et al Am J Clin Nutr 2006; 83; 1483S-93S







Action

1. Support and encourage maternal seafood and omeg-3 consumption in pregnancy to protect children from lifelong adverse behavioural and educational harms.

2. Establish recommendations for minimum daily intakes or EPA and DHA considering mental health outcomes.

3. Determine if high levels of dietary linoleic acid from seed oils is safe and is not contributing to increasing rates of violence.

4. Support fisheries habitats and ecologically safe aquaculture.