

# RISK-BENEFIT ANALYSIS: NUTRITIONAL AND ENVIRONMENTAL SAFETY OF FISH CONSUMPTION

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**Background and Aims:** Research reveals associations between fish consumption and long-chain polyunsaturated fatty acid (n-3PUFA) intake, exposure to environmental contaminants and health outcomes including developmental, coronary heart disease (CHD) and cancer (IOM, 2007; Mozaffarian and Rimm, 2006; Willett, 2005). There is also evidence of public confusion about risks and benefits inherent in consuming fish, raising concerns about food safety communication. (WHO, 2009; McManus et. al., 2009). The aims of this study are to: (1) demonstrate the influence of fish consumption choice on exposures to risks and benefits; and (2) quantify associated health and socio-economic outcomes.

**Methods:** A risk-benefit framework is applied to the association between CHD and low-dose, chronic exposure to methyl mercury (MeHg) and n-3PUFAs resulting from fish consumption. Ecological exposure assessment is conducted with reference to species and quantity consumed and whether fish are farmed or wild. A baseline consumption profile and exposure factors are constructed for the US population. Five consumption/exposure scenarios are elaborated and input into a dose-response synthesis to assess associated changes in CHD. The Value of a Statistical Life Year (VSLY) method is used to analyse the socio-economic implications of the dose-response results.

**Results:** The distribution of fish species within the consumption portfolio is the main determinant of exposure factors. Significant improvements are achievable with minor adjustments in consumption patterns. The dose-response synthesis supports assertions that for CHD outcomes, n-3PUFAs and MeHg are, respectively, the main sources of benefits and risk. The simulations point to associations between lower relative risk of CHD death and consumption profiles featuring lower MeHg/ higher n-3PUFAs species.

**Conclusions:** This risk-benefit framework is effective for analyzing and communicating food safety information and is applicable to multiple attributes and health associations. Incorporating socio-economic analysis translates health information for a wider audience.

IOM (Institute of Medicine) (2007) *Seafood choices: Balancing benefits and risks*. Washington, DC: National Academy Press.

McManus A, Howieson J, and C. Nicholson (2009) *Review of literature and resources relating to the health benefit of regular consumption of seafood as part of a health diet*. Curtin Health Innovation Research Institute, Curtin University of Technology, Perth. Report 090101.

Mozaffarian, D. and E.B. Rimm (2006) *Fish intake, contaminants, and human health. Evaluating the risks and benefits*. *Journal of the American Medical Association* 296. pp.1885–1899.

Willett, W.C. (2005) *Balancing health risks and benefits*. *American Journal of Preventative Medicine*. 29:4, pp. 320-321.

WHO (World Health Organization) (2009) *Population nutrient intake goals for preventing diet-related chronic diseases*. Geneva: World Health Organization.